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A Synopsis of the family Pottiaceae in Brazil

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Abstract

The Pottiaceae are acrocarpous mosses, with South America being considered one of the centers of diversity. A revision of Brazilian species of the Pottiaceae resulted in 66 accepted species in the subfamilies Timmielloideae, Trichostomoideae, Barbuloideae, and Pottioideae. These species are found at elevations from sea level to 2700 m in Brazil. The family itself consists of 36 genera and 66 species, with only six taxa being considered endemic. Two new synonyms are designated for *Weissia controversa*: *Weissia submicacea* and *Trichostomum exulatum*. An illustrated key is presented for all the Brazilian species of the family Pottiaceae, as well as the vegetation types where they occur, there altitudinal ranges in Brazil, substrate types, world distributions, and additional comments.

Key words: South America, taxonomy, Pottiaceae

Introduction

The Pottiaceae is a family of acrocarpous mosses comprising seven subfamilies, six tribes, 77 genera, and 1457 species globally (Zander 1993). In the Neotropics, it is represented by 55 genera and 361 species (approximately 250 valid species), (Gradstein *et al.* 2001). According to Zander (1996), this is the largest moss family in terms of the number of genera (77), with 22 being considered critically threatened as they are rare and include each only two species. Three of these genera occur in Brazil, *Erythrophyllopsis* Brotherus in Herzog (1916), *Ganguleea* Zander (1989), and *Hymenostyliella* Bartram (1939).

This synopsis recognizes four subfamilies, 36 genera, and 69 species. The Brazilian taxa are found in open and often rather dry habitats, with their greatest diversity being observed in submontane areas. The habitats of the species in Brazil are diverse, but they usually occur in environments subject to desiccation or disturbances that are associated with human anthropogenic activities (urban areas).

This treatment for Brazil is based on specimens studied by the author as well as the publications of Zander (1972, 1977a,b, 1979, 1982, 1989, 1993, 1994, 2003), Guerra *et al.* (1992), Jiménez & Cano (2008), Jiménez *et al.* (2012), Cano & Jiménez (2013), Alonso *et al.* (2014), and Cano *et al.* (2015).

In the course of this study 650 specimens were examined, including 90 types. Of the 66 species of Pottiaceae recognized to Brazil, eight are endemic species, and their habitat should be considered for protection.

Material and Methods

I compiled the names of Pottiaceae cited in the publications of Zander (1993) and Crosby *et al.* (1999), and in TROPICOS database (2015). This study was based on the analyses of specimens deposited in the following herbaria: B, BM, CEPEC, F, G, HBG, H-BR, JE, LE, MEXU, MG, MO, NY, PACA, PC, R, RB, S-PA, SP, Schäfer-Verwimp, UB, and UFPE. The protologues of each name were checked, involving reviews of ca. 90 papers. The types or original materials of 49 taxa (representing 77% of the total species) were studied. Field work was carried out in several Brazilian states (Amazonas, Bahia, Distrito Federal, Minas Gerais, Rio de Janeiro, Rio Grande do Sul, and São Paulo) in different vegetation types. The collections are deposited in the RB herbarium.

The treatment cites all validly published Pottiaceae species known to Brazil, their original literature, type information, some synonyms (those that have been used in the literature of the Brazilian flora), vegetation types, altitudinal range in Brazil, substrate type, the specimens examined, taxonomical notes, and illustrations.

No infraspecific taxa were recognized in the present synopsis. For each accepted species, the synonyms listed are mainly names considered valid in Brazil, largely based on studies of type materials, with references to recent synonyms.

Brazil can be divided into five phytogeographic domains (Fiaschi & Pirani, 2009): Amazon, Savanna (*Cerrado*), Atlantic Forest, *Caatinga* (the xerophytic vegetation of the semi-arid northeastern region), and Steppe (*Campos Sulinos*).

For each taxon recorded for Brazil, the following information is provide: state distribution (state), altitudinal range, world distribution (based on literature), and comments.

For author names I follow Brummitt & Powell (1992). The TROPICOS database (2015) was used to obtain

current information for moss names. The state names are abbreviated according to the IBGE (NORTHERN: Roraima—RR, Rondônia—RO, Amapá—AP, Acre—AC, Amazonas—AM, Pará—PA, Tocantins—TO; NORTHEASTERN: Maranhão—MA, Piauí—PI, Ceará—CE, Rio Grande do Norte—RN, Paraíba—PB, Pernambuco—PE (including Fernando de Noronha Archipelago—FN), Alagoas—AL, Sergipe—SE, Bahia—BA; MIDDLE-WESTERN: Goiás—GO, Mato Grosso—MT, Mato Grosso do Sul—MS; SOUTHEASTERN: Minas Gerais—MG, Espírito Santo—ES, Rio de Janeiro—RJ, São Paulo—SP; SOUTHERN: Paraná—PR, Santa Catarina—SC, Rio Grande do Sul—RS).

Taxonomic Treatment

This includes the names for which I have seen the types or, in a few cases, accurate and informative descriptions and illustrations. Accepted names, in **bold**, are listed alphabetically by genera, and synonyms, in *italic*, are listed under accepted names in chronological order of publications. Names with type material not seen are listed after each genus and at the end of the treatment. The classification proposed by Zander (2006) is used in this study.

Subfamilies and tribes of Pottiaceae present in Brazil

1. Subfamily **Timmielloideae** (1 genus, 1 species): *Timmiella*.
2. Subfamily **Trichostomoideae** (8 genera, 18 species): *Eucladium, Pleurochaetae, Pseudosymblepharis, Streptocalypta*, *Tortella, Trachycarpidium, Trichostomum, Weissia.*
3. Subfamily **Barbuloideae** (3 tribes, 18 genera, 35 species).
   Tribe **Barbuleae** (9 genera, 14 species): *Andina*, *Anoectangium*, *Barbula*, *Didymodon, Erythrophyllopsis, Gymnostomum*, *Hymenostyliella*, *Hyophiladelphus*, *Molendoa.*
   Tribe **Bryoerythrophylleae** (1 genus, 2 species): *Pseudocrossidium.*
   Tribe **Hyophilleae** (6 genera, 8 species): *Ganguleea*, *Gymnostomiella*, *Hyophila*, *Luisierella, Plaubelia*, *Weisiopsis*.
   Tribe **Leptodontieae** (2 genera, 11 species): *Hymenostylium*, *Leptodontium*.
4. Subfamily **Pottioideae** (2 tribes, 9 genera, 15 species).
   Tribe **Pottieae** (1 genus, 1 species): *Tortula*.
   Tribe **Syntrichieae** (8 genera, 14 species): *Acaulon*, *Aloina*, *Chenia*, *Dolotortula*, *Hennediella, Microbryum*, *Streptopogon, Syntrichia*.

Key to the genera of Pottiaceae (*pro parte* to species)

1. Costal outgrowths present (filaments or lamellae) 2
1'. Costal outgrowths absent 4
2. Costa with 2 rows of lamellae on the upper ventral surface or adaxial surface (lamellae with 10–12 cells high) ..... ***Hymenostyliella alata***
2'. Costa with many photosynthetic filaments on the adaxial surface 3
3. Leaves short-lingulate to lingulate, costa subpercurrent to percurrent, covered from midleaf to near apex with photosynthetic filaments with 3–9 cells high. Basal membrane of peristome with with 3–4 rows of cells projecting above mouth ..... ***Aloina rigida***
3'. Leaves ovate-lanceolate to lanceolate, costa percurrent, ventral outgrows forming a group of cells inflate and papillose. Basal membrane of peristome scarcely differentiated ..... ***Andina pruinosa***
4. Lamina bistratose or partially unistratose and fully bistratose at midleaf 5
4'. Lamina unistratose 6
5. Lamina plane to slightly incurved, bistratose except at margin; cells smooth, the upper laminal cells medially bistratose, in cross section without a layer of cells directly above the other ..... ***Timmiella barbuloides***
5'. Lamina keeled or channeled, partially unistratose and fully bistratose at midleaf; cells papillose, the upper laminal cells bistratose, in cross section with one layer of cells directly above the other ..... ***Erythrophyllopsis andina***
6. Costa without stereid bands ..... ***Gymnostomiella vernicosa***
6'. Costa with stereid bands 7

7. Costa with one stereid band 8
7. Costa with two stereid bands 24
8. Costa with two rows of guide cells ..... ***Streptocalypta lorentziana***
8'. Costa with one row of guide cells 9
9. Costal epidermis presents in both abaxial and adaxial surfaces 10
9'. Costal epidermis present in only one surface, abaxial or adaxial 17
10. Leaves obtuse, acute, acuminate, rounded or abruptly cucullate 12
10'. Leaves apiculate or mucronate 11
11. Leaves broadly ovate. Dioicous. Capsule globose. Operculum absent ..... ***Acaulon uleanum***
11'. Leaves oblong-elliptical to spathulate. Monoicous. Capsule ovate ...., with 8 plicae. Operculum long-conical, smooth to rough ..... ***Ganguleea angulosa***
12. Leaf margins plane 13
12'. Leaf margins recurved 16
13. Leaves lingulate to spathulate; laminal cells in cross section bulging on both surfaces (abaxial and adaxial) 14
13'. Leaves oblong-elliptic or ligulate to spathulate; laminal cells in cross section bulging-mammillose on the ventral surface and plane or weakly convex on the abaxial surface 15
14. Marginal cells forming a border, (2–)3–5(–7) rows of linear to long-rectangular cells at midleaf. Capsule yellow-brown, cylindrical; annulus of 2–4 rows of cells. Operculum conical to rostrate. Calyptra cucullate .... ***Hennediella denticulata***
14'. Marginal cells not forming a border. Capsule brown, spherical; annulus of 2–3 rows of cells. Operculum short- to long-conical. Calyptra mitriform ..... ***Chenia leptophylla***
15. Plants rosulate. Leaves oblong-elliptical; costa subpercurrent to percurrent. Dioicous. Capsule ellipsoidal or oblong; annulus persistent on the capsule mouth. Operculum rostrate ..... ***Plaubelia sprengelli***
15'. Plants evenly foliate. Leaves ligulate to spathulate; costa subpercurrent. Monoicous. Capsule cylindrical; annulus not persistent. Operculum long-conical to rostrate ..... ***Weisiopsis bahiensis***
16. Leaf bordered by rows of long and narrow cells, apex with propagula. Dioicous or monoicous. Capsule elliptical, with a short rugose neck; annulus of 4 rows of slightly vesiculose cells. Operculum conical. Calyptra conic-mitrate, lobed below, strongly papillose ..... ***Streptopogon***
16'. Leaf not bordered, apex without propagula. Dioicous. Capsule elliptical to cylindrical, with a neck; annulus of 1–3 rows of vesiculose cells. Operculum short- to long-conical. Calyptra cucullate, smooth ..... ***Didymodon p.p.***
17. Ventral costal epidermis absent ..... ***Anoectangium aestivum***
Obs: the leaves are keeled and narrowly oblong.
17'. Ventral costal epidermis present 18
18. Leaves with a strong multistratose border ..... ***Dolotortula mniifolia***
18'. Leaves without a multistratose border 19
19. Leaves lingulate ..... ***Luisierella barbula***
19'. Leaves oblong, lanceolate, ovate, obovate to spathulate 20
20. Leaf margins plane ..... ***Syntrichia p.p.***
20'. Leaf margins recurved 21
21. Leaves not mucronate (acute) ..... ***Syntrichia amphidiacea***
21'. Leaves mucronate 22
22. Leaf margins usually bordered by one or two rows of cells with thicker walls and a lesser development of papillae. Costa short- to long-excurrent as a hair point hyaline or rarely yellowish ..... ***Tortula muralis***
22'. Leaf margins not bordered. Costa excurrent or short-excurrent as an apiculus, mucro or short awn, occasionally only percurrent 23
23. Leaf margin incurved distally, often recurved near the apex, entire at apex (rarely serrulate). Costa excurrent as an apiculus, mucro or short awn, occasionally percurrent. Monoicous. Capsule ovate to short-elliptical; annulus of 1–2 rows of vesiculose cells, persistent. Operculum short-conical. Calyptra mitrate, smooth ..... ***Microbryum davallianum***
23'. Leaf margin incurved distally, plane below, or strongly revolute, entire. Costa subpercurrent or short-excurrent (mucronate). Dioicous. Capsule elliptical to cylindrical, occasionally curved; annulus of 2–4 rows of vesiculose cells, persistent. Operculum short- to long-conical or conical-rostrate. Calyptra cucullate, smooth ..... ***Pseudocrossidium***
24. Costal epidermis absent on both surfaces ..... ***Leptodontium***
24'. Costal epidermis present 25
25. Costal epidermis present on both surfaces, abaxial and adaxial 26
25'. Costal epidermis present in one surface, abaxial or adaxial 34
26. Leaf margins usually denticulate only near leaf base or upper sheathing portion of leaf ..... ***Eucladium verticillatum***
26'. Leaf margins entire, denticulate, serrulate or serrate near apex or throughout 27
27. Leaves not mucronate, apex acute-rounded to subulate 28
27'. Leaves mucronate, apex acute to rounded-obtuse 29
28. Leaf apex acute-rounded, margins plane (occasionally recurved), costa subpercurrent to percurrent. Capsule short-cylindrical, erect. Operculum rostrate ..... ***Molendoa sendtneriana***
28'. Leaf apex acute to subulate, occasionally fragile, margins recurved, costa percurrent to long-excurrent as a subula. Cap-

sule long-elliptical to cylindrical, sometimes curved. Operculum long-conical to conical-rostrate..... ***Didymodon rigidulus***

Obs: ventral stereid band usually weak.

29. Leaf margins recurved..... ***Barbula p.p.***
29'. Leaf margins not recurved (plane or incurved)..... 30
30. Leaves oblong-obovate, elliptical to spathulate..... 31
30'. Leaves ovate to elliptical, ligulate, oblong, oblong-lanceolate, linear-lanceolate 32
31. Leaf acute, margins plane, recurved near base; costa excurrent to percurent, with hydroid (in cross section). Peristome well-developed..... ***Hyophiladelphus agrarius***
31'. Leaf rounded-obtuse, margins plane throughout; costa subpercurrent to percurrent, without hydroid (in cross section). Peristome absent ..... ***Hyophila***
32. Leaf margins plane or incurved or undulate above. Leaves ligulate, oblong to oblong-lanceolate, linear-lanceolate; costa strong, shortly-excurrent, tip robust..... ***Trichostomum***
32'. Leaf margins plane or weakly recurved at midleaf. Leaves ovate to elliptical, lanceolate to triangular-lanceolate; costa not strong, subpercurrent to shortly-excurrent as a mucro..... 33
33. Costa shortly-excurrent as a mucro..... ***Barbula indica***
33'. Costa subpercurrent..... ***Barbula afrofontana***
34. Abaxial costal epidermis present ..... ***Hymenostylium recurvirostrum***
34'. Adaxial costal epidermis present 35
35. Leaf margins incurved..... ***Weissia***
35'. Leaf margins plane..... 36
36. Costa with two rows guide cells ..... ***Streptocalypta lorentziana***
36'. Costa with one row guide cells 37
37. Leaves bordered, marginal cells forming a border 2/3–3/4 lamina length ..... ***Pleurochaete luteola***
37'. Leaves not bordered..... 38
38. Leaves with basal laminal cells differentiated extending upward along margin like a V (inverted or not) 39
38'. Leaves with basal laminal cells not differentiated along margin or weakly differentiated as weak V..... 40
39. Basal laminal cells extending upward along margin like a V inverted, rectangular, lax, thin-walled. Costa excurrent as a mucro or awn. Monoicous. Seta very short. Capsule ovate, with protuberances, annulus absent. Calyptra campanulate**..** ..... ***Trachycarpidium lonchophyllum***
39'. Basal laminal cells forming a V-shape extension toward and along marginal shoulder, rectangular, thin to occasionally thick-walled. Costa percurrent to short-excurrent. Dioicous. Seta long. Capsule cylindrical without protuberances. Calyptra cucullate ..... ***Tortella***
40. Leaves plane or weakly concave, costa subpercurrent (ending below apex). Peristome absent ..... ***Gymnostomum aeruginosum***
40'. Leaves erect, often clasping at base, incurved, costa short-excurrent or excurrent in a mucro. Peristome 16 teeth, short, erect or twisted, spiculose..... ***Pseudosymblepharis***

Acaulon Müll. Hal.

One species occurs in Brazil, on semi-dry vegetation at low to medium elevations.

1. *Acaulon uleanum* Müll. Hal., *Flora* 71: 3, 1888 (Müller 1888). Type:—BRAZIL. Santa Catarina: insula Sta. Catharina, in terra nuda, August 1886, *E. Ule 2* (BM, holotype; BM, RB!, HBG, isotypes). Fig. 1 (A-F).

In Steppe and Atlantic Rainforest (Dense Ombrophylous Forest), 0-700 m. On moist soil or rocks. Brazil (PR, RS, SC) and Chile (Zander 1993, Tropicos 2015).

Specimens examined—BRAZIL. **Paraná:** Sengés, 24°08'S- 49°26'W, 15 August 1984, *D.M. Vital 11403* (SP); **Rio Grande do Sul:** Bagé, 31°18'S, 54°04'W, 16 July 1980, *D.M. Vital 9175* (SP); Cachoeira do Sul, 31°15'S, 53°52'W, 17 July 1980, *D.M. Vital 9220, 9232, 9244* (SP); Pedro Osório, 31°43'S, 52°53'W, 15 July 1980, *D.M. Vital 9099* (SP); Pinheiro Machado, 31°30'S, 53°38'W, 15 July 1980, *D.M. Vital 9130, 9143* (SP); Vitória do Palamar, 33°28'S, 53°23'W, 13 July 1980, *D.M. Vital 9011, 9039* (SP); **Santa Catarina:** Desterro (Nossa Senhora do Desterro is the oldest name of Florianópolis, that was also known as Ilha de Santa Catarina), July 1886, *E. Ule s.n.* (RB); Tubarão, August 1889, *E. Ule 2* (LE, MG, NY 2 samples, Ex E. Ule Bryotheca brasiliensis nº 2).

In Brazil, this taxon is restricted to the southern region; globally it appears to be restricted to subtropical areas in the Southern Hemisphere.

It is characterized by very small plants, with leaves strongly concave, broadly ovate, costa short-excurrent, capsule immersed, cleistocarpic. According to Zander (1993), the presence of an apiculus in cleistocarpic capsules in other genera is a well-recognized and highly conserved trait.

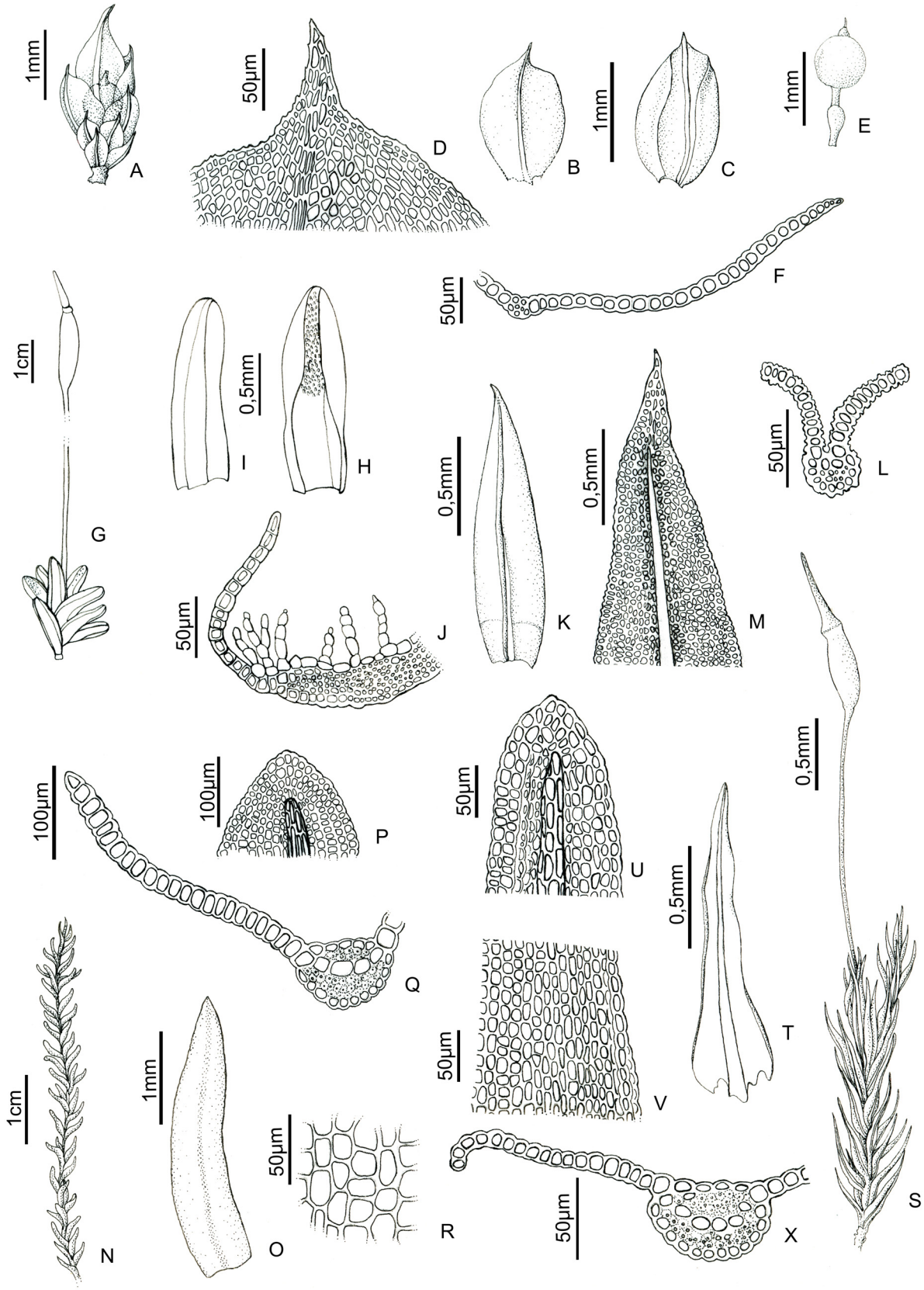

FIGURE 1. *Acaulon uleanum* Müll. Hal. A. Habit. B–C. Leaves. D. Leaf apex. E. Sporophyte. F. Leaf section. *Aloina rigida* (Hedw.) Limpr. G. Habitat. H. Leaf with photosynthetic filaments. I. Leaf. J. Leaf section. *Anoectangium aestivum* (Hedw.) Mitt. K. Leaf. L. Leaf section. M. Leaf apex. *Barbula afrofontana* (Müll Hal.) Broth. N. Habit. O. Leaf. P. Leaf apex. Q. Laminal cells. R. Leaf section. *Barbula arcuata* Griff. S. Habit. T. Leaf. U. Leaf apex. V. Leaf section. X. Marginal cells.

Excluded species

Acaulon nanum Müll. Hal., *Flora* 71: 3, 1888 (Müller 1888). — Cited from Brazil, Paraná (Angely 1961, 1965), Rio Grande do Sul states (Sehnem 1955). This is a species from Paraguay, and the collections from the states of Paraná and Rio Grande do Sul belong to *A. uleanum*.

Aloina Kindb.

A widely distributed genus, with six species in South America (Delgadillo & Schiavone 2004, Cano *et al.* 2008) and only one species in Brazil.

1. *Aloina rigida* (Hedw.) Limpr., *Die Laubm. Deutschl*. 1: 637, 1888 (Limpricht 1888). Basionym:—*Barbula rigida* Hedw., *Sp. Musc. Frond*. 115, 1801 (Hedwig 1801). Type:—EUROPE. In muris limosis, tumulis coemeteriorum, collibus apricis Saxoniae, Germaniae, Angliae, Scotiae, Hungariae (G 208412, lectotype by Gallego *et al.* 1999, Herbier Hedwig-Schwaegrinchen). Fig. 1 (G–J).

In urban area of São Paulo city, on soil, ca. 800 m. Brazil (SP); widespread throughout the world—Europe, Africa, North and Central America, Asia, Australia, and South America (Zander 1993).

Specimens examined—BRAZIL. **São Paulo:** São Paulo city, Zona Sul, Alto da Boa Vista, Praça an der Strasse São Benedito/Fraternidade, 30 December 1991, *A. Schäfer-Verwimp 15308* (MEXU, SV).

The plants are very small (to 2.5 mm), with leaves short-lingulate to lingulate, margins entire or dentate, apex cucullate, costa large, subpercurrent to percurrent, ventrally covered with photosynthetic filaments (4–8 cells high), and lamina bistratose.

Only one collection is known for Brazil, from an urban area.

Andina J.A. Jiménez & M.J. Cano

A South American genus, with one rare species occurring in Brazil (Jiménez & Cano 2012).

1. *Andina pruinosa* (Mitt.) J.A. Jiménez & M.J. Cano, *Syst. Bot*. 37: 296, 2012 (Jiménez & Cano 2012). Basionym:—*Tortula pruinosa* Mitt., *J. Linn. Soc., Bot.* 12: 152, 1869 (Mitten 1869). Type:—ECUADOR. Cargairazo: 10,000–11,000 ft, *Spruce 208* (NY!, lectotype by Steere 1948; BM!, S, isolectotypes)

In the Atlantic Rainforest (Dense Ombrophylous Forest), ca. 900 m. On soil. Brazil (PR); South America—Argentina, Bolivia, Brazil, Colombia, Ecuador, Peru, and Venezuela (Jiménez *et al.* 2012).

Ilustration: Jiménez & Cano (2008).

Jiménez & Cano (2008) cited one collection from Brazil, from Paraná state, Bocaiúva do Sul county, sampled by *Cordeiro & Poliquesi 1040* (FLAS). I could not study this collection, or any other from Brazil belonging to this taxon, but according to its distribution, this species should occur in southern Brazil.

The authors considered this taxon similar to *Pseudocrossidium replicatum* (Taylor) R.H. Zander because both have leaves with margins recurved when dry and laminal cells papillose. However, *A. pruinosa* presents axillary hairs with one basal brownish cell, while in *P. replicatum* they are hyaline. The leaves are ovate-lanceolate to lanceolate when twisted; apex cucullate; margins revolute; costa percurrent, with two stereid bands in cross section, with the cells of the adaxial surface as groups of bulging and papillose cells.

Anoectangium Schwägr.

One species occurs in Brazil, on soil or rocks (frequently calcareous) in lowland to upper montane sites.

1. *Anoectangium aestivum* (Hedw.) Mitt., *J. Linn. Soc., Bot.* 12: 175, 1869 (Mitten 1869). Basionym:—*Gymnostomum aestivum* Hedw., *Spec. Musc. Frond.* 32, 1801 (Hedwig 1801). Type:—Locia palustribus Angliae, Helvetiae, Lipsiae in argillaefodina inventum habet Schreber, mihit tamen necdum obvium (G, lectotype by Geissler 1985). Fig. 1 (K–M)

Anoectangium euchloron (Schwägr.) Mitt., *syn. fide* Zander (1977b)

In the Amazon Forest, Savanna, and Atlantic Rainforest (Dense Ombrophylous Forest), 0–1900 m. On moist soil and rocks. Brazil (GO, MA, MG, RJ, SC, SP); widespread throughout the world—Europe, Asia, Africa, Australia, North, Central and South America (Zander 1993).

Specimens examined—BRAZIL. **Goiás**: am Rande der Altstadt na zeitweise sickerfeuchter Felswand, 400 m, 8 June 1987, *A. Schäfer-Verwimp & I. Verwimp 8668* (MO, SP as *A. euchloron*); **Maranhão:** Carolina BR 010, Transamazônica, margem esquerda da rodovia, lugar Pedra Caída, margem do córrego, sobre rocha com fina camada de areia, 13 April 1983, *M.F.F. Silva, E. Taylor, N.A. Rosa, J.B.F. Silva, J. Oliveira, C.S. Rosário & M.R. Santos 1095* (NY as *A. euchloron*); **Minas Gerais:** Pico da Piedade, 5600 ft, 2 April 1922, P.H. Rolfs (NY); **Santa Catarina**: Desterro (Nossa Senhora do Desterro is the oldest name for Florianópolis and after as known as Ilha de Santa Catarina), on soil, Jule 1886, *E. Ule s.n.* (RB); Serra Geral, Serra do Rio do Rastro, 13 Km W of Bom Jardim da Serra and 1 Km down from summit plateau on road to Lauro Muller, ca. 1200 m, ca. 28º22'S, 49º32'W, road side rocks with three small waterfalls, 27 September 1984 *D.M. Vital & W.R. Buck 12427* (NY); **São Paulo**: Monte Alto, Serra Tabarana, ca. 10 km da cidade, 20º22'S, 48º28'W, serra com mata seca semi-decídua de enconsta, em paredão rochoso úmido e sombreado, próximo de respingo d`água, 3 June 1997, *M.R. Pietrobom-Silva 1787* (SP).

This species was only known to two states in Brazil in the southeastern region, up to 800 m, being cited here for states in the following regions: northern (Maranhão, at sea level), southeastern (Minas Gerais, ca. 1900 m), and southern (Santa Catarina, at sea level). This taxon was cited for Petrópolis (RJ) by Brotherus (1924) as *A. euchloron* (Schwägr.) Mitt. Although this collection was not available for study, it probably does occur in Rio de Janeiro State based on its distribution throughout the rest of the country.

It can be distinguished by having terminal sporophytes on short lateral branches, costa deeply grooved, absence of a ventral stereid band, and laminal cells strongly bulging-pluripapillose. According to Zander (1979), it can be confused with *Barbula indica* (Hook.) Spreng. when sterile, however, the leaf base in the former is poorly differentiated, the costa has only one stereid band, and the abaxial propagulae are lacking.

In Brazil, *Anoectangium aestivum* may be confused with *Molendoa sendtneriana* (Bruch & Schimp.) Limpr., which differs by being smaller, leaves with part of the lamina bistratose, costa ending below the apex with two stereid bands. This species has stems with sclerodermis and central strand present, leaves sharply keeled or grooved along the costa, plane margins, and non-porous leaf cells, costa narrow, with a single, dorsal stereid band, and 2–3 ventrally exposed guide cells.

Cano & Jiménez (2013) considered *A. euchloron* a valid species. I considered it a synonym, however, mainly because the many variations observed in the collections studied are consistent with the variations observed in *A. aestivum*.

Barbula Hedw.

Five species recorded for Brazil, occurring on exposed sites, frequently associated with disturbed areas.

1. Costa subpercurrent (2–5 cells below apex) or percurrent 2
1'. Costa percurrent, short- to long-excurrent (mucronate) 3
2. Leaf narrowly lanceolate-subulate, margin revolute, upper laminal cells rectangular, usually smooth ..... ***B. arcuata***
2'. Leaf broadly lanceolate to triangular-lanceolate, margin plane, upper laminal cells hexagonal, quadrate or short-rectangular, cells smooth ..... ***B. afrofontana***
3. Costa long-excurrent, mucro long with ca. 6 rectangular cells, yellowish, strongly toothed; abaxial costal cells quadrate, strongly papillose ..... ***B. riograndensis***
3'. Costa short-excurrent, mucro short with 1–3 conical cells, not colored, smooth; abaxial costal surface with cells long-rectangular, cells smooth or weakly papillose 4
4. Leaf oval to elliptical, apex acute (green), margins plane or weakly recurved at midleaf; gemmae small, green, obovoid, in upper leaf axils ..... ***B. indica***
4'. Leaf long-lingulate or ovate-lanceolate (blackish), apex obtuse to broadly acute (black), margins recurved (1/2–2/3 length) rarely to near apex; gemma absent ..... ***B. unguiculata***

1. *Barbula afrofontana* (Müll. Hal.) Broth., *Die Natürl. Pflanz., Zweite Auflage* 10: 280, 1924 (Brotherus 1924). Basionym:—*Trichostomum afrofontanum* Müll. Hal., *Hedwigia* 38: 99, 1899 (Müller 1899). Type:—SOUTH AFRICA. Natal: Van Reenen, 1875, *A. Rehmann 82* (PRE, holotype), in Musci Austro-Africani nº *82 sub Didymodon fontano* (NY!, isotype as *Didymodon afro-fontanum* Rehm. *n. sp*.). Fig. 1 (N–R)

In Savanna and Atlantic Rainforest (Semi-deciduous Forest), 500–800 m. In rocky crevices, near misty waterfalls or on rocks along streams. Brazil (MG, SP); eastern and southern Africa (Zander 1993).

Specimens examined—BRAZIL. **Minas Gerais**: Santa Bárbara, rocky crevices, in mist of waterfall, September 1984, *Vital 10841* (SP).

Reported by Vital & Visnadi (2000) as a new record to Brazil, this species has a semi-aquatic nature, with a flaccid habit, costa subpercurrent, leaf cells smooth, with leaf borders (enlarged and thickened cells). It has so far only been possible to study a single collection.

2. *Barbula arcuata* Griff., *Calcutta J. Nat. Hist. Misc. Arts Sci. India* 2: 491, 1842 (Griffith 1842). Type:—INDIA. legimus specimina 2–3 fructifera in arenosis "Bogapanee", *J.W. Griffith 27* (BM!, holotype). Fig. 1 (S–X)

In the Amazon Forest, Savanna, and Atlantic Rainforest (Dense Ombrophylous Forest), 0–900 m. On humid soils along river banks, sometimes submerged, or on moist rocks. Brazil (AM, GO, MG, RJ, SP); widespread throughout the world—Mexico, Central America, West Indies, Western and Northern South America, Brazil, Middle and Estern Asia, China, India, Malesia, Southwestern Pacific (Allen 2002).

Specimens examined—BRAZIL. without locality, *V. Brohterus 2103* (RB); *Weiss s.n.* (NY); **Amazonas**: Solimões, Fonte Boa, 6 March 1924, *J.G. Kuhlmann 1585* (RB as *B. lurida*); **Goiás**: Alto Paraíso, Chapada dos Veadeiros, hangwald am Rio São Miguel westlich des Nationalparks, auf feuchter Erde, zeitweise submers, 770 m, 14º11'S, 47º52'W, 21 July 1988, *A. Schäfer-Verwimp 9867* (RB); **Minas Gerais**: Ouro Preto, April 1882, *H. Schenck s.n.* (BM 000845993 as *Barbula schenckii*); Tiradentes, Serra de São José, estrada para cachoeira do Mangue, sobre muro do lago, 900 m, 21º05'S, 44º13'W, 2 December 1993, *O. Yano et al. 21712* (SP); **Rio de Janeiro**: Corcovado, em aqueduto, March 1895, *E. Ule 216* (BM 000845996, BM 000845994, MG isotypes of *Barbula amblyacra*).

In light of its distribution, this taxon is apparently rare in Brazil and only one old collection is known from Rio de Janeiro State. It was reported for the first time in Brazil by Schäfer-Verwimp (1992) for Goiás State, being here cited for the second time for the country and for the first time in the northern and southeastern regions (Amazonas and Rio de Janeiro states).

Barbula arcuata has stem with a sclerodermis and central strand; the leaves are linear-lanceolate, with apex obtuse, denticulate, and margins entire; the costa is broad (up to 1/3 the width of the base), with cells smooth, rectangular in cross section, with guide cells, epidermal cells only on the ventral surface, and stereids on the dorsal surface.

3. *Barbula indica* (Hook.) Spreng., *Nomencl. Bot*. 2: 72, 1824 (Sprengel 1824). Basionym:—*Tortula indica* Hook., *Musci Exot*. 2: 135, 1819 (Hooker 1819). Type:—INDIA ORIENTALI. Madras: Tranquebar, *Röttler s.n.* (LINN, holotype; NY!, isotype). Fig. 2 (A–F)
Barbula cruegeri Sond. ex. Müll. Hal., *syn. fide* Zander (1979)

In the Amazon Forest, Atlantic Rainforest (Open Ombrophylous Forest and Dense Ombrophylous Forest), Savanna (Gallery Forest), *Pantanal* (seasonally inundated), and *Restinga*, 0–1600 m. On sandy soils, shaded rocks, road banks, and steep slopes. Brazil (AC, AM, BA, DF, ES, GO, MG, MS, MT, PA, PE, RJ, RS, SE, SP); tropical and warm temperate areas world-wide (Zander 1993, 1994).

Specimens examined—BRAZIL. **Acre**: Reserva Extrativista do Alto Juruá, sobre solo argiloso do salão junto com pteridófitas, gramíneas e outras plantas, 27 November 2000, *D.P. Costa et al. 3897* (RB); **Distrito Federal**: Recanto das Emas, 16 March 2001, *P.E.A.S. Câmara et al. s.n.* (UB); **Espírito Santo**: Anchieta, Bairro Iriri, calçada, 20 m, 20º50'S, 40º41'W, 30 May 1991, *D.M. Vital s.n.* (SP); Fundão, Recanto das Garças, solo, 150 m, 20º2'S, 40º10'W, 28 April 1991, *D.M. Vital s.n.* (SP); Itapemirim, Praia de Itaoca, calçada, 4 m, 20º54'S, 40º47'W, 2 May 1991, *D.M. Vital s.n.* (SP); **Goiás**: Anápolis, Praça Henrique Curado, 16º19'44"S, 48º57'11"W, 1000 m, 5 February 2004, *M.A.S. Carvalho 147* (SP); **Mato Grosso**: Cáceres, ao largo do Rio Paraguai, Rochedo da Serra Pelada, na base do tronco de uma árvore, 6 June 1984, *Saddi & Vital 6162-B* (UB); **Minas Gerais**: Formoso, on soil at base of large rocks, at the slopping area of Serra Dourada, 13º37'S, 48º45'W, 1 January 1985, *D.M. Vital 12753* (SP); Providência, Fazenda Bom Destino, ad terram marginis viae, 21 March 1924, *M.C.V. Bandeira 195* (NY, RB as *B. sambakiana*); **Rio de Janeiro**: Rio de Janeiro, arboreto do Jardim Botânico do Rio de Janeiro, on

wall rock of the stream, 26 January 2001, *D.P. Costa & L.C. Molinaro 241* (RB); **São Paulo**: Serra do Mar bei Paranapiacaba, an der Einsenbahnlinie zwischen São Paulo unde Santos, auf Ruderalfläche unweit der Sendestation, 1040 m, 22º47'S, 46º17'W, 1 September 1990, *A. Schäfer-Verwimp & Verwimp 13147* (RB); Ubatuba, Parque Estadual da Serra do Mar, Núcleo Picinguaba, Praia da Fazenda, 23º35'56"S, 44º85'11"W, nível do mar, sobre tronco de árvore a beira da praia, 27 October 2009, *D.P. Costa et al. 5033* (RB); **Rio Grande do Sul**: Caxias do Sul, Parque dos Macaquinhos, no solo, barranco, 780 m, 15 October 2005, *J. Bordin 154* (SP); Santana da Boa Vista, sobre barrancos, 14 November 1987, *R. Wasum et al. s.n.* (SP).

This species was reported for the first time in Brazil by Schäfer-Verwimp (1991) to Espírito Santo State, appearing quite common to the author, from southeastern to northeastern Brazil, as was corroborated by the present study.

According to Zander (1979), *Barbula indica sensu stricto* has leaves narrowly oval to elliptical, with plane margins or weakly recurved at mid-leaf, with small, green, obovoid propagula occurring in masses in the leaf axils, characteristics found in the Brazilian specimens examined. This species is quite common in Brazil.

Barbula indica var. *gregaria* (Mitt.) R.H. Zander was previously known only from Japan, but it was recorded by Schäfer-Verwimp (1992) for Itatiaia (RJ). This variety has massive, brown, elliptical to spherical, many-celled propagulae.

The samples of *Barbula sambakiana* Broth. from Minas Gerais State (leg. *M.C.V. Bandeira*) and housed at the NY and RB herbaria belong to *B. indica*.

4. *Barbula riograndensis* Bartr., *J. Washington Acad. Sci*. 42: 179, 1952 (Bartram 1952). Type:—BRAZIL. Rio Grande do Sul: São Leopoldo, Quilombo, super rupem ad marginem viae, 50 m, September 1941, *A. Sehnem 195* (FH, holotype; PACA!, isotype). Fig. 2 (G–J)

In the Atlantic Rainforest (Mixed Ombrophylous Forest), 0–950 m. On soil along roads or river rocks. Endemic to Brazil (PR, RS).

Specimens examined—BRAZIL. **Paraná:** Foz do Iguaçu, Parque Nacional do Iguaçu, sobre bloco de pedra a beira do rio, 200 m, 14 June 1989, *G. Hatschbach & A.C. Cervi 53150* (NY); **Rio Grande do Sul**: Caçapava do Sul, Pedra do Segredo, sobre rochas, 15 November 1987, *R. Wasum et al. s.n.* (NY); Caçapava do Sul, sobre rochedos, junto a estrada, 15 July 2006, *E. Pasini 85* (RB, SP); Caxias do Sul, Galópolis, *super rupem ad rivum,* 650 m, 31 October 1949, *A. Sehnem 3980* (R, RB, SP); Garibaldi, Salto Ventoso, ad rupem, 950 m, 13 May 1951, *A. Sehnem 5549* (NY); São Francisco de Paula, Lageado Grande, sobre rochedos, 800 m, 8 November 1987, *R. Wasum et al. s.n.* (NY).

According to Bartram (1952), it resembles a small *Tortula* in many ways but the costa (in cross section) showing dorsal and ventral stereid bands is decisive. The mucro short, yellowish, and strongly toothed, distinguishes this species from the other *Barbula* species in Brazil.

Restricted to southern region of Brazil, being known from localities at ca. 200 m, here increasing its altitudinal range to 950 m (montane forest).

5. *Barbula unguiculata* Hedw., *Sp. Musc. Frond*. 118, 1801 (Hedwig 1801). Type:—In muris limosis, arvis siccioribus, locis gramineneis, *Hedwig s.n.* (G!, holotype). Fig. 2 (K–N).
Barbula stricta Hedw., *syn. fide* Zander (1979)

In the Atlantic Rainforest (Dense Ombrophyllous Forest), 700–800 m. On rocks. Brazil (RS, SP); widespread in northern and southern temperate zones (Zander 1994).

Specimens examined—BRAZIL. **Rio Grande do Sul**: Caxias do Sul, Bairro São Ciro, sobre muro de tijolos, 780 m, 5 February 2006, *J. Bordin & L. Bordin 381* (SP as *B. riograndensis*); **São Paulo**: Guapiara, Serra Paranapiacaba, Fazenda Intervales, ca. 800 m, ca. 28º16'S, 48º25'W, roadside trees and fields, 24 July 1991, *D.M. Vital & W.R. Buck 20541* (NY).

According to Zander (1994), this species is common in northern and southern temperate zones (common in ruderal habitats), but rare in the tropics, where it is only known from Mexico.

Barbula indica is often confused with *B. unguiculata*, but differs by having leaves conduplicate but not contorted when dry, with margins plane or weakly recurved and abaxial surface of the costa prorate (with papillae borne at the tip of the cells). The leaves of *B. unguiculata* are often blackened.

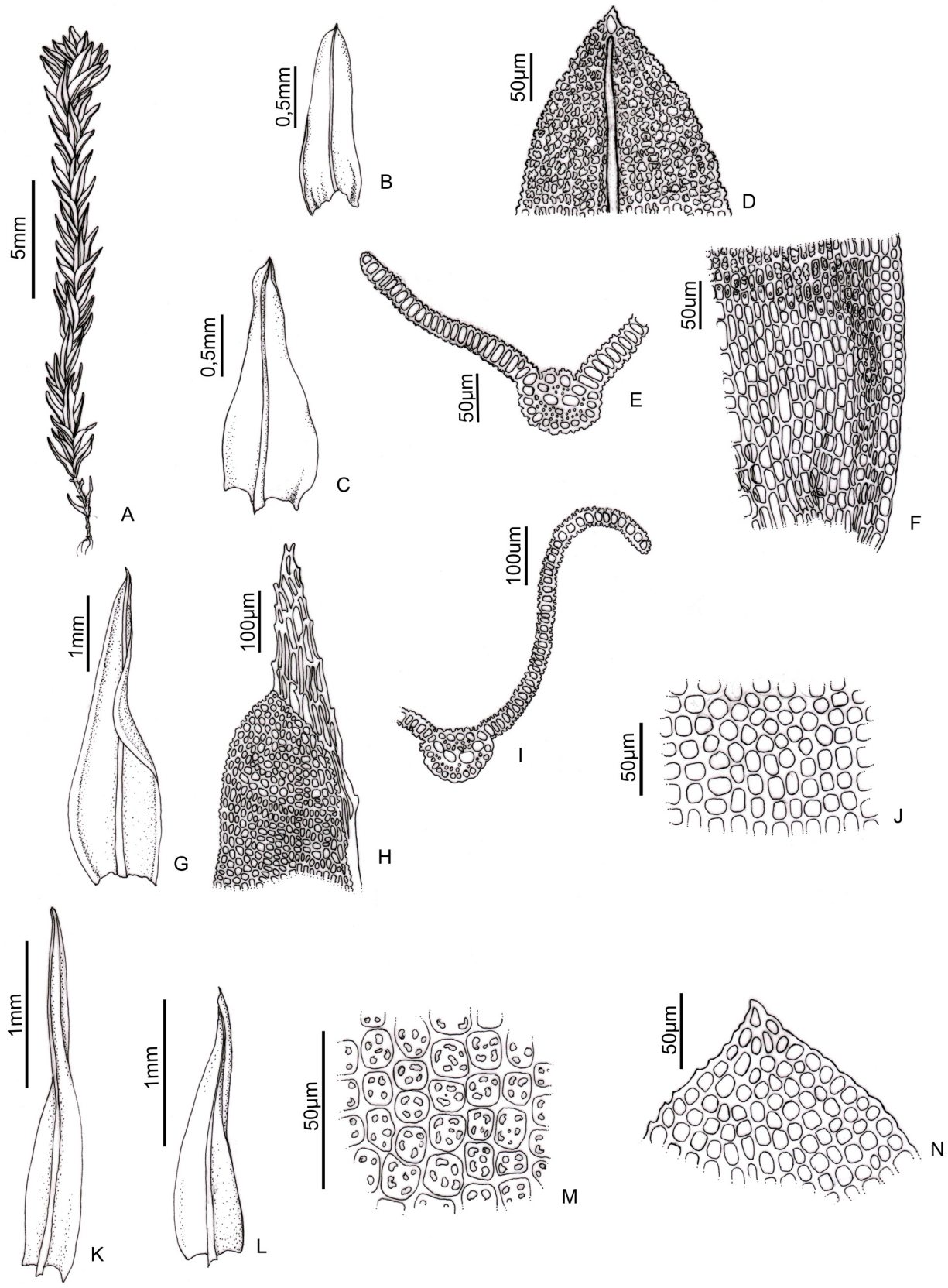

FIGURE 2. *Barbula indica* (Hook.) Spreng. A. Habit. B–C. Leaves. D. Leaf apex. E. Leaf section. F. Basal cells. *Barbula riograndensis* Bartr. G. Leaf. H. Leaf apex. I. Leaf section. J. Laminal cells. *Barbula unguiculata* Hedw. K–L. Leaves. M. Laminal cells with papillae. N. Leaf apex.

Names with types material not seen

Barbula capillipes Broth., *Hedwigia* 34: 125, 1895 (Brotherus 1895a).—Cited by Brotherus (1924, 1895a) to Brazil, Goiás, Fev 1893, *E. Ule 1547* (isotype: HBG).

Barbula lurida Hornsch., *Fl. Bras*. 1: 18, 1840 (Hornschuch 1840).—Cited from Brazil, Minas Gerais and Rio de Janeiro by Ångström (1876) and Hampe (1874a, 1879).

Barbula sambakiana Broth., *Ergebn. Bot. Exped. Südbras., Musci*. 286, 1924 (Brotherus 1924).—Brotherus (1924) described this taxon based on two Brazilian collections made by E. Ule in Minas Gerais and Santa Catarina states (*Ule 610* and *Ule 742*). I studied only one collection of *B. sambakiana* from Minas Gerais, Providência, Fazenda Bom Destino, collected on 21 March 1924, by *M.C.V. Bandeira 195* (NY!, RB!), although it belongs to *Barbula indica*.

Barbula tenuicoma Müll. Hal. ex. Broth., *Ergebn. Bot. Exped. Südbras., Musci*. 285, 1924 (Brotherus 1924). —Cited by Brotherus (1924) for Brazil, Minas Gerais State, Itabira do Campo, Apr 1892, *E. Ule 1397* (isotype: HBG).

Excluded species

Barbula unguiculatula Müll. Hal., *Linnaea* 42: 333, 1879 (Müller 1879).—Yano (1984) cited this taxon to Minas Gerais State based on the publication of Müller (1901—Genera Muscorum Frondosum). However, checking this publication, I found that the citations for this taxon do not cover Brazil, being cited by Müller (1901) for Argentina in South America. According to Zander (1993), the taxon is distributed in Am4 (Andes) and Am6 (West Indies), not occurring in Brazil.

Chenia R.H. Zander

One species frequently occurs in Brazil in disturbed areas. The genus is closely related to *Syntrichia*.

1. ***Chenia leptophylla*** (Müll. Hal.) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci*. 32: 258, 1993 (Zander 1993). Basionym:—*Phascum leptophyllum* Müll. Hal., *Flora* 71: 6, 1888 (Müller 1888). Type:—AFRICA. Promontorium bonae spei, Somerset East, Monte Boschberg, cum *Ephemerum capense*, *Ephemerum rehmannii* et *Phascum peraristatum* vigens, prof. Mac Owan s.n., 1882 (B holotype destroyed; H-BR!, isotype). Fig. 3 (A–D)

Chenia rhizophylla (Sak.) R.H. Zander, *syn. fide* Zander (1993)

In Savanna and Atlantic Rainforest (Semi-deciduous Forest, Open Ombrophylous Forest, and Dense Ombrophylous Forest), 0–1600 m. In urban and disturbed areas, on stone walls, humus, the base of roadside walls, and bare soil. Brazil (ES, MA, MG, PR, RJ, RS, SP); Europe, Asia, Oceania, Africa, Australia, North, Central and South America (Zander 1993).

Specimens examined—BRAZIL. **Espírito Santo**: Domingos Martins, auf feucht-schattigem, groβem granitblock in einer Weide AM "Morro do cruzeiro", SE Von Venda Nova, 1160 m, 20º26'S, 41º00'W, 11 October 1988, *A. Schäfer-Verwimp & Verwimp 10241* (RB, SP); **Maranhão**: São Luis, Reserva Florestal do Sacavém, 2º32'35"S, 44º20'39"W, 20 m, 6 May 2002, *M.M.F. Correia s.n.* (SP); **Rio Grande do Sul**: Antonio Prado, Fátima, no solo, 658 m, 9 January 2009, *M. Tonini 6* (SP); Caxias do Sul, Jardim Botânico, sobre rochas junto ao caminho, 780 m, 12 april 2004, *R. Wasum & J. Bordin 2140* (SP); Caxias do Sul, Bairro Exposição, no muro, beira da rua, 780 m, 21 January 2006, *J. Bordin 321* (SP); Caxias do Sul, Bairro Salgado Filho, sobre barranco de terra, beira da estrada, 780 m, 26 January 2006, *J. Bordin & M.A. Bordin 345* (SP); Caxias do Sul, Viaduto da Rota do Sol, sobre barranco, 780 m, 5 February 2006, *J. Bordin & L. Bordin 375* (SP); **Rio de Janeiro**: Angra dos Reis, 22 March 1995, *M.I.N. Oliveira-e-Silva 2818* (HBR as *Tortula rhizophylla*); **São Paulo**: São Paulo, Morumbi, Parque do Colégio Visconde de Porto Seguro, on soil, 780 m, 7 March 1991, *A. Schäfer-Verwimp 14361* (MG).

There are two Neotropical species, *C. leptophylla* and *C. subobliqua* (R.S. Williams) R.H. Zander. They differ in the narrowly elliptic leaves, with margins finely and evenly denticulate of *C. leptophylla* while the leaves of *C. subobliqua* are obovate, with irregularly dentate margins.

The first record of this species for Brazil was published by Schäfer-Verwimp (1991) from a single specimen

collected in a natural habitat in a mountainous region of Espírito Santo State. According to Schäfer-Verwimp (1992) and Schäfer-Verwimp & Giacontti (1993), this is a common species in urban areas in southeastern Brazil, mostly ruderal and rarely collected, probably overlooked.

Didymodon Hedw.
Two species occur in Brazil in shaded and dry exposed areas, often in disturbed areas. This genus requires a critical revision in tropical America.

This key is based on Sharp *et al.* (1994)

1. Plants blackish-green. Leaves oblong-lanceolate to lanceolate, apex rounded to acute, costa subpercurrent to percurrent, in cross section without hydroids and ventral stereids, basal cells differentiated hyaline, thin-walled ..... ***D. australasiae***
1'. Plants olive-yellow to dark-green. Leaves ovate to lanceolate, apex obtuse, costa excurrent to percurrent, in cross section without hydroids but ventral stereids often present, basal cells not or weakly differentiated, walls thin or evenly thickened ..... ***D. rigidulus***

1. *Didymodon australasiae* (Hook. et Grev.) R.H. Zander, *Phytologia* 41: 21, 1978 (Zander 1978). Basionym:—*Tortula australasiae* Hook. et Grev., *Edinburgh J. Sci*. 1: 301, 1824 (Hooker & Greville 1824). Type:—AUSTRALIA. New Holland: King George's Sound, *A. Menzies s.n.*, 1791 (BM!, lectotype by Guerra & Ros 1987). Fig. 3 (E–H)

In the Savanna and Atlantic Rainforest (Mixed Ombrophylous Forest and Semi-deciduous Forest), 780–900 m. In city centers, ruderal on the base of walls and sidewalks. Brazil (GO, PR, RS, SP); widespread throughout the world—Europe, Africa, America, Asia, Australia, and New Zealand (Jiménez *et al.* 2005).

Specimens examined—BRAZIL. **Goiás**: Formoso, 13º37'S, 48º45'W, on bank along a stream at Serra Dourada, 25 December 1984, *D.M. Vital 12672* (SP); **Rio Grande do Sul**: Caxias do Sul, Lourdes, sobre muro de tijolo, 780 m, 14 April 2006, *J. Bordin & L. Bordin 472* (SP); Caxias do Sul, ruínas do Forte, sobre pedras, 15 November 1987, *R. Wasum et al. 3583* (NY); **São Paulo**: São Paulo city, Zona Sul, Stadtteil Alto da Boa Vista, Rua Irineu Marinho 804, auf Geweg, mit *Chenia rhizophylla*, 780 m NN, 21–31 December 1991, *A. Schäfer-Verwimp 15297* (RB).

Schäfer-Verwimp (1996) recorded this taxon for the first time to Brazil, commenting that it may have been introduced through humam activities.

According to Zander (1994), hydroids in the costa, and the absence of ventral stereid bands are characteristic of *D. australasiae*.

2. *Didymodon rigidulus* Hedw., *Sp. Musc. Frond*. 104, 1801 (Hedwig 1801). Type:—EUROPE. in interstitiis murorum antiquorum, praeprimis cotaceorum (G!, holotype). Fig. 3 (I–N)

In the Atlantic Rainforest (Dense Ombrophylous Forest and Semi-deciduous Forest), 200–1500 m. On human habitats, open soil near a hotel, sunny stone walls of a pool, or shaded stone walls of a garden. Brazil (MG, RS); widespread throughout the world—Europe, North Africa, Asia, and North and South America (Zander 1994).

Specimens examined—BRAZIL. **Minas Gerais**: Camanducaia, Serra da Mantiqueira, Monte Verde, Wanderweg in Podocarpuswald, auf Betonmauer einer Quellfassung, 1450 m, 12 May 1990, *A. Schäfer-Verwimp & Verwimp 12701* (SP); Delfim Moreira, Serra da Mantiqueira, na sonnogem Wegabstsch bei der Pousada do Barão in São Francisco dos Campos, 1550 m, 22º35'S, 45º18'W, 25 September 1988, *A. Schäfer-Verwimp & Verwimp 10039* (RB); **Rio Grande do Sul**: Candiota, Passo do Tigre, no barranco junto a sanga, 22 February 2006, *R. Wasum & E. Pasini 3555* (SP); Caxias do Sul, Bairro Cinquentenário, sobre calçada de concreto, 789 m, 9 February 2006, *J. Bordin & M. Sartori 427* (SP).

According to Schäfer-Verwimp (1992), in view of the nature of its collecting sites, this taxon was probably introduced from Europe, which was found in this study based on the origins of the collections.

Zander (1998) considered this species polymorphic, and specimens with intermediate morphologies may be identified as *D. rigidulus sensu lato*, although some authors use the presence of axillary gemmae as a diagnostic characteristic.

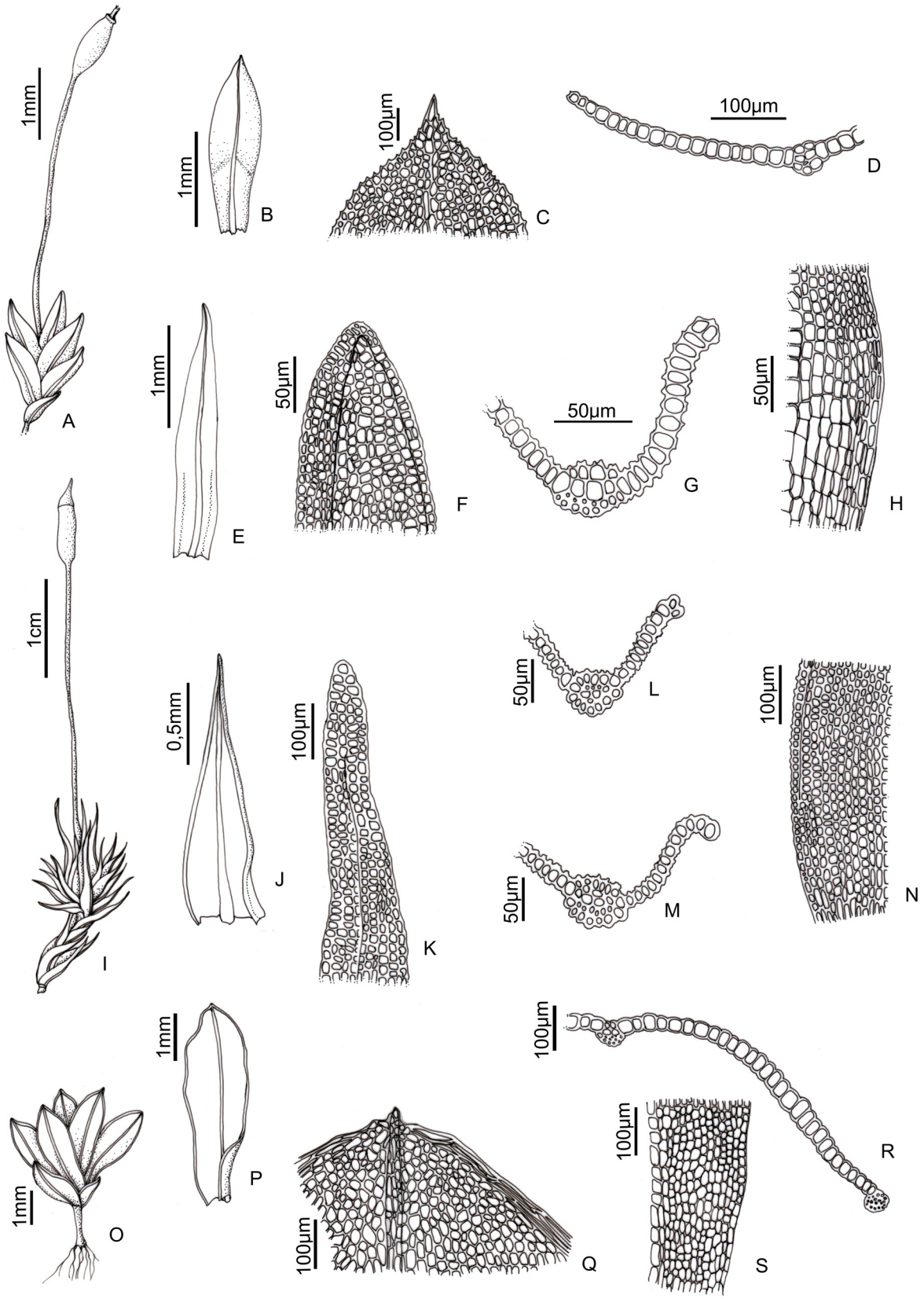

FIGURE 3. *Chenia leptophylla* (Müll. Hal.) R.H. Zander. A. Habit. B. Leaf. C. Leaf apex. D. Leaf section. *Didymodon australasiae* (Hook. & Grev.) R.H. Zander. E. Leaf. F. Leaf apex. G. Leaf section. H. Basal cells. *Didymodon rigidulus* Hedw. I. Habit. J. Leaf. K. Leaf apex. L–M. Leaf sections. N. Laminal cells. *Dolotortula mniifolia* (Sull.) R.H. Zander. O. Habit. P. Leaf. Q. Leaf apex. R. Leaf section. S. Laminal cells.

Excluded species

Didymodon amblyophyllus (Hook.) Broth., *Nat. Pflanzenfam.* 1(3): 405, 1902 (Brotherus 1902). Basionym:—*Gymnostomum amblyophyllum* Hook., *Bot. Miscellany* 1: 352, 1830 (Hooker 1830). Type:—ANDES CHILENSES. Mendonza, *Gillies s.n.* (BM!, NY!, isotypes). — Hampe (1870) cited this taxon as *Pottia* from Rio de Janeiro (in the vicinity of Rio de Janeiro, Glaziou) and from Uruguay (Monte Video, Sellow). Until now, it has not been possible to confirm the presence of this species in Brazil, and as it is a species from southern South America (Chile and Uruguay), its presence is doubtful.

Didymodon umbrosus (Müll. Hal.) R.H. Zander, *Phytologia* 41: 22, 1978 (Zander 1978). — Vital & Bononi (2006) cited this taxon from São Paulo City (Lapa Cemitery). However, until now, I cannot confirm the presence of this species in Brazil because I studied the collections made by them in the cemiteries of São Paulo city and did not find this taxon.

Dolotortula R.H. Zander

A monotypic genus previously placed in *Tortula*. In Brazil, it occurs on soil, along stream banks. According to Gradstein *et al.* (2001), this genus is rare and can be distinguished by its obtuse-rounded, spathulate leaves with a strong, multistratose borders and large upper laminal cells.

1. *Dolotortula mniifolia* (Sull.) R.H. Zander, *Phytologia* 65: 426, 1989 (Zander 1989). Basionym:—*Barbula mniifolia* Sull., *Proc. American Acad. Arts Sci*. 5: 277, 1861 (Sullivant 1861). Type:—CUBA. Dry shaled banks, *Wright 33* (BM!, holotype). Fig. 3 (O–S)

In the Atlantic Rainforest (Dense Ombrophylous Forest), 0–540 m. Occurs in urban areas, on the ground, or along stream margins on calcareous soils, or on shaded river banks. Brazil (BA, CE, ES, RJ, SP); Mexico, West Indies, Central America, in the Andes of South America Vital et Pursell (1992).

Specimens examined—BRAZIL. **Bahia**: Salvador, February 1997, *Bastos 805.* (ALCB); **Ceará:** Crato, Sítio Fundão, solo, s.d., *S. dos Prazeres s.n.* (SP); **Espírito Santo**: Anchieta, Praia de Paraty, barranco úmido, 20°50'S, 40°42'W, 29 April 1991, *D.M. Vital s.n.* (SP); **Rio de Janeiro:** Rio de Janeiro, Campus da Universidade Federal, barranco úmido, 3 May 1991, *D.M. Vital s.n.* (SP); **São Paulo:** Conchas, in partial shade, on bank along the river (Rio Conchas) near the bridge, 23º02'S, 47º58'W, 23 August 1983, *D.M. Vital 11087* (SP); Laranjal Paulista, nos bordos de um riacho ocorrendo em solo calcáreo, 23º02'S, 47º55'W, ca. 4,5 km a oeste da vila Maristela, 23 August 1983, *D.M. Vital 11082* (SP).

It is characterized by the spathulate, apiculate leaves, with a multistratose border of stereid cells; upper laminal cells large and hexagonal, basal laminal cells short-rectangular, papillae absent; costa in cross section with stereid band weak, ventral and dorsal epidermis present, 2 guide cells in 1 layer.

Erythrophyllopsis Broth.

A genus with two species and previously known to the Andes, from Venezuela to Chile (Cano *et al.* 2010), and reported by Yano & Colletes (2000) for southern Brazil, where it occurs on humid rocks at low elevations.

1. *Erythrophyllopsis andina* (Sull.) R.H. Zander, *Bryologist* 80: 159, 1977 (Zander 1977). Basionym:—*Trichostomum andinum* Sull., *U. S. Expl. Exped., Musci* 5, 1859 (Sullivant 1859). Type:—Andes Peruvianae, U.S. Expl. Exp. Wilkes, 1838–1842, 15.000 ped, 1838–1842, *Sullivant s.n.* (FH, holotype). Fig. 4 (A–F).
Erythrophyllopsis boliviana Broth. in Herzog, *syn. fide* Zander (1977)
Erythrophyllopsis fuscula (Müll. Hal.) Hilp., *syn. fide* Zander (1977)

In the Atlantic Rainforest (Ombrophylous Dense Forest and Semi-deciduous Forest), 220–1500 m. On moist rocks. Brazil (PR, RS); Colombia, Peru, Bolivia, Ecuador, Argentina, and Chile (Cano *et al.* 2010).

Specimens examined—BOLIVIA. **Cochabamba:** Lagunas Wara-Wara, 17°17'14"S, 66°07'15"W, 4140 m, Puna, base de roquedo protegido, 30 August 2007, *M.J. Cano et al. 3455a* (RB); **La Paz**: entre Ovejuyo y Ituni, 16°32'50"S, 68°00'38"W, 3990 m, ladera pedregosa con Mutisia, 16 August 2007, *M.J. Cano et al. 3854* (RB). BRAZIL. **Paraná**: Guaíra, Parque Nacional de Sete Quedas, sobre pedra úmida, 7 March 1982, *O. Yano 3983 p.p.*

(SP); **Rio Grande do Sul**: Caxias do Sul, Jardim Botânico, sobre rochas, na beira de lago, 780 m, 12 April 2006, *J. Bordin & E. Pasini 452* (SP as *Didymodon australasiae*).

The construction of the Itaipu hydroeletric dam in 1982 inundated the entire area of the Sete Quedas National Park. Six months before the area was flooded, two Brazilian bryologists collected bryophytes in this region (Yano & Colletes 2000). They found one sample of *E. andina* mixed with *Trichostomum brachydontium*, this being its first record outside the Andes; this collection is housed at the herbarium of the Instituto de Botânica de São Paulo (SP). The taxon is considered Critically Endangered (CR—B1ab (iii)) in Brazil because of its restricted geographic range, extent of occurrence (less than 100 km^2), the small number of locations (only known from one sample collected 27 years ago from only one locality), and habitat quality (the area of the Sete Quedas National Park was flooded).

According to Cano *et al.* (2010), the lamina regularly bistratose in distal part and the adaxial surface cells of the costa absent below the apex, are characteristic of this species. It is a widely distributed in the South America Andes.

Eucladium Bruch & Schimp.

A monotypic genus encountered in southeastern Brazil on the calcareous rocks of a cave.

1. ***Eucladium verticillatum*** (With.) Bruch. & Schimp., *Bryol. Europ*. 1: 93, 1846 (Bruch & Schimper 1846). Basionym:—*Bryum verticillatum* With., *Syst. Arr. Brit. Pl. Ed*. 4, 3: 804, 1801 (Withering). *Weissia verticillata* (With.) Brid., *Muscol. Recent. Suppl*. 1: 121, 1806 (Bridel 1806). Type:—*Dicks. h. s.* —Dill. 47.35 [Nº 19. *Bryum verticillatum*. Rocks, Cumberland. Dickson's Hor.[tus] Sicc.[us] Brit.[annicus] (BM 000855574!, lectotype by Ochyra & Zijlstra 2005). Fig. 4 (G–K)

In the Atlantic Rainforest (Dense Ombrophyllous Forest) and Savanna, 200–900 m. On shaded calcareous rocks at the entrance of a cave. Brazil (MG—Gruta de Maquiné, RO—Alvorada d'Oeste); widespread throughout the world—Europe, Africa, Asia, and America (Zander 1994).

Specimens examined—BRAZIL. **Rondônia:** rodovia Pte. Médici, Alvorada d'Oeste, BR 429, km 33, mancha de cerrado, solo arenoso, 1 April 1986, *P. Lisboa 3795* (MG).

Schäfer-Verwimp (1996) recorded this taxon for the first time for South America, commenting that its natural habitat and its association with *Neohyophila sprengelii* (Schwägr.) H.A. Crum (= *Plaubelia sprengelii* (Schwägr.) R.H. Zander, a species known only from the Americas), indicated that it was not introduced. The record for Rondônia State is the second for Brazil, and the first for Savanna vegetation.

It is characterized by having plane leaf margins and irregular serration along the leaf base, with upper median laminal cells often larger than those at the margins. I did not observe the leaf margins denticulate below in the sample from Rondônia.

Ganguleea R.H. Zander

A monotypic genus in Brazil, occurring on rocks, on river banks, or river sides.

1. ***Ganguleea angulosa*** (Broth. & Dix.) R.H. Zander, *Phytologia* 65: 427, 1989 (Zander 1989). Basionym:—*Merceyopsis angulosa* Broth. & Dixon, *Journ. Bot*. 48: 302, 1910 (Dixon 1910). Type:—INDIA. Sikkim-Himalaya: prope Kurseong Punkabari, 2000 p., 16 December 1899, *Decoly & Schaul s.n*. (H!, holotype; BM!, isotype). Fig. 4 (L–P)

In the Atlantic Rainforest (Dense Ombrophylous Forest), 160–700 m. On shaded rocks along riverbanks and on the vertical faces of granitic riverside rocks. Southeastern Brazil (RJ, SP); the Himalayas of India and Nepal (Zander 1989).

Specimens examined—BRAZIL. **Rio de Janeiro**: Itatiaia, Três Cachoeiras, NW of Penedo, 500 m, ca. 22º27'S, 44º32'S, waterfall and adjacent humid Forest, 10 July 1991, *D.M. Vital & W.R. Buck 20053* (NY, SP); Nova Friburgo, June 1989, *D.P. Costa 250* (RB); Resende, Serra de Itatiaia, Bachschlucht bei Penedo, an schattingem Gestein am Bach, 700 m, 20 April 1987, *A. Schäfer-verwimp 8403* (NY, RB, SP); **São Paulo**: Serra do Mar zwischen Mogi das cruzes und Bertioga, Mata Atlântica am Rio Itapanhaú, na senkrechter, halbexponierter Felswand wenig unterhalb der Wasserfálle, ca. 160 m, 15 August 1991, *A. Schäfer-verwimp 14844* (NY, SP).

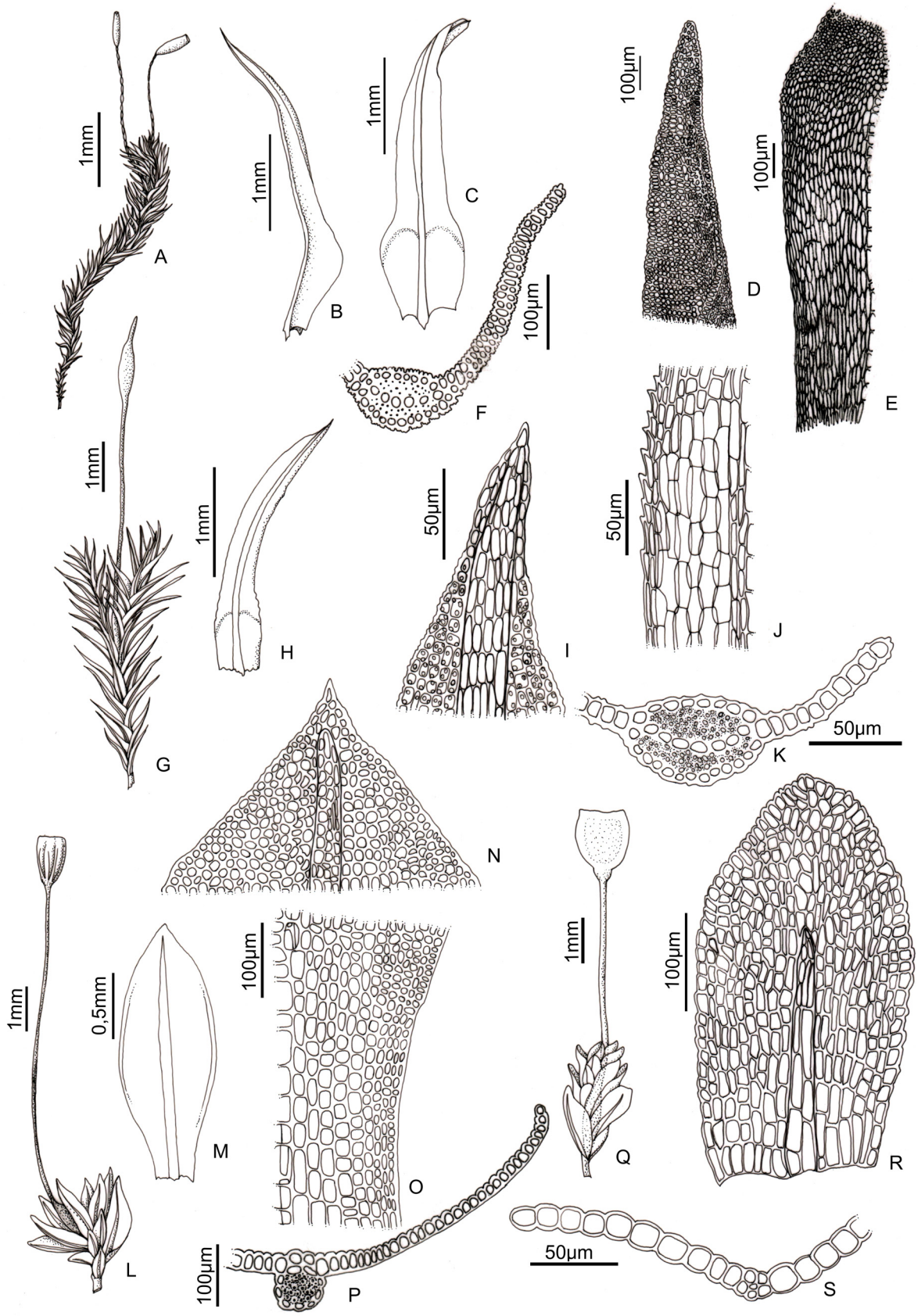

FIGURE 4. *Erythrophyllopsis andina* (Sull.) R.H. Zander. A. Habit. B–C. Leaves. D. Leaf apex. E. Laminal cells. F. Leaf section. *Eucladium verticillatum* (With.) Bruch. & Schimp. G. Habit. H. Leaf. I. Leaf apex. J. Marginal basal cells. K. Leaf section. *Ganguleea angulosa* (Broth. & Dix.) R.H. Zander. L. Habit. M. Leaf. N. Leaf apex. O. Marginal cells. P. Leaf section. *Gymnostomiella vernicosa* (Harv.) Fleisch. Q. Habit. R. Leaf. S. Leaf section.

This monotypic genus was described by Zander (1989) from the Himalayas of India and Nepal. The Brazilian collections of Schäfer-Verwimp (1992) and Schäfer-Verwimp & Giacontti (1993) were the first records for the Southern Hemisphere. Considered a rare moss in Brazil, being cited now for Itatiaia (*Serra da Mantiqueira*) and Nova Friburgo (*Serra do Mar*), in Rio de Janeiro State. It is characterized by leaves narrowing toward the base, sporophyte lateral, and capsule plicate without peristome.

Gymnostomiella Fleisch.
A single species in Brazil, occurring on rocks.

1. *Gymnostomiella vernicosa* (Harv.) Fleisch., *Musci Fl. Buitenzorg* 1: 310, 1904 (Fleischer 1904). Basionym:—*Gymnostomum vernicosum* Harv. in Hooker's *Ic. Pl.* 1: t. 17, f. 4, 1836 (Hooker ex Harver 1836). Type:—BURMA. Prome, 1826, *N. Wallich s.n.* (BM!, holotype; BM!, E, isotypes). Fig. 4 (Q–S)
Gymnostomiella orcuttii Bartr., *syn. fide* Redfearn (1991)

In Savanna, 0–500 m. In urban areas, on the walls at the entrance of a small cave, on humid cliffs, or on soils. Brazil (MG—Campina Verde, PA—Belém); Southeastern U.S.A., Mexico, Central America, West Indies, Western South America, Indo-China, and Australasia (Allen 2002).

Specimens examined—JAMAICA. Sherwood Forest, *C.R. Orcutii 2786*, IX/1927 (NY, as isotype of *Gymnostomiella orcuttii*). BRAZIL. **Minas Gerais**: Campina Verde, growing on walls of a small cave, on a humid cliff, 11 February 1975, *D.M. Vital 5022* (SP as *Gymnostomiella orcuttii*); **Pará**: pátio interno da cooperativa dos rodoviários, D. Pedro I, 52, sobre terra arenosa no solo do pátio, 10 August 1982, *R. Lisboa 422* (MG).

According to Arts (1998), the pluripapillose upper leaf laminal cells are the main difference between the varieties *G. vernicosa* var. *vernicosa* and *G. vernicosa* var. *tenerum* (Müll. Hal. ex Dusén) Arts, the latter having upper leaf laminal cells unipapillose. However, in the sample from Pará State the papillae were not observed. This is the second record for Brazil and the first for northern region; the current distribution may not reflect the real distribution of this species in Brazil.

Gymnostomum Nees & Hornsch.
Only one species in Brazil, occurring on calcareous rocks or soil.

1. *Gymnostomum aeruginosum* Sm., *Fl. Brit.* 3: 1163, 1804 (Smith 1804). Type:—WALES. North Wales, in palustribus alpinis, *J.W. Griffith s.n.* Esq. (BM?, holotype). Fig 5 (A–D)

In Savanna, 400–800 m. In urban areas, on calcareous rocks or soils. Brazil (GO, MG, SP, TO), widespread throughout the world—North, Central and South America, Europe, Asia, and Africa (Zander 1977b, 1994).

Specimens examined—BRAZIL. **Goiás**: Formoso, in partial shade, on bank along a stream near waterfall, at Serra Dourada, 13°37'01"S, 48°45'W, 1 January 1985, *D.M. Vital 12769* (SP); **Minas Gerais**: Fronteira, Fazenda Retiro Velho, 29 October 1994, *L. Rodrigues 28* (SP); Fronteira, Fazenda Retiro Velho, 29 October 1994, *J. Trevisan 20* (SP); **São Paulo**: Cemitério de Diadema, sobre o teto, parede e base das tumbas, 700 m, 23°34'01"S, 46°37'32"W, 28 June 2003, *D.M. Vital s.n.* (SP); **Tocantins**: Dianópolis, ca. 10 km de Taipas perto do Morro da Cabeça Branca na Serra de Ouro, rocha, 11 February 1987, *J.R. Pirani et al. 1958* (SP).

In Brazil, it was known from only one old collection cited by Brotherus (1924) without a locality, reported here for the middle-western and southeastern regions. It can be confused with *Molendoa sendtneriana* but separated by the small plants, with ligulate leaves, subpercurrent costa, laminal cells pluripapillose, and basal cells rectangular with thin to occasionally thick-walled.

Names with the types material not seen
Hymenostomum goyazensis (Broth.) Broth., *Nat. Pflanzenfam.* 1: 386, 1902 (Brotherus 1902). Basionym:—*Hyophila goyazensis* Broth., *Hedwigia* 34: 124, 1895 (Brotherus 1895). Type:—BRAZIL, Goiás: *E. Ule 1537*. Cited for Brazil from Bahia, Espírito Santo, Goiás, Mato grosso, and Paraíba states (Yano 2011). No material collected by E. Ule in Goiás State was encountered in any of the herbaria consulted.

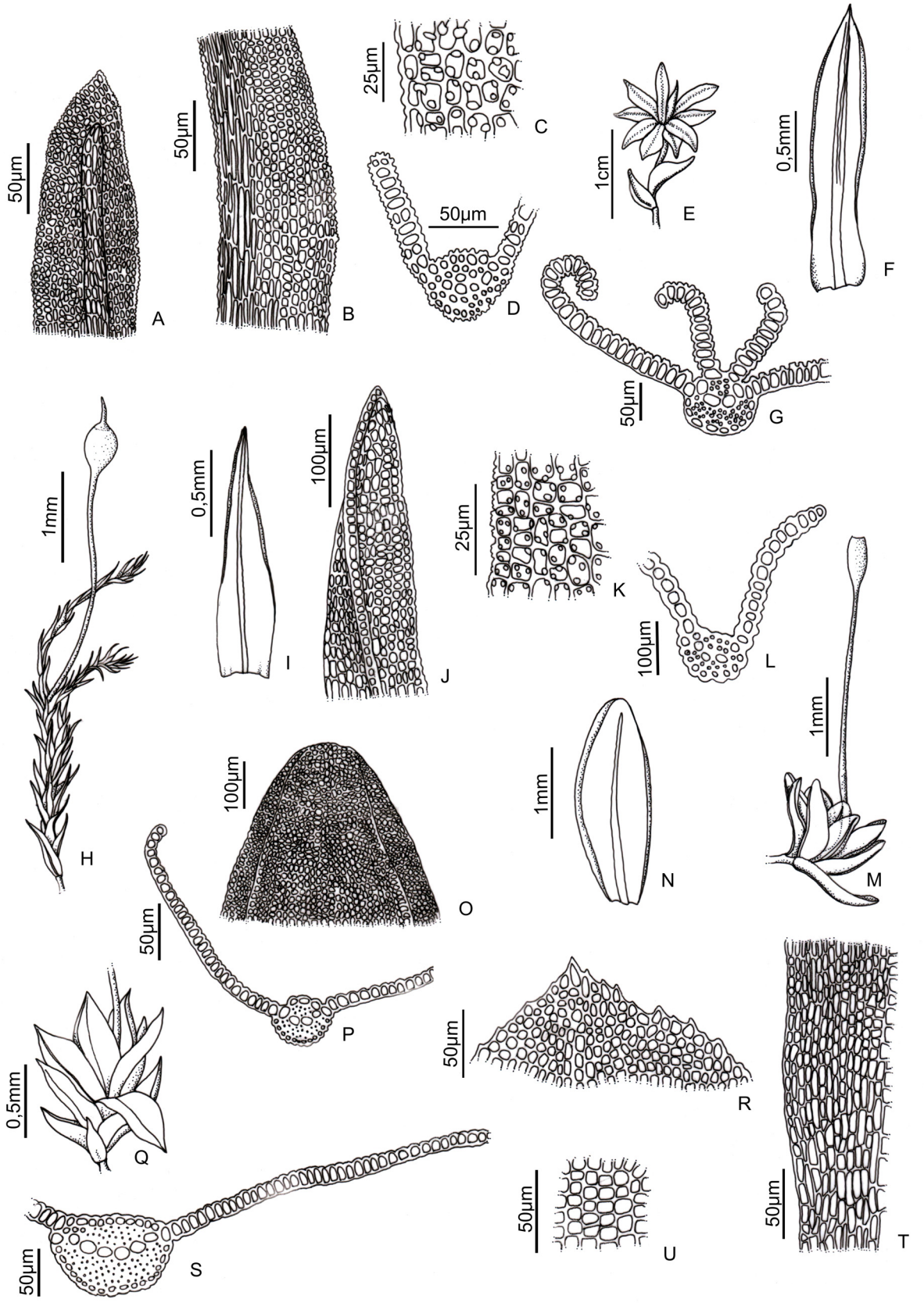

FIGURE 5. *Gymnostomum aeruginosum* Sm. A. Leaf apex. B. Basal cells. C. Laminal cells with papillae. D. Leaf section. *Hymenostyliella alata* (Herzog) Robins. E. Habits. F. Leaf. G. Leaf section (redrawn from Herzog 1925). *Hymenostylium recurvirostrum* (Hedw.) Dixon. H. Habit. I. Leaf. J. Leaf apex. K. Laminal cells with papillae. L. Leaf section. *Hyophila blanda* (Hook. f. & Wilson) A. Jaeger. M. habitat. N. Leaf. O. Leaf apex. P. Leaf section. *Hyophila involuta* (Hook.) A. Jaeger. Q. Habitat. R. Leaf. apex. S. Leaf section. T. Basal cells. U. Laminal cells.

Hymenostomum laxirete (Broth.) Broth., *Nat. Pflanzenfam*. 1: 386, 1902 (Brotherus 1902). Basionym:—*Hyophila laxirete* Broth., *Hedwigia* 34: 124, 1895 (Brohterus 1895). Type:—BRAZIL, Goiás, *E. Ule 1549*. Cited by Yano (2011) for Goiás State. According to Zander (1993), this taxon is distributed in Am6 (Chile and Argentina), not occurring in Brazil.

Hennediella Par.
One species occurring in Brazil.

1. *Hennediella denticulata* (Wilson in Mitt.) R. H. Zander, *Bull. Buffalo Soc. Nat. Sci*. 32: 269, 1993 (Zander 1993). Basionym:—*Barbula denticulata* Wilson in Mitt., *Kew J. Bot.* 3: 50, 1851 (Wilson in Mitt. 1851). Type:—ECUADOR. Pichincha: Quito, *W. Jameson* s.n. (FH, lectotype by Cano 2008)
Illustrations: Zander (1993)

In the Amazon Forest, River Negro, on soil. Brazil (AM); Bolivia, Ecuador, Peru (Cano 2008).

Cano (2008) cited two collections from Brazil, one from Amazonas State, sampled by *Spruce 157* (NY 02047548 as *Tortula denticulata* (Wilson) Mitt.) and another without locality, sampled by *Weir* (NY 02047547 ex Mitten Herb.). I could not study these collections, or any other from Brazil belonging to this taxon, but according to its distribution, this species should occur in northern Brazil.

According to Cano (2008), *Hennediella denticulata* is distinguished by its elliptic to oblong-elliptic leaves, bordered by unistratose, rectangular to linear marginal cells, and usually smooth and broad laminal cells.

Hymenostyliella Bartr.
A small genus with three species, only one occurring in southeastern Brazil.

1. *Hymenostyliella alata* (Herzog) H. Rob., *Phytologia* 21: 3, 1971 (Robinson 1971). Basionym:—*Timmiella alata* Herzog, *Arch. Bot. Est. São Paulo* 1(2): 61, 1925 (Herzog 1925). Type:—BRAZIL. *Lützelburg s.n*. (SP, holotype not found). Fig. 5 (E–G)

This species was described by Herzog (1925) based on a collection by Lützelburger on soil, in southeastern Brazil.

According to Robinson (1971), although the type material was not studied, the combination of leaf characters and the adaxial surface of the costa are characteristic of this taxon, but additional material should be examined to confirm the position of the perichaetia. I have not yet been able to study the type or any other collection from Brazil.

Robinson (1971) transfered *Timimiella alata* to the genus *Hymenostyliella* as it appears to be closely related to *H. llanosii* (Müll. Hal.) H. Rob., differing by the cucullate leaf apex and the presence of ventral lamellae (up to 12 cells long) in two rows over the costa, in combination with strongly mammillose cells on the upper leaf surface.

Hymenostylium Brid.
Two species occurring in Brazil.

This key is based on Cano et Jiménez (2013).

1. Leaves oblong-lanceolate to linear-lanceolate; median laminal cells often collenchymatous, cells with 1(–2) coarse papillae. Setae straight to twisted to the right. Capsule ovoid to cylindrical. Operculum conical-rostrate to rostelate, 0.6–1.2 mm long, not systylious..... ***H. aurantiacum***
1. Leaves usually lanceolate; median laminal cells usually not collenchymatous, cells with 2–3 small or coarse papillae. Setae twisted to the right. Capsule cylindrical. Operculum rostrate, usually systylious..... ***H. recurvirostrum***

1. ***Hymenostylium aurantiacum*** Mitt., *J. Proc. Linn. Soc., Bot., Suppl*. 1: 32, 1859 (Mitten 1859). Type:—INDIA. Sikkim, *Hooker 190.* (NY 1128560!, lectotype by Saito 1975)
Illustrations: Cano & Jiménez (2013).

In Savanna and the Atlantic Rainforest (Dense Ombrophylous Forest), 200–1100 m. On calcareous rocks near

streams and waterfalls. Brazil (DF, GO, MG, SP); Asia, South and Central America, West Indies, and Oceania (Cano et Jiménez 2013).

Specimens examined—BRAZIL. **Distrito Federal**: on wet face of limestone, in trickling water, calcareous outcrop ca. 25 Km N of Brasília, near Cia. Cimento Tocantins, Corrge Landim, occupied by woodland and adjacent cerrado, ca. 800 m, 11 March 1971, *H.S. Irwin, R.M. Harley & G.L. Smith 31701* (NY); **Goiás**: Chapada dos Veadeiros, Alto Paraíso, bank of Rio São Miguel, on wet, dripping rock, 23 July 1988, *A. Schäfer-Verwimp & Verwimp 9910* (MG, SP); **Minas Gerais**: Lagoa Santa, Gruta da Lapinha, auf schattingen Kalktuff, 28 July 1988, *A. Schäfer-Verwimp & Verwimp 9970* (SP); **São Paulo**: Eldorado Paulista, Caverna do Diabo, ca. 200 m, 24º42'S, 48º20'W, humid hardwood forest over limestone, 29 September 1984, *D.M. Vital & W.R. Buck 12538* (NY).

According to Cano & Jiménez (2013), it can be distinguished by more oblong, longer and less glossy leaves than *H. recurvirostrum*. It is characterized by having leaves oblong-lanceolate and less glossy (not lanceolate as in *H. recurvirostrum*), distal laminal cells with sinuose lumens and often with one papilla per cell.

2. *Hymenostylium recurvirostrum* (Hedw.) Dixon, *Rev. Bryol. Lichénol*. 6: 96, 1934 (Dixon 1934). Basionym:—*Gymnostomum recurvirostrum* Hedw., *Spec. Musc. Frond.* 33, 1801 (Hedwig 1801). Type:—POLAND and GERMANY. In rupibus gypsaceis prope Osterode et Niedersachswerfen dextexit, *J.B. Ehrhart s.n.* (G 00040165!, lectotype by Cano & Jiménez 2013). Fig. 5 (H–L)

In Savanna and the Atlantic Rainforest (Dense Ombrophylous Forest), 200–2350 m. On rocks near streams and waterfalls. Brazil (RJ, SP); widespread throughout the world—Europe, Macaronesia, Asia, Africa, North America, Central America, South America, West Indies, New Zealand, and Oceania (Cano & Jiménez 2013).

Specimens examined—BRAZIL. **Rio de Janeiro**: Itatiaia, Parque Nacional do Itatiaia, abrigo Rebouças, 2350 m, no solo sobre a rocha, February 2002, *H. Soares Filho s.n.* (RB); Santa Maria Madalena, Parque Estadual do Desengano, na parede rochosa entre moitas da vegetação, 1700 m, 29 October 2008, *D.P. Costa, T.M. Crespo & J.C. Silva 4953* (RB).

Characterized by the absence of a hyalodermis and central strand, leaves oblong-lanceolate or ligulate, one margin recurved and the other erect, laminal cells with one or more low papillae, the costa without ventral epidermis and with two stereid bands, and the capsule without peristome.

In Brazil, it can be confused with *Anoectangium aestivum*, *Gymnostomum aeruginosum*, and *Molendoa sendtneriana*, distinct from *A. aestivum* by having an apiculus ending in 1–3 cells, costa deeply grooved and only 2–3 cells wide on the ventral surface, without ventral stereid band, and non-porous leaf cells; it is distinct from *G. aeruginosum* by having a stem with a central strand, costa with large ventral epidermal cells, margin plane, and non-porous leaf cells; and distinct from *M. sendtneriana* by its multiple papillae centered over the cell lumina (Allen 2002).

Yano (1981) cited this taxon for Oeiras, in Goiás State (Gardner 1840), although this municipality is actually situated in Piauí State, one of the places where Gardner sampled in Brazil. She also cited it from Santa Catarina state, but until now I could not confirme its presence in this state.

Hyophila Brid.

According to Zander (1993), a revision of the Neotropical species of this genus should reduce to less than half the number of its recognized species. Only two species can be recognized for Brazil, occurring on rocks and soil in urban areas or on exposed sites.

1. Leaves obovate, margin entire, upper and median laminal leaf cells smooth..... ***H. blanda***
1'. Leaves spathulate, margin entire to dentate above, upper and median laminal leaf cells mammillose..... ***H. involuta***

1. *Hyophila blanda* (Hook. f. & Wilson) A. Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges.* 1871–72: 352, 1873 (Jaeger 1873). Basionym:—*Gymnostomum blandum* Hook. f. & Wilson, *London J. Bot.* 3: 151, 1844 (Hooker & Wilson 1844). Type:—BRAZIL. Piauí: on sandstone rocks, near city of Oeiras, May 1839, *G. Gardner 6* (BM 000872676!, holotype; BM 000872671!, BM 000872674! [4], NY!, isotypes). Fig. 5 (M–P)

In Savanna and Atlantic Rainforest (Dense Ombrophylous Forest), 0–1100 m. On rocks and soil. Endemic to Brazil (MG, PI).

Specimens examined—BRAZIL. without locality, *Gardner 6* (BM 000872672 as *Pottia blanda*—Ex Herb. Schuttleworth); **Piauí**: on sandstone rocks, near city of Oeiras, May 1939, *Gardner 3150* (BM 000872677 as *Gymnostomum blandum*); *Gardner 1* (BM [2] 000872673 as *Gymnostomum blandum*—Ex Herb. Musc. W. Wilson).

Yano (1981) cited this taxon for Oeiras, in Goiás State (Mitten 1869; Müller 1849—leg. Gardner nº 6), but this municipality is actually situated in Piauí State, one of the places Gardner surveyed in Brazil (Hooker & Wilson 1844).

This taxon is only known from very old collections made between 1839 and 1876. The plants are very small, with leaves appressed, erect-patent, concave, obovate, keeled (channeled), involute, entire; with upper and median laminal cells quadrate, smooth; costa subpercurrent; seta 3.5 mm long.

2. *Hyophila involuta* (Hook.) A. Jaeger, *Ber. Thätigk. St. Gallischen Naturwiss. Ges*. 1871–72: 354, 1873 (Jaeger 1873). Basionym:—*Gymnostomum involutum* Hook., *Musci Exot.* 2: 154, 1819 (Hooker 1819). Type:—NEPAL. *D. Gardner s.n* (BM!, holotype). Fig. 5 (Q–U)
Hyophila mattogrossensis Broth., *syn. fide* Costa (2014).

In the Amazon Forest, Atlantic Rainforest (Dense Ombrophylous Forest, Open Ombrophylous Forest, and Semi-deciduous Forest), *Caatinga* (dryland vegetation), and Savanna (Gallery Forest), 0–1400 m. On shaded soils, old stone walls in urban areas, or rocks. Brazil (AL, AM, BA, CE, DF, ES, GO, MG, MS, MT, PA, PB, PE, PI, PR, RJ, RO, RR, RS, SP); widespread throughout the world—America, West Indies, Europe, Siberia, Russia Far East, China, Japan, Asia, Macaronesia, Africa, Western Indian Ocean, Indian Subcontinent, Indo-China, Malesia, and Australia (Allen 2002).

Specimens examined—BRAZIL. **Alagoas**: Messias, ca 33 km N of Maceió, wet, secondary coastal forest along stream, ca. 100 m, rock in stream, shade, 2 June 1981, *B.M. Boom & S.A. Mori 1042* (NY); **Amazonas**: São Gabriel da Cachoeira, along Rio negro at city of São Gabriel da Cachoeira, 00º07'S, 67º05'W, in seepy ditch near river with *Philonotis*, 21 July 1980, *W.R. Buck 2620A* (NY); São Gabriel, *R. Spruce s.n.* (NY); in Mr. Campbell's, on stones, July, *Spruce s.n.* (NY); Manaus, public square on E side of Manaus Opera House, center of city of Manaus, on soil between paving stones in square, partial shade, xeric, 20 June 1982, *A.J. Fife, K.D. McFarland, L.A. Teixeira, B.W. Nelson, J.L. Santos, C.D. Motas & S.P. Gomes 4332* (NY); wall in downtown Manaus and vicinity, 6 December 1978, *W.D. Reese 12687* (NY); estrada Manaus-Caracaraí, km 4, Igarapé do Tarumã, sobre o solo argiloso próximo a um buritizal, 26 March 1976, *P. Lisboa & R. Lisboa 849* (MG); **Bahia**: 106 km da Bahia, en route to Juazeiro, 31 May 1915, *J.N. Rose & P.G. Russel 19707* (NY); Alagoinhas, 12 June 1915, *J.N. Rose & P.G. Russel 19883* (NY); Ilhéus, rapids and falls of the Rio feeding into the Lagoa Encantada, Caldeiras, 14º36'S, 39º10'W, on grazed seepage slopes by Caldeiras, on sandstone at edge of dry sinkhole scarce, 17 January 1993, *W. Thomas, A. Carvalho, A. Amorim & A. Chautems 9530* (NY); Irecê, growing on soil under a shrub in open field covered with scattered shrubs, near Lagoa do Maroto, ca. 3 km S from Gameleira dos Crentes, 17 May 1967, *D.M. Vital 1082* (SP); Pindaí, na caatinga, 12 May 1978, *D.M. Vital 7938* (SP); Tremedal, Km 79 on BA 262 between Vitória da Conquista and Brumado, 22 km SE of Aracatu, ca. 700 m, ca. 14º 32'S, 41º 05'W; 18 July 1991, *D.M. Vital & W.R. Buck 20344* (NY); Urandi, no solo barrancoso da caatinga, 12 May 1978, *D. M. Vital 7934* (SP); **Ceará**: Baturité, Serra de Guaramiranga, no paredão de concreto da lagoa, 26 January 1990, *O. Yano & Z.R. Mello 13896* (SP); Maranguape, Serra da Pirapora, sobre pedra arenosa úmida, 27 January 1990, *O. Yano & Z.R. Mello 13958* (SP); Ubajara, Gruta de Ubajara, no trecho que decline enconstada, Serra de Ipiapaba, 27 January 1968, *D.M. Vital 1332* (SP); **Distrito Federal**:, on limestone rock, calcareous outcrop, ca. 25 km N of Braslia, near Cia. Cimento Tocantins, Correge Landim, occupied disturbed woodland, ca. 800 m, 10 March 1971, *H.S. Irwin, R.M. Harleyl & G.L. Smith 31674* (NY); **Goiás**: Chapada dos Veadeiros, on masonry of bridge abutment, gallery forest bordering riacho, with adjacent campo and cerrado, ca. 18 km N of Alto Paraíso, 1250 m, 21 March 1971, *H.S. Irwin, R.M. Harley & G.L. Smith 32849* (NY); Formoso, on large rocks, in partial shade at the sloping area of Serra Dourada, 13°37'S, 48°45'W, 0 January 1985, *D.M. Vital 12761* (SP); Goiânia, bosque Saint Hilaire do Campus II perto do Inst. Ciencias Biológicas, no solo úmido da picada, 23 March 1990, *O. Yano & I.F.P. Campos 14403* (SP); Goiânia, bosque do Parque Mutirana, sobre mureta de concreto do bosque, 20 January 1990, *O. Yano & I.F. Campos 14123* (SP); Serra dos Pirineus, moss growing on top of Pico dos Pirineus, ca. 20 km NW of Corumbá de Goiás, near road to Niquelândia, Goiás, steep sandstone slopes ca. 1400 m elevation, 27 January 1968, *H.S. Irwin,*

H. Maxwell & D.C. Wasshausen 21800b (NY); **Mato Grosso**: Guia, ca. 15 km E do centro de Guia, 15º21'S, 56º14'W, na margem esquerda do rio Caxipo Acu, sobre pau podre, 18 June 1981, *D.M. Vital 9949* (NY); **Mato Grosso do Sul**: Ribas do Rio Pardo, 16 km, na base do tronco, perto do rio, mata de galeria, 25 January 1979, *O. Yano 1346* (SP); **Minas Gerais**: São Roque de Minas, ca. 23 km NE of São Roque de Minas, on road Bambuí, along Rio Samburá, ca. 600 m, ca. 20º10'S, 46º15'W, cerrado above river, 19 September 1984, *D.M. Vital & W.R. Buck 11874* (NY); **Pará**: Base aérea do Cachimbo and vicinity, km 780–820 on Cuiabá-Santarém highway (BR 163), ca. 20 km N of border of Mato Grosso, ca. 9º22'S, 54º54'W, el ca. 430–480 m, sandstone and mortar wall at radio station, at air base, broad, wet sandy plain with sandstone exposures, low ridges and valleys to the N and S, 30 April 1983, *W.D. Reese 16196* (NY); Base aérea do Cachimbo and vicinity, km 780–820 on Cuiabá-Santarém highway (BR 163), ca. 20 km N of border of Mato Grosso, ca. 9º22'S, 54º54'W, ca. 430–480 m, open sandstone pavement near falls on Rio Braco Norte at air base, broad, wet sandy plain with sandstone exposures, low ridges and valleys to the N and S, 05–30 April 1983, *W.D. Reese 16191* (NY); Base aérea do Cachimbo and vicinity, km 780–820 on Cuiabá-Santarém highway (BR 163), ca. 20 km N of border of Mato Grosso, ca. 9º22'S, 54º54'W, ca. 430–480 m, concrete spillway on bank of Rio Braco Norte at air base, broad, wet sandy plain with sandstone exposures, low ridges and valleys to the N and S, 25–30 April 1983, *W.D. Reese 16167* (NY); Belém, em pedras, 18 October 1967, *P. Cavalcante, Ieda & Ilze 32938* (NY); Campus de Pesquisa do M.P.E.G., Departamento de Botânica, na parede da "vala" da Boânica, 26 March 1992, *R. Lisboa & A.L. Borges 1167* (MG); Serra do Cachimbo, Serra Maze and vicinity, 1208–1229 km N of Cuiabá along Cuiabá-Santarém highway (BR 163), ca. 5º55'S, 55º40'W, ca. 100–200 m, mature, tall, humid forest on steep slopes and valleys, with occasional igarapés and igneous rock exposures, 18–22 May 1983, *W.D. Reese 16800* (NY); **Paraná**: Guaíra, nos barrancos rochosos, junto a sexta queda, 5 October 1978, *D.M. Vital 8352* (NY); **Paraíba**: Campina Grande, na mureta do jardim do Instituto Pequeno Principe, rua Antenor Navarro, 31 January 1976, *D.M. Vital 5423* (SP); **Pernambuco**: Rio Formoso, Estação Experimental de Saltinho, sobre barranco úmido, 11 September 1984, *O. Yano et al. 9144* (SP); Recife, no Horto Zoo-botânica da Mata de Dois Irmãos, sobre muro úmido perto da mata secundária, 6 September 1984, *O. Yano & K.C. Porto 9056* (SP); **Piauí**: Piripiri, on walls of the houses, near Hotel Resende, 27 January 1976, *D.M. Vital 5413* (SP); **Rio de Janeiro**: Rio de Janeiro, Arboreto do Jardim Botânico do Rio de Janeiro, Canteiro 39, sobre pedra na margem da vala, 4 February 2000, *L.C. Molinaro & D.P. Costa 83* (RB); *Glaziou 7196* (NY); Rio de Janeiro, Morro de Nova Cintra, em rochedos do morro, September 1893, *E. Ule 1659* (R); Santa Maria Madalena, Parque Estadual do Desengano, sobre pedra no barranco, 21°52'893"S, 41°56'350"W, 800 m, 31 October 2008, *D.P. Costa, T.M. Crespo & J.C. Silva 5022* (RB); Santa Maria Madalena, Parque Estadual do Desengano, sobre barranco na estrada da entrada do sítio da Muribeca, 21°52'893"S, 41°56'350"W, 800 m, 31 October 2008, *D.P. Costa, T.M. Crespo & J.C. Silva 5023* (RB); Santa Maria Madalena, Parque Estadual do Desengano, sobre pedra no barranco na margem da estrada próximo a entrada do rancho da Mata Atlântica, 21°53'447"S, 41°57'113"W, 500 m, 31 October 2008, *D.P. Costa, T.M. Crespo & J.C. Silva 5024* (RB); **Rondônia**: Ariquemes, Alto Condeias, on land of Mibrasa Tin Mine, ca. 10º35'S, 63º35'W, reagional relief dissected, relief ca. 200 m, collected in vicinity of acess road water pumping station, on concrete of water supply dam within 10 cm of water level, probably subjected to inundation, moist nearly full sun, 15 April 1982, *A.J. Fife, K.D. McFarland, L.A. Teixeira, B.W. Nelson, J.L. Santos, C.D. Motas & S.P. Gomes 4141* (NY); Guajará-Mirim, masonry wall, 1 February 1978 *W.D. Reese 12967* (NY); Porto Velho, wall, Hotel Vitoria, 20 January 1978, *W.D. Reese 12710* (NY); on mortar and adjacent brick of wall, shaded by roof of open-air mechanic's shop by receiving rain water, ± mesic, 1 June 1982, *A.J. Fife, K.D. McFarland, L.A. Teixeira, B.W. Nelson, J.L. Santos, C.D. Motas & S.P. Gomes 4261-b* (NY); **Roraima**: Caracaraí-Boa Vista, km 11, sobre rocha granítica, luz média, 02 August 1974, *P.N. Conceição 654* (MG); rodovia Caracarai-Boa Vista, km 11, 2 August 1974 *P.N. Conceição s.n.* (SP); **São Paulo**: Iperó, Flona de Ipanema, perto do centro de visitantes, no solo batido perto do centro, 14 December 2009, *O. Yano & J. Bordin 32068* (SP); Iporanga, Serra Paranapiacaba, Caverna Santana, ca. 200 m, ca. 24º34'S, 48º42'W, humid forest over limestone, 29 September 1984, *D.M. Vital & W.R. Buck 12590* (NY); Santos, on walls, August 1912, *J. Hunter 40* (NY).

Hyophila involuta is recognized when dry by its strongly rolled-up leaf margins. The propagula vary in shape and size, and considerable differences were observed in the dentations of the upper leaf margins (Zander 1994).

Hyophila mattogrossensis (known only from the type collection from mid-western of Brazil, Mato Grosso State, Diamantino, Savanna, ca. 500 m, on rocks) is very similar to *H. involuta* (Hook.) A. Jaeger and *Luisierella barbula* (Schwägr.) Steere, differing in the structures and shapes of their leaves. Brotherus (1900) also observed

similarities between *H. mattogrossensis* and *H. involuta* when he studied the types (*Lindmann 541, 542*—H-BR). Costa (2014b) agreed about these similarities, although in *H. mattogrossensis* the lamina cells in the abaxial surface are papillose (mainly near the margin) and not weakly convex; this is the only difference observed between these two species. However, according to Zander (1993), papillae can be related to the environmental conditions.

Names with the types material not seen

Hyophila assimilis Broth., *Hedwigia* 34: 125, 1895 (Brotherus 1895). Type:—BRAZIL. Goyás: Mossamedes, Jan 1893, *E. Ule 1551* (?, holotype, HBG, isotype). Similar to *H. uleana* Müll. Hal. differing only in the leaf shape with entire margins.

Hyophila brevifolia Hampe, *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn ser*. 4, 1: 80, 1879 (Hampe 1879). Type:—BRAZIL. Minas Gerais: Lagoa Santa, *Warming s.n.* (BM ?, holotype).

Hyophila laete-virens Broth., *Bih. Kongl. Svenska Vetensk.-Akad. Handl*. 3: 22, 1895 (Brotherus 1895). Type:—BRAZIL. *Glaziou 9227* (BM ?, holotype).

Hyophila loxorhyncha Müll. Hal. ex. Ångstr., *Öfvers. Förh. Kongl. Svenska Vetensk.-Akad.* 33: 9, 1876 (Ångström 1876). Type:—BRAZIL. Rio de Janeiro: Catumby ad muros, *Mosén 198* (?, holotype).

Hyophila mosenii Broth., *Bih. Kongl. Svenska Vetensk.-Akad. Handl*. 3: 22, 1895 (Brotherus 1895). Type:—BRAZIL. Minas Gerais: Caldas, ad arbores in ripa rivuli Ribeirão de Girivas, *Mosén 38* (?, holotype).

Hyophila ochracea Broth., *Ergebn. Bot. Exped. Südbras., Musci.* 285, 1924 (Brotherus 1924). — Cited from Brazil, Rio de Janeiro by Brotherus (1924).

Hyophila ovalifolia (Hampe) Hampe, *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn ser*. 3, 6: 131, 1879 (Hampe 1874). — Cited from Brazil, Ceará, Rio de Janeiro, and São Paulo (Müller 1849; Hampe 1872; Brotherus 1924).

Hyophila regnellii Müll. Hal. ex Ångstr., *Öfvers. Förh. Kongl. Svenska Vetensk.-Akad*. 33: 9, 1876 (Ångström 1876). Type:—BRAZIL. Rio de Janeiro: *Glaziou s.n.* (Hampe 1879).

Hyophila rubiginosa Hampe, *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn ser*. 4, 1: 80, 1879 (Hampe 1879). Type:—BRAZIL. Rio de Janeiro: *Glaziou 1994* (BM?, holotype).

Hyophila uleana Müll. Hal., *Hedwigia* 34: 125, 1895 (Müller 1895). Type:—BRAZIL. Goiás, auf Felsen im Walde bei Goyaz, *E. Ule 1550* (HBG, isotype) by Brotherus (1895a).

Hyophila variegata Ångstr., *Öfvers. Förh. Kongl. Svenska Vetensk.-Akad*. 33: 8, 1876 (Ångström 1876). Type:—BRAZIL. Minas Gerais: Rio de Janeiro, and São Paulo (Ångström 1876; Hampe 1879).

Hyophila warmingii Hampe, *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn ser*. 3, 2: 269, 1879 (Hampe 1870). — Cited by Hampe (1870) for Brazil, Minas Gerais State. Type:—BRAZIL. Minas Gerais: Lagoa Santa, *Warming s.n.* (BM 000872666 [Herb. Hampe], holotype).

Doubtful species

Hyophila subcucullata Williams, *Bryologist* 24: 22, 19121 (Williams 1921). — Until 1993 this species was considered endemic from Cuba (Zander 1993), but cited by Yano (2011) for Rio de Contas, Bahia State. Until now I could not study this material.

Hyophiladelphus (Müll. Hal.) R.H. Zand.

A monotypic genus occurring on calcareous soils, limestone and sandstone rocks; being frequent in urban areas on brick or concrete.

1. *Hyophiladelphus agrarius* (Hedw.) R.H. Zander, *Bryologist* 98: 372, 1995 (Zander 1995). Basionym:—*Barbula agraria* Hedw., *Sp. Musc. Frond*. 116, 1801 (Hedwig 1801). Type:—JAMAICA. *O. Swartz s.n.* (G!, lectotype by Zander 1979). Fig. 6 (A–G)

In the Amazon Forest, Atlantic Rainforest (Dense Ombrophylous forest), Savanna, and *Restinga* (sandy area coastal vegetation), 0–650 m. On soil, limestone rocks, and walls in urban areas. Brazil (AC, AL, AM, BA, DF, CE, DF, ES, FN, GO, MA, MG, MS, MT, PA, PB, PE, PI, PR, RJ, RO, RS, SE, SP); U.S.A., Mexico, Central America, West Indies, South America (Allen 2002).

Specimens examined—BRAZIL. **Acre**: Cruzeiro do Sul, on wall of house, 27 June 1971, *P.J.M. Maas, K. Kubitzki, W.C. Stweart, J.F. Barros, W.S. Pinheiro & J.F. Lima P13330* (MG, NY); Rio Branco, masonry wall in park, 26 February 1978, *W.D. Reese 13236* (MG, NY); **Amazonas**: Manaus, Praça da Igreja N.S. da Conceição, sobre muro da igreja, 12 August 1974, *D. Griffin, D.M. Vital & O. Yano 826* (MG); estrada Manaus-Caracaraí, km 60, Estação de Silvicultura Tropical, solo arenoso em frente a cantina, sobre parede de cimento, 11 January 1977, *P. Lisboa & O. Monteiro 960* (MG); Tapajoz, ad terram argillosam humidam marginis fluminis, April 1924, *J.G. Kuhlmann 2170* (NY, RB); along Rio Negro at cementery Tapereira with old fort and at São Tomé (stony beach), campina with rock outcrops, 00º25'S, 64º25'W, on old mortar and bricks at Tapereira, 29 June 1979, *W.R. Buck 2198* (MG, NY); auf einer Mauer in der Rua Recife, 80 m, 03º07'S, 60º1'W, 8 July 1988, *A. Schäfer-Verwimp & Verwimp 9781* (RB); **Bahia**: vicinity Bahia, May 1925, *J.N. Rose & P.G. Russell 19620, 19620a* (NY); Ilhéus, Morro do Pernambuco, small peninsula projecting into the ocean, 14º50'S, 39º02'W, rocky hillsides with *Cocos nucifera*, 13 July 1991, *D.M. Vital & W.R. Buck 20061, 20066, 20071* (NY); Salvador, Hotel Pelourinho, Rua Alfredo Brito 20, window ledge, S exposure, moist soil in cracks of roof tiles, 21 June 1981, *B.M. Boom & S.A. Mori 1287* (NY); **Ceará**: Maranguape, Serra de Maranguape, mata pluvial com rochas graníticas arredondadas expostas, sobre muro de cimento, 150 m, 30 March 1990, *M.P. Marcelli 7611* (SP); **Maranhão**: Governador Archer, solo, 12 March 2008, *E.S. Brito & G.M. Barroso 323* (SP); Presidente Dutra, solo, 19 February 2008 *E.S. Brito & G.M. Conceição 295* (SP); São Luis, Bairro Vila Palmeira, tijolo, 10 October 2007, *E.S. Brito & G.M. Conceição 284* (SP); **Pará**: Belém, Bairro do Marco, Pass. Cristina, coletada sobre muro, 22 February 1994, *A.L. Ilkiu-Borges & F. Ilkiu-Borges 379* (MG); Rua Itororó, coletada sobre calçada, 21 March 1994, *A.L. Ilkiu-Borges & C. Cavalcante 438* (MG); Belém, Bairro Cidade Velha, Rua Ângelo Custódio, sobre calçada molhada com água de esgoto. 06 December 1993, *A.L. Ilkiu-Borges & F. Ilkiu-Borges 289* (MG); Belém, Parque Zoobotânico do Museu Goeldi, sobre muro que dá para a 9 de Janeiro, bosque mixto com plantas naturais e introduzidas, 27 April 1992, *R. Lisboa, A. Luiza & M. Rosa 1252* (MG); Belém, sobre muro da casa 58 do Cond. Green Gardem em Coqueiro, 31 March 1991, *R. Lisboa 1024* (MG); Ilha de Marajó, Afuá-Pa, sobre muro de encosta da praça da prefeitura sede do município, 10–24 January 1992, *Maciel 1754* (MG); **Pernambuco**: Recife, Cordeiro, rua Santos Moreira, 55, sobre muro, 08 August 1986, *L.L.S. Silva s.n.* (RB); **Rio Grande do Sul**: Sapiranga, Picada Verão, sobre rochedos, interior da mata, 650 m, 18 June 1989, *M. Rossato et al. 5896* (NY); **Rio de Janeiro**: Araruama, caminho para a Praia Seca, no solo argiloso, 20 June 1995, *D.P.Costa et al.* s.n. (RB); Arraial do Cabo, Restinga da Massambaba, sobre sambaqui, formando pequenas aglomerados entre conchas, fértil, 11 October 1991, *D.P.Costa & O. Yano 1592* (RB); Parati, Caminho do Sono ao Saco do Mamanguá, sobre o solo argiloso do caminho, 19 October 1990, *D.P. Costa et al. 1250* (RB); Reserva Ecológica de Massambaba, no solo à beira da estrada, 21 June 1995, *D.P. Costa et. al 2188* (RB); Rio de Janeiro, arboreto do Jardim Botânico, Seção 28, canteiro A, no tronco de uma Moraceae*, 8 November 1999, D.P. Costa & F. Martins 3626* (RB).

It is characterized by leaves oblong-obovate to spathulate, costa with cells elongated and smooth on the adaxial and abaxial surfaces, stereid bands visible in cross section above and below the guide cells, with cells bulging on the adaxial surface lamina.

According to Allen (2002), the stems have short rhizoids densely clustered at the base, making it difficult to prepare stem cross-sections or observe auxiliary hairs. This feature was also observed in some collections from Brazil.

Leptodontium (Müll. Hal.) Hampe ex Limpr.

Nine species occur in Brazil, on soil and rocks, occasionally on tree trunks, common at high altitudes. It is characterized by relatively large plants, without a central strand, hyalodermis present or absent, leaf margins strongly recurved, both costal epidermis lacking, and peristome teeth smooth or striate.

1. Leaf lingulate 2
1'. Leaf lanceolate, oblong-lanceolate to ovate-lanceolate 3
2. Leaves obtuse to broadly acute, margin reflexed in the lower 1/2, crenulate in the distal 1/2 by papillae, costa and basal cells red to orange..... ***L. stellatifolium***
2'. Leaves broadly acute, margin recurved in the lower 1/2–2/3, dentate to denticulate in the upper 1/3, costa and basal cells hyaline or yellow ..... ***L. flexifolium***
3. Leaf strongly dentate near the base ..... ***L. luteum***
3'. Leaf not dentate at base 4
4. Leaf with apex narrowly acute, margin recurved, revolute and incurved in the lower 1/3–1/2, high sheating base (>2/3).. 5
4'. Leaf with apex acute to obtuse, margin recurved in the lower 1/3–2/3, slightly sheating base (< 1/2)..... 6
5. Leaves lanceolate to long-lanceolate, apex narrowly acute, margin revolute and incurved in the lower 1/3–1/2, dentate in upper 1/4–1/2, costa percurrent or ending 1–3 cells below apex ..... ***L. wallisii***
5'. Leaves lanceolate to ovate-lanceolate, apex acute, margin recurved in the lower 1/2–3/4, dentate in the upper 1/4–1/2, costa subpercurrent ending 4–8 cells below apex ..... ***L. araucarieti***
6. Alar cells differentiated (grouped of cells short-rectangular, thick and porose walls) ..... ***L. pungens***
6'. Alar cells not differentiated..... 7
7. Papillae coroniform, crownded (sometimes scattered), in a crown-like ring over the cell lumen, with a high columnar base (in cross section)..... ***L. capituligerum***
7'. Papillae simple to bifid, scattered or centrally grouped over each lumen (in cross section) 8
8. Margin serrate; papillae scattered grouped over each lumen; inner basal cells rectangular to long-rectangular, porose to not porose. Monoicous or Dioicous. Annulus of 4–6 rows of cells ..... ***L. viticulosoides***
8'. Margin denticulate; papillae centrally grouped over each lumen; inner basal cells short-rectangular, not porose. Dioicous. Annulus of 2 rows of cells..... ***L. filicola***

1. *Leptodontium araucarieti* (Müll. Hal.) Paris, *Ind. Bryol. Suppl*. 224, 1900 (Paris 1900). Basionym:—*Trichostomum araucarieti* Müll. Hal., *Bull. Herb. Boissiser* 6: 93, 1898 (Müller 1898). Type:—BRAZIL. Santa Catarina: Serra Geral, May 1890, *E. Ule 658* (FH, lectotype; HBG, M, NY!, S-PA, US, isolectotypes). Fig. 6 (H–L)

In Atlantic Rainforest (Dense Ombrophylous Forest and Mixed Ombrophylous Forest), 300–2500 m. On soil and rocks. Brazil (MG, PR, RJ, RS, SC, SP); Peru, Bolivia, and Brazil (Zander 1972).

Specimens examined—BRAZIL. **Minas Gerais**: Serra de Itatiaia, zwischen Gras am Rande einer Weide bei Brejo da Lapa, 2130 m NW, 22º22'S, 44º41'W, 4 June 1989, *A. Schäfer-Verwimp & Verwimp 11188* (RB, SP); **Rio Grande do Sul**: Cambará do Sul, Fortaleza, sobre rochedos, 1100 m, 18 June 1992, *R. Wasum et al. 8885*, (NY); junto a rochedos, 1050 m, 27 September 1992, *R. Wasum et al., 8662, 8667* (NY); Caxias do Sul, Ana Rech, faxinal, sobre rochedos, 700 m, 16 June 1989, *J. Brinkler et al. 5834* (NY); **Rio de Janeiro**: Nova Friburgo, sobre paredão de pedra à beira da estrada, 29 March 1989, *D.P. Costa 855* (RB); Nova Friburgo, Pico da Caledônea, no solo humoso no alto do pico, ca. 2000 m, 30 March 1989, *D.P. Costa 885* (RB); Itatiaia, Macieiras, Serra de Itatiaia, in solo turfoso, 17 January 1925, *M.C.V. Bandeira s.n.* (NY, RB); Pico das Agulhas Negras, nas caneluras da rocha, 22 November 1925, *Príncipe Pedro d'Orleans de Bragance s.n.* (RB); Três Picos, sobre pedra num descampado, 1650 m,4 October 1989, *D.P. Costa et al. 1007* (RB); Rio de Janeiro, Parna Tijuca, estrada do Excelsior sobre tronco de árvore na margem direita da estrada, 22º57'37"S, 43°16'4"W, 430 m, 12 September 2006, *D.P. Costa et al. 4625* (RB); **Santa Catarina**: Serra Geral, Serra Rio do Rastro, ca. 12 km W of Bom Jardim of summit plateau, 1470 m, ca. 28º22'S, 49º32'S, humid hardwoods, 27 September 1984, *D.M. Vital & W.R. Buck 12411A* (NY).

In Brazil, this taxon is close to *L. wallisii*, differing by the recurved margin (not revolute and incurved), and costa supercurrent ending below the apex (not percurrent).

2. *Leptodontium capituligerum* Müll. Hal., *Linnaea* 42: 323, 1879 (Müller 1879). Type:—ARGENTINA. Cordobensis: Siambon, *Lorentz s.n.* (NY!, lectotype). Fig. 6 (M–P)
Leptodontium fuscescens Bartr., *syn. fide* Zander (1972)
Leptodontium gracile Müll. Hal., *syn. fide* Zander (1972)

In Steppe and the Atlantic Rainforest (Deciduous Forest), 500–800 m. On soil or rocks. Brazil (RS—São Franscisco de Paula and Montenegro); Mexico, Central America, Andes, southern Brazil, Uruguay, and Africa (Zander 1972, 1994).

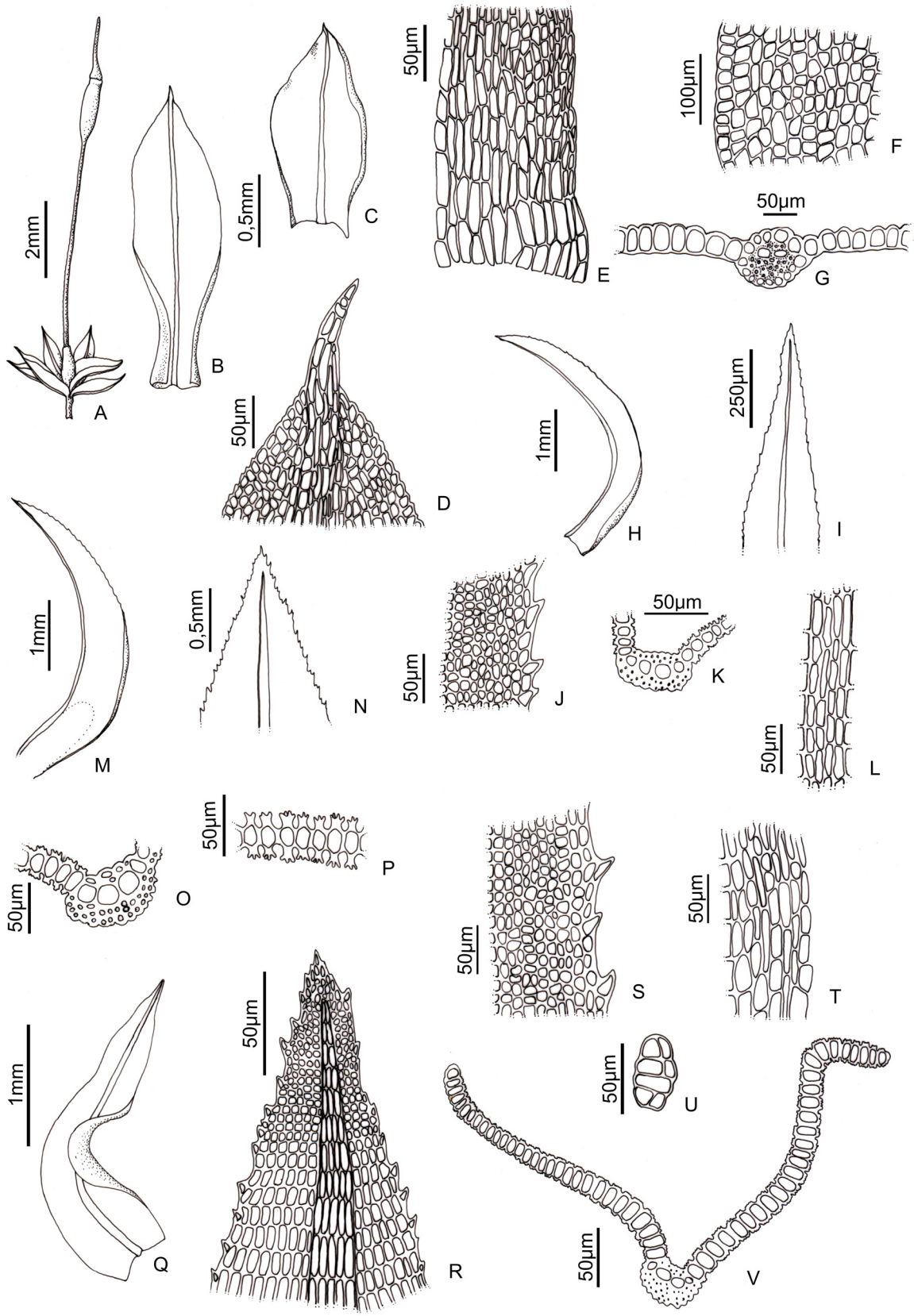

FIGURE 6. *Hyophiladelphus agrarius* (Hedw.) R.H. Zander. A. Habit. B–C. Leaves. D. Leaf apex. E. Basal cells. F. Laminal cells. G. Leaf section. *Leptodontium araucarieti* (Müll. Hal.) Paris. H–I. Leaves. J. Marginal cells. K. Leaf section. L. Basal cells. *Leptodontium capituligerum* Müll. Hal. M. Leaf. N. Leaf apex. O. Leaf section. P. Papillae coroniform with columnar base. *Leptodontium filicola* Herzog. Q. Leaf. R. Leaf apex. S. Marginal cells. T. Basal cells. U. Propagula. V. Leaf section.

Specimens examined—ECUADOR. **Quito:** *W. Jameson 143* (NY); BOLIVIA: **Mapiri**: 5000 ft, 1885–1886, *H.H. Rusby 3111* (NY lectotype of *Leptodontium gracile*); BRAZIL: **Rio Grande do Sul**: Caxias do Sul, Ana Rech, Faxinal, sobre rochedos no campo, 800 m, 15 July 1988, *R. Wasum et al. 4158, 4161* (NY).

In this taxon, the papillae are coroniform, with a thickened columnar base, occurring on the lumen of the upper laminal cells. It is considered a rare species in Brazil, restricted to the southern region (although it probably occurs in other states there).

3. *Leptodontium filicola* Herzog, *Biblioth. Bot.* 87: 34, 1916 (Herzog 1916). Type:—BOLIVIA. An einem Baumfarn zwischen San Mateo und Sunchal, ca. 1800 m, *T. Herzog 4512*, April 1911 (JE!, holotype). Fig. 6 (Q–V)

In the Atlantic Rainforest (Dense Ombrophylous Forest and Deciduous Forest), 800–2500 m. On tree trunks and rocks. Brazil (MG, RJ—Itatiaia and Serra dos Órgãos, RS, SC); Central America and Southern Brazil (Allen 2002, Zander 1972).

Specimens examined—BRAZIL. **Minas Gerais**: Caparaó Novo, 16 September 1984, *D.M. Vital 11694* (SP); **Rio de Janeiro**: Itatiaia, *Schiffner 1861* (FH); **Santa Catarina**: São Joaquim, estrada de São Joaquim para Urubici, sobre solo por debaixo da vegetação herbácea, formando extenso tapete a beira da estrada, 28°15'39"S, 49°51'49"W, 1468 m, 14 November 2003, *D.P. Costa et al. 4283* (RB).

Only known for Rio de Janeiro State from two old collections of the mountainous regions from *Serra dos Órgãos* and *Serra da Mantiqueira*; probably a rare species. It is distinguished by its strongly incurved leaves, and propagula clustered in dense masses on the upper stem.

4. ***Leptodontium flexifolium*** (Dicks. ex With.) Hampe in Lindb., *Öfvers. Förh. Svenska Vetensk.-Akad.* 21: 227, 1864 (Hampe in Linddb. 1864). Basionym:—*Bryum flexifolium* Dicks. ex With., *Syst. Arrang. Brit. Pl., ed*. 4, 3: 799, 1801 (Dickson 1801). Type:—ENGLAND. On barren sloping ground near Croydon, *Dickson s.n*. (BM!, holotype). Fig. 7 (A–F)

In the Atlantic Rainforest (Dense Ombrophylous forest), ca. 2500 m. Occurs on layers of humus on exposed rocks. Brazil (RJ—Serra de Itatiaia and Agulhas Negras); Southern Appalachians, Mexico, Central America, Andes, Europe, Africa, Himalayas, China, Formosa, Japan, Southeast Asia, Hawaii (Zander 1972, 1994).

Specimens examined—COLOMBIA. Páramo Choache, 3600 m, September 1860, *A. Lindig 2127* (NY as isotype of *Trichostomum filescens* Hampe—Ex Herb. Lindg.); BRAZIL. **Rio de Janeiro**: Serra de Itatiaia, Paramo-ähnliche Vegetation beim Aufstieg zu den Agulhas Negras, 2460 m, 8 July 1991, *A. Schäfer-Verwimp & Verwimp 14659* (RB).

This species is widespread globally, although it was reported for the first time for Brazil by Schäfer-Verwimp (1996), by only one collection from Itatiaia; and considered a rare species in the country. It is characterized by the stem with small leaves, erect-appressed to erect-flexuose, and by the presence of a sclerodermis rather than a hyalodermis.

5. ***Leptodontium luteum*** (Taylor) Mitt., *J. Linn. Soc. Bot.* 12: 50, 1869 (Mitten 1869). Basionym:—*Didymodon luteus* Taylor, *London Jour. Bot*. 5: 48, 1846 (Taylor 1846). Type:—ECUADOR. Pichincha: near Quito, *W. Jameson s.n.* (FH, holotype). Fig. 7 (G–K)

In the Atlantic Rainforest (Dense Ombrophyllous Forest), 1750–2130 m. On soil, rotting wood, or tree branches. Brazil (MG, RJ); Central America, West Indies, Western and Northern South America, West Central and East Tropical Africa (Allen 2002).

Specimens examined—ECUADOR. **Quito**: *W. Jameson 143* (NY); BRAZIL: without locality, *W. Jameson s.n.* (NY); *J. Taylor s.n.* (NY); **Rio de Janeiro**: Itatiaia, October 1989, *Schäfer-Verwimp 11188* (NY); Santa Maria Madalena, Parque Estadual do Desengano, sobre ramo de arbusto no alto do pico, 1750 m, 29 October 2008, *D.P. Costa, T M. Crespo & J.C. Silva 4959* (RB); Santa Maria Madalena, Parque Estadual do Desengano,sobre tronco morto no alto do pico da Pedra do Desengano, 1750 m, 29 October 2008, *D.P. Costa, T.M. Crespo & J.C. Silva 4957* (RB).

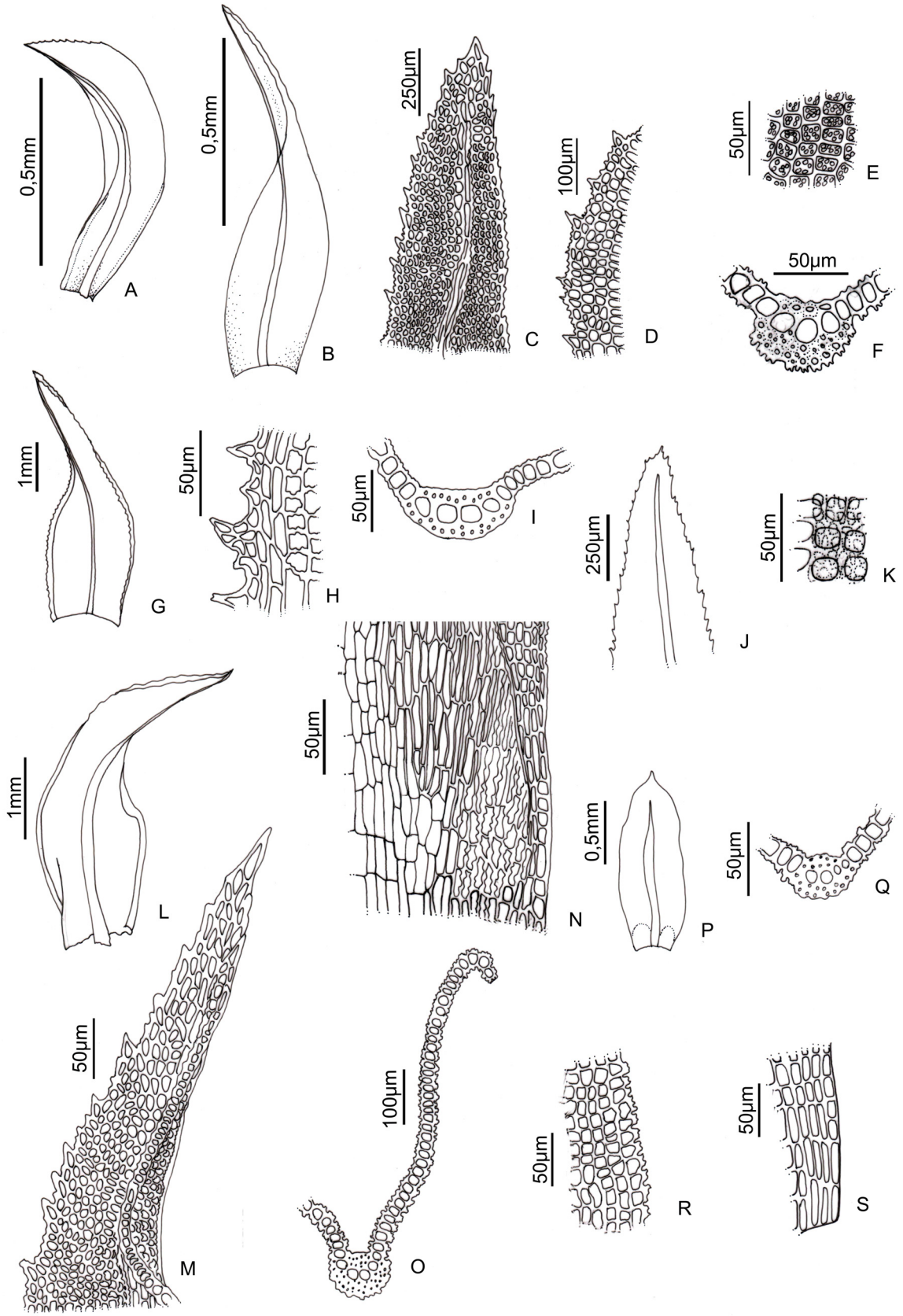

FIGURE 7. *Leptodontium flexifolium* (Dicks. ex With.) Hampe in Lindb. A–B. Leaves. C. Leaf apex. D. Marginal cells. E. Laminal cells with papillae. F. Leaf section. *Leptodontium luteum* (Taylor) Mitt. G. Leaves. H. Marginal cells. I. Leaf section. J. Leaf apex. K. Laminal cells with papillae. *Leptodontium pungens* (Mitt.) Kindb. L. Leaf. M. Leaf apex. N. Basal cells. O. Leaf section. *Leptodontium stellatifolium* (Hampe) Broth. P. Leaf. Q. Leaf section. R. Marginal cells. S. Basal cells.

The first record outside the Andes was reported by Schäfer-Verwimp (1996) for Itatiaia (*Serra da Mantiqueira*—RJ); the collections from the Desengano State Park (*Serra dos Órgãos*—RJ) represent the second record for Brazil. According Zander (1972), this species is found at high elevations (1830–4000 m) in the Andes and Africa, having been collected on volcanoes and páramos. In Brazil, it also occurs at high elevations, in *Serra da Mantiqueira* and *Serra do Mar.*

6. *Leptodontium pungens* (Mitt.) Kindb., *Enum. Bryin, Exot*. 63, 1888 (Kindberg 1888). Basionym:—*Didymodon pungens* Mitt, J. Linn. Soc. Bot. 7: 150. 1864. Type:—CAMEROON. Cameroon Mountains, on rocks, 10.000 ft, December 1862, *Mann s.n*. (NY!, holotype). Fig. 7 (L–O)
Leptodontium acutifolium Mitt., *syn.* fide Zander (1972)

In Steppe, Savanna (Gallery Forest), and Atlantic Rainforest (Dense Ombrophylous Forest), 0–1100 m. On soil or rocks. Brazil (MG, GO, RS); Mexico, Central and South America, Andes, Juan Fernandez, Southern Brazil, Africa (Zander 1972, 1994).

Specimens examined—BRAZIL. **Minas Gerais**: Itamonte, Serra do Itatiaia, sobre pedras de paredão úmido, 27 April 2009, *O. Yano & B.L. Morretes 31584* (SP); **Goiás**: Itajá, 51°37'W, 19°08'S, ca. 400 m, rodovia GO Itajá-Aporé, ca. 25 km de Itajá, próximo da rodovia, região de morros com mata de enconta, baixadas com mata ciliar, terrestre sobre bloco rochoso, sombreado, junto de cachoeira, interior de mata ciliar, 17 February 1996, *M.R. Pietrobom-Silva 2878* (SP); **Rio Grande do Sul**: Bom Jesus, 1100 m, on earth, 14 January 1942, *A. Sehnem 286* (NY—Ex Herbarium E.B. Bartram); Quevedos, Rio Toropi, sobre rochedos da usina, 300 m, 15 September 2007, *R. Wasum 4163* (SP); São Francisco de Paula, in humo in silva, 900 m, 18 December 1949, *A. Sehnem 4520, 4542, 4550* (NY); Tapes, Enseada da Lagoa dos Patos, no solo arenoso, branco de restinga, 29 January 1994, *O. Yano et al. 22317* (SP).

The papillae of this species are thick, crowded, 2–3 branched near the base, and usually secondary branching above, forming a crest.

7. *Leptodontium stellatifolium* (Hampe) Broth., *Nat. Pflanzenfam*. 1: 400, 1902 (Brotherus 1902). Basionym:—*Anacalypta stellatifolia* Hampe, *Vidensk. Meddel. Dansk. Naturhist. Foren. Kjobenhavn* 34: 37, 1872 (Hampe 1872). Type:—BRAZIL. Rio de Janeiro: *Glaziou 5205* (BM 872532!, lectotype by Costa *et al.* 2015 ; BM 872528!, BM 872531!, BM 872524!, BM 872526!, BM 872527!, S-PA, NY! [2], PC 0109728!, PC 0709197!, isolectotypes). Fig. 7 (P–S)
Leptodontium anoectangiaceum (Müll. Hal.) Par., *syn. fide* Zander (1972)
Leptodontium chrysobaceum (Müll. Hal.) Broth., *syn. fide* Zander (1972)
Leptodontium squamifolium (Müll. Hal.) Broth., *syn. fide* Zander (1972)

In the Atlantic Rainforest (Dense Ombrophylous Forest and Mixed Ombrophylous Forest), 1000–2890 m. On rocks or soil. Southeastern and southern Brazil (ES, MG, RJ, SC, SP); Central America (Allen 2002).

Specimens examined—BRAZIL. **Espírito Santo**: Iúna, Parque Nacional do Caparaó, along trail from Terreirão to the summit of Pico da Bandeira, 2350–2890 m, 20º25'S, 41º43'W, dry, rocky hillsides with small streams, shrubs and small trees, on rock, 16 September 1984, *D.M. Vital & W.R. Buck 11754E* (NY); **Minas Gerais**: Caparaó Novo, Parque Nacional do Caparaó, along trail to Pico da Bandeira from Tronqueira to Terreirão, 1970–2350 m, ca. 20º26'S, 41º44'W, dry rocky hillsides along Rio José Preto with scattered shrubs and small trees, 16 September 1984, *D.M. Vital & W.R. Buck 11722* (NY); Itamonte, Parque Nacional do Itatiaia, along entry near border with Rio de Janeiro in vicinity km 4, ca. 2000 m, ca. 22º22'S, 44º44'W, humid montane forest and roadbank, 5 July 1991, *D.M. Vital & W.R. Buck 19638* (NY); Parque Nacional do Itatiaia, exponierte Felswand bei 1950 m an der Strabe von Itamonte nach Abrigo Rebouças, 22º22'S, 44º40'W, 2 April 1988, *A. Schäfer-Verwimp & Verwimp 9567* (RB); **Rio de Janeiro**: *Glaziou 7064* (NY); Itatiaia, Parque Nacional do Itatiaia, along entry near border with Minas Gerais between km 9 and km 10, 2200–2240 m, 22º22'S, 44º45'W, humid roadsides near upper limit of continuous forest, 6 July 1991, *D.M. Vital & W.R. Buck 19734* (NY); Itatiaia, estrada para o parque, paredão rochoso, escorrendo água, 24 April 2006, *O. Yano & P. Shinzato 28835* (SP as *Bryoerythrophyllum ferruginascens*); Parque Nacional do Itatiaia, Planalto de Itatiaia, Maciço das Prateleiras, 2400 m, 22°30'S, 44°40'W, 04 February 2010, *K.T. Ribeiro & B. Medina 147* (RB); Serra do Itatiaia, in rupibus, ca. 2290 m, June 1902, *P. Dusén* (NY); Rio de Janeiro-Minas Gerais, in paludosis partis superioris montis Itatyaia, 2500 m,

September 1901, *V. Schiffner 750* (BM); Rio de Janeiro-Minas Gerais, in paludosis partis superioris montis Itatyaia, 2000–2500 m, ad saxa, 18 September 1901, *V. Schiffner 1926* (BM); Serra do Itatiaia, Mont Serrat, in saxis, ca. 900 m, 11 July 1902, *P. Dusén 814* (R as *Tortella ulei*); Serra do Itatiaia, páramo perto do Abrigo Rebouças, em direção a Agulhas Negras, 2400 m, 3 June 1989, *A. Schäfer-Verwimp & I. Verwimp 11160* (SP); **São Paulo**: Piquete, trilha Morro do Careca—Pico do Marinzinho, margem da trilha, 1700 m, campo de altitude, rocha, 23 September 2006, *D.F. Peralta et al. 4053, 4070* (SP).

The distinguishing characters of this taxon are the crowded, lingulate leaves, with margins minutely crenulated, and costa and inner basal laminal cells orange.

8. *Leptodontium viticulosoides* (P. Beauv.) Wijk & Margad., *Taxon* 9: 51, 1960 (Wijk & Margadant 1960). Basionym:—*Neckera viticulosoides* P. Beauv., *Prodr*. 78, 1805 (Palisot de Beauvois 1805). Type:—RÉUNION. *Bory-St.-Vicent s.n.* (holotype not located). Fig. 8 (A–E)
Leptodontium brasiliense Mitt., *syn. fide* Zander (1972)
Leptodontium laevigatum Herzog, *syn. fide* Zander (1972)
Leptodontium rigidum Broth., *syn. fide* Zander (1972)

In the Atlantic Rainforest (Dense Ombrophylous Forest, Deciduous Forest, and Mixed Ombrophylous Forest), 100–2200 m. On soil, rocks, tree trunks, and rotten wood. Brazil (BA, ES, MG, PE, PR, RJ, RS, SC, SP); Mexico, Central America, Andes, Southern Brazil, Africa, Madagascar, Réunion, Himalayas, Formosa, Southeastern Asia (Zander 1972, 1994).

Specimens examined—BRAZIL. without locality, *Weir s.n.* (NY holotype of *Leptodontium brasiliense*); **Bahia**: Rio de Contas, topo do Pico das Almas, 13°31'19"S, 41°57'44"W, 1870 m, fendas da rocha, 27 October 1994, *S.R. Visnadi & D.M. Vital 2605a* (RB); **Espírito Santo**: Castelo, Parque Estadual do Forno Grande, 1600 m, Forninho, epífita na sombra, 5 September 2004, *L. Kollmann 7036* (SP); Iúna, Parque Nacional do Caparaó, 20º25'S, 41º43'W, 16 September 1984, *D.M. Vital 11753* (SP); **Minas Gerais**: Itamonte, Parque Nacional de Itatiaia, along entry near border with Rio de Janeiro at km 8.5, 2150 m, ca. 22º22'S, 44º45'W, secondary mixed forest with *Araucaria*, 7 July 1991, *D.M. Vital & W.R. Buck 19873* (NY); Catas Altas, RPPN Caraça, trilha de acesso ao Pico mdo Inficcionado, campo de altitude com *Vellozia*, 20º05'56"S, 43°29'17"W, 1800–2700 m, 31 May 2008, *D.F. Peralta et al. 6586* (RB *var. panamense*); **Paraná**: Paulo de Frontin, Vicinal 9, sobre troncos, interior da mata, 800 m, 28 January 2005, *R. Wasum 2546* (SP); **Pernambuco**, Bonito, Reserva Ecológica de Bonito, tronco vivo, 28 April 1995, *K.C. Pôrto 3165* (UFP *var. panamense*); **Rio Grande do Sul**: Fazenda Boa Vista, sobre rochedos em beira de mata, 900 m, 23 April 1988, *R. Wasum et al., 3981* (NY); Barracão, Parque Estadual do Espigão Alto, sobre Araucaria, 21 June 1996, *E. Lemos-Michel 3647* (SP); Cambará do Sul, Fortaleza, junto aos rochedos, 1050 m, 25 October 1986, *R. Wasum et al. 2140, 2143* (NY); Caxias do Sul, Vila Oliva, 700 m, 15 January 1947, *A. Sehnem 6135* (NY); Esmeralda, Fazenda da Guabiroba, sobre rochedos, interior da mata, 850 m, 13 September 1987, *R. Wasum et al. 3259* (NY); Parque Nacional de Aparados da Serra, near Itaimbezinho, ca. 1000 m, ca. 29º08'S, 50º05'W, *Araucaria* dominated cloud forest, 26 September 1984, *D.M. Vital & W.R. Buck 12262* (NY); Porto Alegre, 100 m, on rock, 10 January 1942, *A. Sehnem s.n.* (NY—Ex herb. E. B. Bartram nº 287); São Francisco de Paula, ad arbore in silva, 900 m, 19 December 1949, *A. Sehnem 4612, 4663* (NY); São Francisco de Paula, Floresta Nacional, sobre troncos caídos, 800 m, 14 December 1995, *R. Wasum et al. s.n.* (SP); São Matheus do Sul, Usina de Xisto, sobre troncos cortados, orla da mata, 750 m, 27 January 2005, *R. Wasum 2512* (SP); Serra do Faxinal, ad ramullus siccos, 1200 m, 18 December 1950, *A. Sehnem 5302* (NY); **Rio de Janeiro**: *A. Glaziou 3940* (NY isotype of *L. viticulosoides* var. *panamense*), *Glaziou 6369* (NY); Itatiaia, Serra de Itatiaia, June 1902, *P. Dusén s.n.* (NY); Itatiaia, sobre o solo em local seco, 19 September 1955, *Fidalgo & Kauffmann Fidalgo Eg-16* (RB); Nova Friburgo, sobre tronco em decomposição no pasto, 10 October 1990, *D.P. Costa 1066* (RB); Rio de Janeiro-Minas Gerais, in regionis silvaticae partibus superioribus montis Itatyaia, 1400–2000 m, 19 September 1901, *V. Schiffner 453* (BM as *Leptodontium saxicolum*); Rio de Janeiro-Minas Gerais, in paludosis partis superioris montis Itatyaia, 2500 m, September 1901, *V. Schiffner 766* (BM as *Leptodontium saxicolum*); Rio de Janeiro-Minas Gerais, in rupestribus montis Itatyaia, 2750 m, 18 September 1901, *V. Schiffner 1874* (BM [2] as *Leptodontium saxicolum*); Rio de Janeiro-Minas Gerais, in paludosis partis superioris montis Itatyaia, 2000–2500 m, ad Araucariae brasil. truncos, 18 September 1901, *V. Schiffner 1922* (BM as *Leptodontium saxicolum*); Rio de Janeiro-Minas Gerais, in paludosis partis superioris montis Itatyaia, 2500 m, ad Araucariae brasil. truncos, September 1901, *V. Schiffner 771* (BM 000872612 isotype of *Leptodontium rigidum*); Rio de Janeiro-Minas

Gerais, in paludosis partis superioris montis Itatyaia, 2500 m, ad Araucariae brasil. truncos, September 1901, *V. Schiffner 868* (BM 000872613 as *Leptodontium rigidum*); **Santa Catarina**: Campo dos Padres, Bom Retiro, epifítico na mata, erva, 1950 m, 17 December 1948, *P.R. Reitz 2484* (NY); Campo dos Padres, Bom Retiro, epifítico na mata, 2000 m, 16 December 1948, *P.R. Reitz 2424* (NY); Campo dos Padres, Bom Retiro, terrestre, 2200 m, 18 December 1948 *P.R. Reitz 2537* (NY); Serra Geral, June 1890, *E. Ule 56* (BM [3], NY as *Holomitrium subtonquescens*—Ex. E. Ule Bryotheca Brasiliensis); Serra Geral, Serra Rio do Rastro, ca. 12 km W of Bom Jardim da Serra on Road to Lauro Muller, at rim of summit plateau, 1470 m, ca. 28º22'S, 49º32'W, humid hardwoods, 27 September 1984, *D.M. Vital & W.R. Buck 12408* (NY); **São Paulo**: Pindamonhangaba, Serra da Mantiqueira, Pico Itapeva, ca. 6 km SE of Campos do Jordão, 22º46'S, 45º35'W, ca. 2000 m, exposed rocks and disturbed Cloud Forest with planted pines, 18 October 1994, *W.R. Buck 26436* (NY, SP as var. *sulphureum*); São Paulo, in M. Jaragua prope Taipas, ad terram, ca. 1050 m, *V. Schiffner s.n.* (NY—Kryptogamae exsiccatae Mus. Hist. Natur. Vindobonensi nº. 2591); São Paulo, in M. Jaragua prope Taipas, 800–1050 m, inter saxa ad terram, June 1901, *V. Schiffner 1467* (BM as *Leptodontium citrinum*); in M. Jaragua prope Taipas, 1050 m, ad terram, 1 June 1901, *V. Schiffner 1253* (BM as *Leptodontium citrinum*); São Paulo, in M. Jaragua prope Taipas, 1050 m, ad terram, June 1901, *V. Schiffner 2591* (BM as *Leptodontium citrinum*).

This species is characterized by cirrhate leaves with papillose laminal cells, and hemispherical papillae. There are seven varieties described for this taxon, but only one was cited by Zander (1972) for Brazil, *Leptodontium viticulosoides* var. *panamense* (Lor.) R.H. Zander (for BA, MG, RJ, RS, SC and SP, between 0–1850 m) with many synonyms assigned by him, for example, *Leptodontium excelsum* (Sull.) Britt., *L. serrae* (Müll. Hal.) Par., and *L. ulocalyx* (Müll. Hal.) Mitt.

There are two collections from Rio Grande do Sul State (Cambará do Sul) housed at the NY herbarium and identified as var. *panamense*; examinations confirmed that they do belong to this variety, differing from var. *viticulosoides* by their papillae and spores. Allen (2002) cited *L. viticulosoides* var. *panamense* as a synonym of *L. ulocalyx* (Müll. Hal.) Mitt. a species synonymized by Zander (1972) with *L. viticulosoides* var. *panamense*. The Zander's treatment (1972) was adopted here.

Yano (2011) cited *Leptodontium viticulosoides* var. *sulphureum* (Lor.) R.H. Zander for many different states in Brazil (BA, MG, PR, RJ, RS, SC, SP), without citation of any voucher or literature. According to Zander (1972, 1993), this taxon occurs in Am2 (Central America) and Am4 (Venezuela, Colombia, Ecuador, Peru) and it is a synonym of *L. viticulosoides* var. *panamense*.

This species produces two kinds of spores: small brown spores that are lenticular to tetrahedral; these occasionally adhering to larger, spherical green spores as "caps". Most of the *Leptodontium viticulosoides* samples are autoicous, authough certain collections are dioicous. Old World collections seem autoicous, differing from those of the New World (Zander 1972).

9. *Leptodontium wallisii* (Müll. Hal.) Kindb., *Enum. Bryin. Exot.* 63, 1888 (Kindberg 1888). Basionym:—*Trichostomum wallisii* Müll. Hal., *Linnaea* 38: 603, 1874 (Müller 1874). Type:—COLOMBIA. Nova Granata: prov. Antioquia, Paramo de Ruiz, 13,000 ped. altum in locis paludosis sphagnosis, 1872, *G. Wallis s.n.* (BM!, JE, NY!, PC, S-PA, isotypes). Fig. 8 (F–H)

Leptodontium schiffneri Broth., *syn. fide* Zander (1972)
Leptodontium variegatum Herzog, *syn. fide* Zander (1972)

In the Atlantic Rainforest (Dense Ombrophylous Forest), 0–1750 m. On soil or rocks. Brazil (RJ, SP); Central America, Andes, Southern Brazil, West-Central and East Tropical Africa (Zander 1972, Allen 2002).

Specimens examined—BRAZIL. **Rio de Janeiro**: Santa Maria Madalena, Parque Estadual do Desengano, sobre tronco no alto do pico da Pedra do Desengano 1750 m, 29 October 2008, *D.P. Costa, T.M. Crespo & J.C. Silva 4972* (RB); Rio de Janeiro-Minas Gerais, in rupestribus montis Itatyaia, 1300–2750 m, 18 September 1901, *V. Schiffner 474b* (BM as *Leptodontium schiffneri*); Rio de Janeiro-Minas Gerais, in rupestribus montis Itatyaia, 1300–2750 m, 18 September 1901, *V. Schiffner 474* (BM 000872508 isotype of *Leptodontium schiffneri*); **São Paulo**: Ubatuba, Parque Estadual da Serra do Mar, Núcleo Picinguaba, mata de restinga, 23º35'56"S, 44º85'11"W, nível do mar, sobre tronco de árvore, 27 October 2009, *D.P. Costa et al. 5031* (RB).

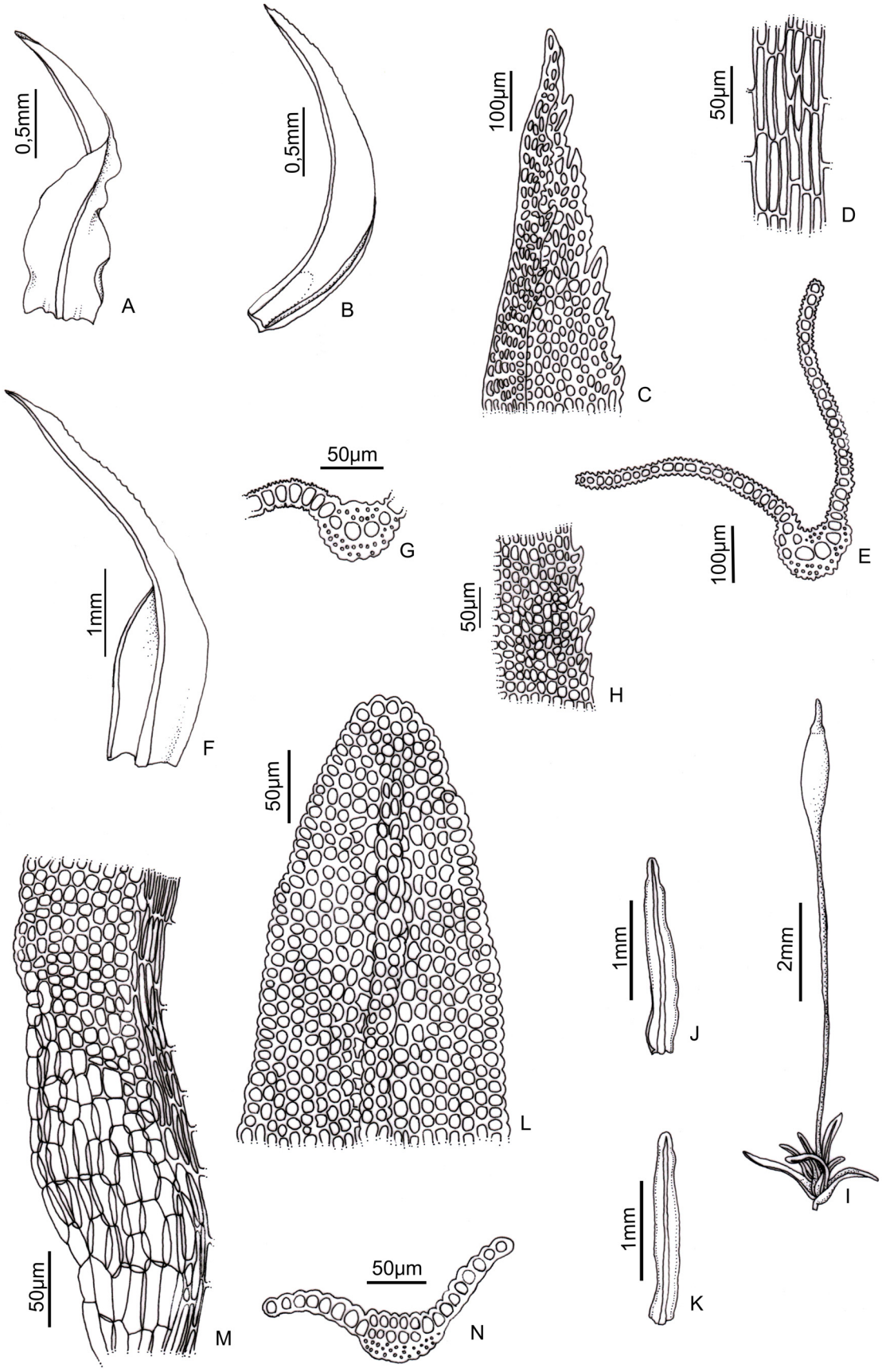

FIGURE 8. *Leptodontium viticulosoides* (P. Beauv.) Wijk & Margad. A–B. Leaves. C–D. Leaf apex. E. Basal cells. F. Leaf section. *Leptodontium wallisii* (Müll. Hal.) Kindb. G. Leaf. H. Leaf section. *Luisierella barbula* (Schwägr.) Steere. I. Habit. J–K. Leaves. L. Leaf apex. M. Basal cells. N. Leaf section.

In Brazil, this species is known from high elevations (1750–2500 m) in the *Serra da Mantiqueira* and *Serra do Mar* mountains, but was recently encountered at sea level in São Paulo State (*Serra do Mar*), being considered a rare species in the country. The samples from Rio de Janeiro have leaf cells mammilose (in cross section) and not papillose as described by Zander (1972) in his treatment for the genus. The same characteristic was observed by Newton et Boyce (1987) in tropical collections of *L. flexifolium*.

According to Zander (1972), this species is closely related to *L. pungens*, but differs mainly in the enlarged lower submarginal cells, and in the usually more highly sheathing leaf base.

Names with the types material not seen

Leptodontium saxicola Müll. Hal. ex Paris, *Index Bryol. Suppl*. 225, 1900 (Müller Paris 1900).—Cited from Brazil, for Minas Gerais, Rio de Janeiro, São Paulo, and Santa Catarina States (Ångström 1876; Müller 1898; Brotherus 1924; Herzog 1925; Reitz 1954).

Leptodontium trifarium Broth., *Ergebn. Bot. Exped. Südbras., Musci* 350, 1924 (Brotherus 1924)—Cited from Brazil, for Rio de Janeiro State by Brotherus (1924).

Luisierella Thér. & P. Varde

This genus was described by Potier de La Varde (1936) based on one collection from Bahia State, Itaparica, 1913, *P.G. Silva Tavares s.n.* (PC as *Luisierella pusilla*). In Brazil it occurs on calcareous rock, often in open sites.

Inoue & Tsubota (2014) recently excluded the genera *Luisierella* and *Timmiella* from Pottiaceae based on phylogenetic and morphological distinctions, accomodating them within a new family, Timmiellaceae Y. Inoue & H. Tsubota. I opted here to continue to include them in the Pottiaceae family.

1. *Luisierella barbula* (Schwägr.) Steere, *Bryologist* 48: 84, 1945 (Steere 1945). Basionym:—*Gymnostomum barbula* Schwägr., *Sp. Musc. Frond. Suppl*. 2, 2: 77, 1826 (Schwägrichen 1826). Type:—CUBA. Ad rupes calcareas Cubenses, *D. Poeppig s.n.* (NY, holotype; BM, MO!, JE?, isotypes). Fig. 8 (I–N)

In Savanna and *Pantanal*, 0–1100 m. On moist rocks. Brazil (GO, MS); South-Central and Southeastern U.S.A., Mexico, Central America, West Indies, Estaern Asia, and Malesia (Zander 1994, Allen 2002).

Specimens examined—BRAZIL. **Goiás**: Formoso, 13º37'S, 48º45'W, 1 January 1985, *D.M. Vital 12762* (SP); **Mato Grosso do Sul**: Miranda, growing on semi-decomposed rocks, in secondary forest (low and not particularly humid or shaded) ca. 5 km W due from the main house of Bodoquena Farm, Guaicurus, 4 June 1973, *D.M. Vital 2307* (SP).

Vital & Pursell (1992) considered this a calciphilous species infrequently cited for Brazil. Yano (1981) cited two old collections from the states of Bahia (Luisier 1941, as *L. pusilla*) and Ceará (Hooker & Wilson 1844), although I have not been able to confirm their occurrence in these states.

In Brazil, it can be confused with *Hyophila involuta* and *Plaubelia sprengelii*, as all of them have spatulate leaves, with apex rounded to obtuse. I observed that the collections from Goiás were very fragile, with most of the leaves being broken.

Microbryum Schimp.

Only one species in Brazil, occurring on soil in montane forest.

1. *Microbryum davallianum* (Sm.) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci*. 32: 237, 1993 (Zander 1993). Basionym:—*Gymnostomum davallianum* Sm., *Ann. Bot*. 1: 577, 1805 (Smith in Drake 1805). Type:—SWITZERLAND. *Davall s.n.* (LINN, holotype). Fig. 9 (A–C)

Pottia humillima (Ångstr.) Par., *Index Bryol*. 1023. 1898 (Paris 1898). Basionym:—*Anacalypta humillima* Ångstr., *Öfvers. Förh. Kongl. Svenska Vetensk.-Akad*. 33: 10, 1876 (Ångström 1876). *Ind. loc.*: [Brazil] 'Widgren retulit'. Type:—BRASILIA. Minas Gerais: Caldas, *Widgren s.n*. (S B10082!, lectotype by Cano et Gallego 2008), *syn. fide* Cano et Gallego (2008).

In the Atlantic Rainforest (Dense Ombrophyllous Forest). On soil. Ca. 1000 m. Brazil (MG—Caldas); Europe, North Africa, temperate Asia, North America, Australia, Brazil, and Chile (Cano et Gallego 2008).

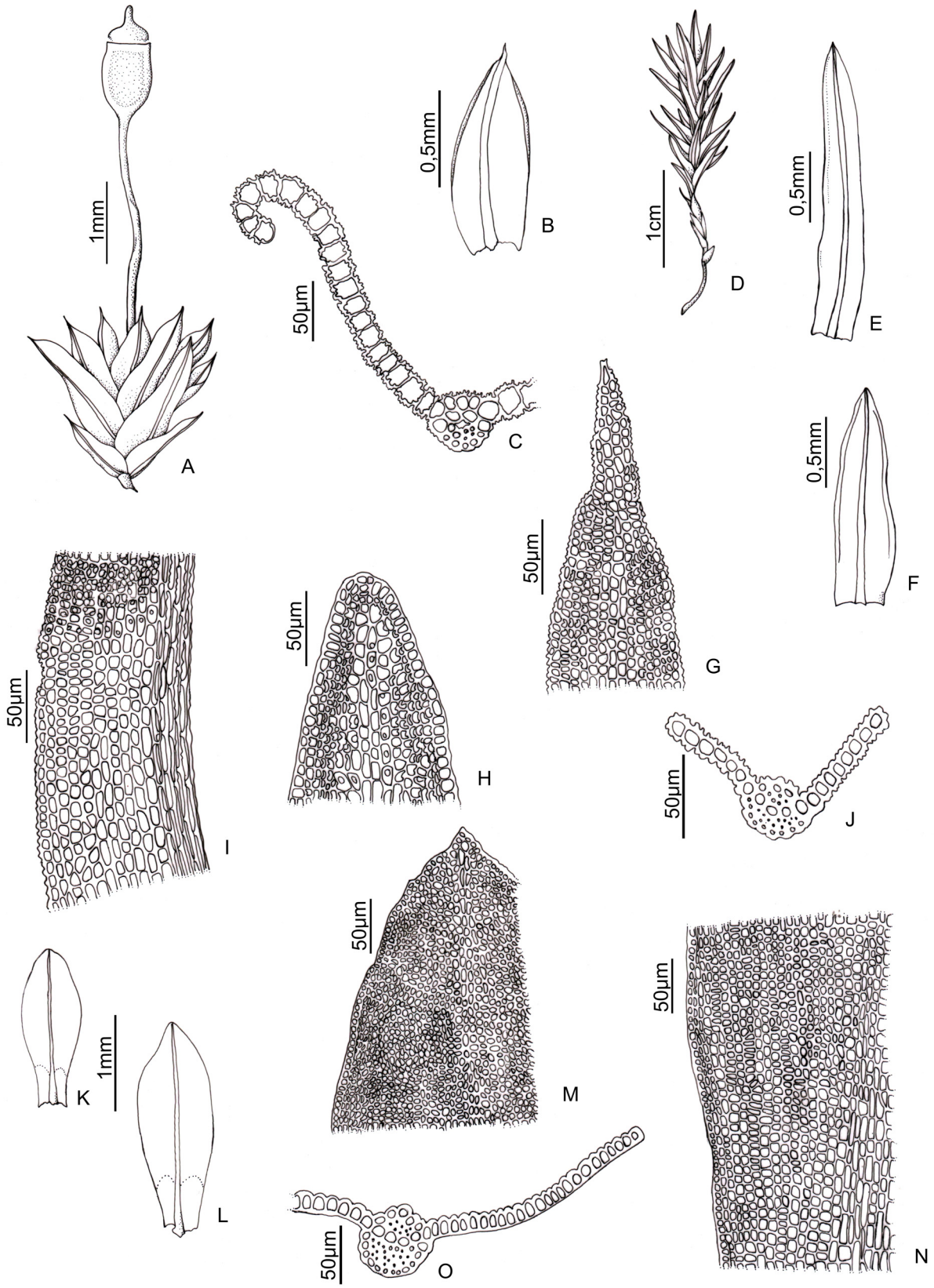

FIGURE 9. *Microbryum davallianum* (Sm.) R.H. Zander. A. Habit. B. Leaf. C. Leaf section. *Molendoa sendtneriana* (Bruch & Schimp.) Limpr. D. Habit. E–F. Leaves. G–H. Leaf apex. I. Basal cells. J. Leaf section. *Plaubelia sprengelii* (Schwägr.) R.H. Zander. K–L. Leaves. M. Leaf apex. N. Basal cells. O. Leaf section.

Specimens examined—BRAZIL. **Minas Gerais**: Caldas, *Widgren s.n.* (S).

Microbryum is similar to *Syntrichia* because of its broad leaves and a single stereid band, but differing by having short stems, a rounded to semicircular costal stereid band (reniform in *Syntrichia*), peristome (when present) with 16 irregular often rudimentary, truncate teeth (large in comparison with the capsule size), and operculum conical.

Cano & Gallego (2008) cited this taxon for the first time for South America (Brazil and Chile).

Molendoa Lindb.

The genus is similar to *Anoectangium* by the lateral perichaetia and absence of peristome, differing by the presence of a ventral stereid band, glaucous upper leaves in some species, and upper margins bistratose.

One species occurs in Brazil on rocks in lower and montane forests.

1. *Molendoa sendtneriana* (Bruch & Schimp.) Limpr., *Laubm. Deutschl*. 1: 250, 1886 (Limpricht). Basionym:—*Anoectangium sendtnerianum* Bruch et Schimp., *Bryol. Eur*. 1: 91, 1846 (Bruch & Schimper 1846). Type:—AUSTRIA. In alpibus Salisburgensisbus, *Funck s.n.* (BM 670335!, lectotype by Cano & Jiménez 2013). Fig. 9 (D–J)

In Savanna and the Atlantic Rainforest (Dense Ombrophylous Forest and Mixed Ombrophylous Forest), 260–1100 m. On shaded lime turf or on the vertical faces of shaded humid rocks (near cave entrances). Brazil (DF, GO, MG, MS, RJ, SC, SP); Europe, Asia, Tropical Africa, North America, Central America, South America, and West Indies (Cano et Jiménez 2013).

Specimens examined—BRAZIL. *Müller 2385a*, Musci Frondosi (NY as *Anoectangium incurvans*); **Goiás**: Formoso, fazenda Murici, sobre galhos de um piquizeiro próximo a Lagoa do Murici, 31 August 1979, *D.M. Vital 8524* (SP); **Rio de Janeiro**: Parque Nacional das Agulhas Negras, in einer felsspalte, 22°28'S, 44°27'W, 24 July 1977, *J.-P. Frahm 1719* (MO); **Santa Catarina**: Serra do Corvo Branco, Pabstrabe Urubici-Grão Pará, feucht-schattige Felswamd wenig unterhalb es Passes, mit *Anoectangium aestivum*, 1100 m, 28º0'S, 49º21'W, 30 December 1990, *A. Schäfer-Vewrimp & Verwimp 13509* (RB); **São Paulo**: Monte Alto, Serra Tabarana ca. 10 Km da cidade, 48º28'W, 20º22'S, no solo no Topo da Serra, 3 June 1995, *F.R. Nonato & M.R. Pietrobom-da-Silva 159* (SP).

Schäfer-Verwimp (1992) cited this taxon for the first time for South America outside of the Andes.

According to Zander (1977b), *Didymodon rigidulus* may be confused with *M. sendtneriana* by their bistratose upper leaf margins, but they are distinct by its leaves lanceolate, apex not apically broadly, obtuse or rounded, not crowded or glaucous. The upper laminal cells in *D. rigidulus* are bulging, pellucid, with simple papilae; the bistratose marginal cells are the same size as the median unistratose cells, seldom appearing as in *M. sendtneriana* as single cells bissected by cross wall. The dorsal epidermal cells are often quadrate, and spherical propagula are often present, borne on stout, brown, stalks branching form the stem.

Plaubelia Brid.

A single species occurring in Brazil on rocks, in exposed sites.

1. *Plaubelia sprengelii* (Schwägr.) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci*. 32: 176, 1993 (Zander 1993). Basionym:—*Barbula sprengelii* Schwägr., *Sp. Musc. Frond., Suppl.* 2, 1: 64, 1823 (Schwägrichen 1823). Type:—HISPANIOLA [In Hispaniola lectam misit cl. Sprengel—ex descr.] (Herb. Hedwig-Schwägrichen G!, holotype). Fig. 9 (K–O)

Neohyophila sprengelii (Schwägr.) H.A. Crum, *syn. fide* Zander (1983)

In the Amazon Forest, Savanna, and Atlantic Rainforest (Dense Ombrophylous Forest and Deciduous Forest), 0–900 m. On shady rocks, soil, rotten woods, or rock walls in urban areas. Brazil (AC, AM, BA, DF, FN, GO, MA, MG, MT, PE, RJ, RR, SP); Southwestern U.S.A., Mexico, Central America, West Indies, and Brazil (Allen 2002).

Specimens examined—BRAZIL. without locality, at the front of the Serra de Santa Bárbara (?), *G. Gardner s.n.* (NY); **Amazonas**: along the Rio Negro just downstream from junction with the Rio Uaupes, NW of São Gabriel, riverside forest, 00º05–08'S, 67°10'W, on submerged rock, 21 July 1979, *W.R. Buck 2619a* (NY); Manaus, 1882,

Schwacke 4160 (RB); **Bahia**: without locality, 15 July 1915, *J.N. Rose & P.G. Russell 19892* (NY); Iraquara, 12 km S of Iraquara, beneath drip at mouth of cave, 14 June 1981, *B.M. Boom, S.A. Mori & H. Funch 1214* (NY, SP); **Distrito Federal**: on pile of earth deposited at side of road, only moss seen, near building of Biological Institute, campus of Universidade de Brasília, cerrado, ca. 800 m, 9 February 1971, *H.S. Irwin, R.M. Harley, G.L. Smith 29738* (NY); **Goiás**: Formoso, cachoeira do rio Icaçu, ca. 12 km NE de Formoso, rocha arenítica, 30 m, faz. Riachão, 26 December 1998, *D.M. Vital s.n.* (SP); Morrinhos, on soil, in a sparse forest covering a rocky slope, 10 April 1976, *D.M. Vital 6144* (SP); **Maranhão**: nas paredes de um palacete em ruínas, uma das construções em que deveria ter hospedado o imperador, em frente a Matriz do Carmo, 20 January 1983, *M.M. Correa s.n.* (SP); **Minas Gerais**: Lagoa Santa, Gruta da Lapinha, ca. 700 m, 19º32'S, 43º57'W, dry, jagged dolomite, 17 September 1984, *D.M. Vital & W.R. Buck 11832, 11855* (NY); Gruta da Lapinha, auf schattigem Kalktuff, 640 m NM, 19º34'S, 43º56'W, 28 July 1988, *A. Schäfer-Verwimp 9969* (RB); **Pernambuco**: Fernado de Noronha, sobre paredão das ruínas do forte, 18 October 1989, *O. Yano et al. 13609* (RB); Ilha de Fernado de Noronha, sobre um velho muro, próximo a praia Sueste, 3º51'S–32º25'W, 31 July 1978, *D.M. Vital 8327* (NY, SP); Ilha de Fernando de Noronha, nos muros do Forte dos Remédios, 3º51'S–32º25'W, 3 August 1978, *D.M. Vital 8339* (NY, SP); **Piauí**: on sandstone rock near the city of Oeiras, May 1938, *Gardner 3150* (BM 000872677 isotype of *Gymnostomum blandum*); **Rio de Janeiro**: Angra dos Reis, July 1994, *Oliveira-e-Silva s.n.* (H-BR); **Roraima**: along Rio Surumu, 214 km N Boa Vista, varzea along river, ca. 700 m, on dry rock, 1 December 1977, *W.R. Buck, I. Araujo, W.C. Stewart, J.F. Ramos & J. Ribamar 2034* (NY); **São Paulo**: São Luiz de Paraitinga, Parque Estadual da Serra do Mar, Núcleo Santa Virgínia, Base Vargem Grande, início da trilha do Corcovado, floresta montana, sobre árvore caída na trilha, 23°32'64"S, 45°07'56"W, 900 m, 29 Ocotber 2009, *D.P. Costa et al. 5095* (RB).

It can be confused with *Hyophila involuta,* differing by the presence of enlarged and bulging epidermal cells on the ventral costal surface.

Pleurochaete Lindb.

A genus with four species widely distributed globally, with only one species occurring in Brazil, on rocks, in exposed sites.

1. ***Pleurochaete luteola*** (Besch.) Thér., *Smithsonian Misc. Collect*. 78 (2): 14, 1926 (Thériot 1926). Basionym:—*Trichostomum luteolum* Besch., *Mém. Soc. Sci. Nat. Cherbourg* 16: 178, 1872 (Bescherelle 1872). Type:—MEXICO. Orizaba, *Fr. Müller s.n.* (not located). Fig. 10 (A–E)

Pleurochaete squarrosa var. *luteola* (Besch.) R.H. Zander, *syn. fide* Grundmann *et al.* (2006).

In Atlantic Rainforest (Dense Ombrophylous Forest, Mixed Ombrophylous Forest and Semi-deciduous Forest), Savanna, and Steppe, 0–2000 m. On rocks, soil, or tree trunks. Brazil (GO, MG, PR, RJ, RS, SP); North-Central, South-Central, and Southeastern U.S.A.; Mexico, West Indies, Central America, and Western South America (Allen 2002).

Specimens examined—BRAZIL. **Goiás**: Formoso, na base de um tronco de árvore viva, no cerradão, fazenda Murici, 30 August 1979, *D.M. Vital 8502* (SP); **Minas Gerais**: Itatiaia, Brejo da Lapa, junto ao Lago dos Lírios, sobre pedra úmida, 23 April 2007, *O. Yano 29505* (SP); **Paraná**: Antonina, Reserva de Sapitanduva, sobre telhado do poço, 10 m, 25 January 2005, *R. Wasum 2426* (SP as *Barbula riograndesis*); **Rio Grande do Sul**: Caxias do Sul, Bairro Petrópolis, sobre muro de basalto, 6 February 2006, *J. Bordin 402* (SP); Lavras do Sul, na encosta suave, rochosa, ca. 2 km S do Rio Camaquã, ao longo da BR-153, 30º58'S, 53º30'W, 16 July 1980, *D.M. Vital 9201* (SP); São Matheus do Sul—Lago Sul, no solo, na orla da mata, 770 m, 19 April 2005, *R. Wasum 2710* (SP); **Rio de Janeiro**: Petrópolis, Araras, base da Pedra Maria Comprida, epífita, umbrófila, crescendo em mata úmida, 10 August 1969, *D. Sucre 3499 & P.I.S. Braga 1027* (RB); **São Paulo**: Matão, Projeto fauna e flora de fragmentos florestais remanescentes no noroeste paulista, Biota Noroeste, Floresta Estacional Semidecidual e Mata Ciliar, 20º05'26"S, 48º03'16"W, barranco, 12 December 2007, *D.P. Peralta & J. Prado 6066* (SP); Taubaté, on banks along road Taubaté-Redenção da Serra, 23º10'S, 45º32'W, 17 August 1987, *D.M. Vital 15095* (SP).

A robust species, similar to *Pseudosymblepharis* Broth., but its leaves are bordered by enlarged, bulging, hyaline cells that are denticulate above, with the upper and basal laminal cells distinctly different. Schäfer-Verwimp & Giacontti (1993) recorded this genus for the first time in southern Brazil, being here cited for the second time for the country, and for the first time in its southeastern region.

Pseudocrosssidium R.S. Williams.
Two species occur in Brazil, on soil or rocks, in dry vegetation areas or in exposed sites.

1. Leaves ellipitic to obovate-lanceolate; apex broadly acute to obtuse-rounded, mucronate; marginal cells differentiated; costa with one guide cells layer; long and spirally twisted peristome teeth..... ***P. replicatum***
1'. Leaves lingulate to oblong-obovate; apex rounded to obtuse, occasionally apiculate or emarginate; marginal cells differentiated or not; costa with 2–3 guide cells; short and straight peristome teeth..... ***P. exiguum***

1. *Pseudocrossidium replicatum* (Taylor) R.H. Zander, *Phytologia* 44: 206, 1979 (Zander 1979). Basionym:—*Barbula replicata* Taylor, *London J. Bot*. 5: 49, 1846 (Taylor 1846). Type:—ECUADOR. Pichincha: near Quito, on walls, *W. Jameson 103,* 1843 (E 00011847, holotype; BM!, NY, isotypes). Fig. 10 (F–I)

In the Atlantic Rainforest (Semi-deciduous Forest and Dense Ombrophylous Forest), 500–1250 m. On rock walls, calcareous rocks, in open areas along road banks, and urban areas. Brazil (MG, PR, SP); Southwestern and South-Central U.S.A., Mexico, Central America, Western, Northern, and South America (Allen 2002).

Specimens examined—BRAZIL. **Minas Gerais**: Delfim Moreira, Serra da Mantiqueira, an alten Mauern in der Stadt, 1230 m, 7 September 1991, *A. Schäfer-Verwimp & Verwimp 14928* (SP); **Paraná**: Castro, Bergland von NordParaná, ruderal auf Teer und in Rissen von Gehwegen, 1000 m NN, 24º47'S, 50º01'W, 15 December 1991, *A. Schäfer-Verwimp & Verwimp 15135* (RB); **São Paulo**: Ribeira, in partial shade, on rocky calcareous banks along road, 24º38'S–48º58'W, 11 May 1983, *D.M. Vital 10977* (SP).

Schäfer-Verwimp & Giancotti (1993) cited this genus for the first time for Brazil. The diagnostic characteristics are the strongly spiralled leaf margins, with thin-walled, papillose cells, the upper laminal papillose cells becoming smoother towards the margins, and costa in cross section presenting only one stereid band (Zander 1979). The sample from São Paulo State has leaves with margins recurved but not strongly revolute, but its is not a different species.

2. *Pseudocrossidium exiguum* M.J. Cano & J.A. Jiménez, *J. Bryol*. 37: 56–61, 2015 (Cano & Jiménez 2015). Type:—PERU. Cajamarca: *pr.* Huayllapampa, 71°12'08"S, 78°33'44"W, 3310 m, 15 June 2009, *M.J. Cano, J. Guerra & J.A. Jiménez 5044* (MUB, holotype; USM!, isotype)
Illustrations: Cano & Jiménez (2015)

Cano & Jiménez (2015) recently described this species based on a collection from Brazil, Castro, in Paraná State, sampled by *Alfons Schäfer-Verwimp 15136* (SV) in a disturbed habitat, on a walkway, ca. 1000 m. Brazil (PR); South America.

Specimens examined—BRAZIL. **Paraná**: Bergland von NordParaná, Castro, Ruderalflora in der Stadt, an alter Mauer bei der Praça Getulio Vargas, mit *Pseudocrossidium replicatum*, 24º47'S, 50º01'W, 1000 m, 15 December 1991, *A. Schäfer-Verwimp & Verwimp 15140* (RB).

Pseudocrossidium exiguum differs from *P. replicatum* by having lingulate to oblong-obovate leaves, with marginal cells differentiated or not, costa with two guide cells, and basal laminal cells rectangular to quadrate.

Pseudosymblepharis Broth.
Only two species known to Brazil, occurring on soils, rocks, or tree trunks, in exposed sites, in lowland forests to upper montane forests.

1. Leaf linear-lanceolate from a broadly ovate, clasping, sheating base, apex acuminate, sharply mucronate, costa short-excurrent..... ***P. schimperiana***
1'. Leaf linear to linear-lanceolate, concave, at base not clasping, apex acute, costa excurrent..... ***P. schlimii***

1. *Pseudosymblepharis schimperiana* (Paris) H.A. Crum, *Bryologist* 55: 139, 1952 (Crum 1952). Basionym:—*Syrrhopodon schimperianus* Paris, *Index Bryol*. 1254, 1898 (Paris 1898). *Symblepharis schimperiana* (Paris) Card., *Rev. Bryol*. 38: 99, 1911 (Cardot 1911). *Pseudosymblepharis circinata* (Schimp. ex Besch.) Broth. in E. & P., *Nat. Pflanzenf.* 10: 261, 1924 (Brotherus 1924). Type:—MEXICO. Veracruz: Orizaba, Cordova,1853, *Fr. Müller s.n*. (BM!, holotype). Fig. 10 (J–M)
Pseudosymblepharis cavernarum (Broth.) R.H. Zander, *syn. fide* Costa (2014b).

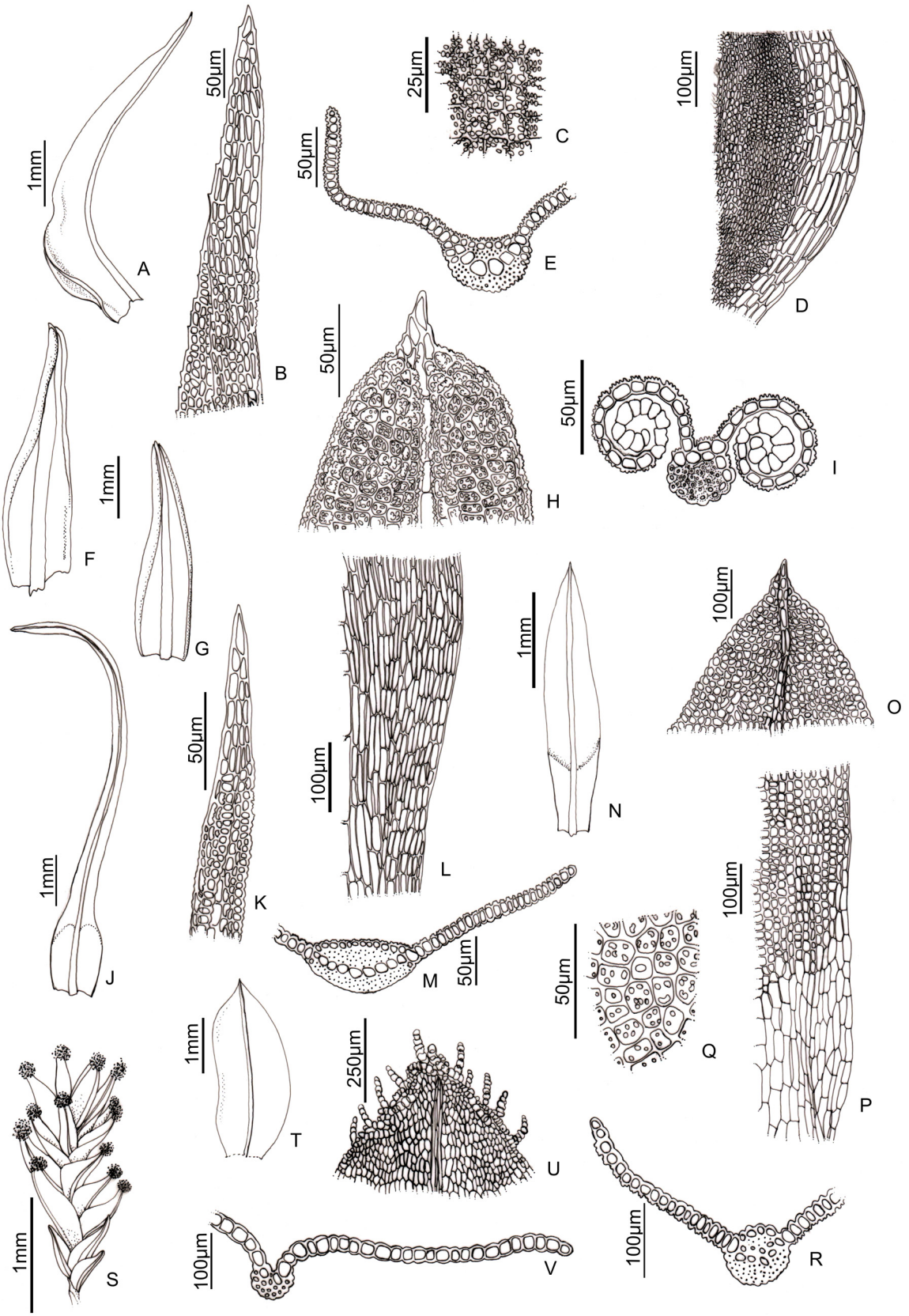

FIGURE 10. *Pleurochaete luteola* (Besch.) Thér. A. Leaf. B. Leaf apex. C. Laminal cells with papillae. D. Marginal basal cells. E. Leaf section. *Pseudocrossidium replicatum* (Taylor) R.H. Zander. F–G. Leaves. H. Leaf apex. I. Leaf section. *Pseudosymblepharis schimperiana* (Paris) H.A. Crum. J. Leaf. K. Leaf apex. L. Basal cells. M. Leaf section. *Streptocalypta lorentziana* Müll. Hal. N. Leaf. O. Leaf apex. P. Basal cells. Q. Laminal cells with papillae. R. Leaf section. *Streptopogon brasiliensis.* S. Habit. T. Leaf. U. Leaf apex. V. Leaf section.

In the Atlantic Rainforest (Dense Ombrophylous Forest, Mixed Ombrophylous Forest and Semi-deciduous Forest), Savanna (Gallery Forest), Steppe, and *Restinga*, 0–2500 m. On soils, rocks, tree trunks, and rotten wood, also in urban areas. Brazil (AL, DF, GO, MG, MS, MT, PE, PR, RJ, RS, SC, SP); Mexico, Central America, West Indies, Western and Northern South America (Allen 2002).

Specimens examined—BRAZIL. **Alagoas**: Pão de Açucar, Serra de Pão de Açucar, Mata do Fuzil, sobre bloco granítico, sombra da mata, 10 June 1981, *D. Andrade Lima 81-6696* (SP as *Hyophila involuta*); **Goiás**: on bark of tree, gallery forest adjacent Cerrado, ca. 3 km S of São João da Aliança, near riacho, ca. 850 m, 15 March 1971, *H.S. Irwin, R.M. Harley & G.L. Smith 31874, 31874a* (NY); **Minas Gerais**: Fazenda Aguada, Buraco Frio, stream bank, on clay, 6 October 1930, *Y. Mexia 5141-a* (BM, NY as *Trichostomum aureum* Bartr. n. sp.); **Mato Grosso do Sul**: Indaiá do Sul, 18°57'S, 52°23'W, 500 m, cachoeira aos fundos, região com capões de cerrado, mata seca semidecídua e mata ciliar, tronco de árvore de grande porte, sombreado, junto da cachoeira, interior da mata ciliar, 18 February 1996, *M.R. Pietrobom-Silva 2941* (SP); **Pernambuco**: Bom Conselho, growing in direct sunlight on the Banks along the Road from Bom Conselho to Brejão, 31 January 1974, *D.M. Vital 2885* (SP as *Hyophila involuta*); **Rio Grande do Sul**: Caxias do Sul, Bairro Exposição, sobre muro de basalto, Rua Santos Dumont, 780 m, 21 January 2006, *J. Bordin 313, 326* (SP); Caxias do Sul, Parque Centenário, sobre raízes de árvore no parque, 3 Ocotber 2006, *O. Yano & J. Bordin 29072* (SP); Santana da Boa Vista, sobre rochedos, 14 November 1987, *R. Wasum et al. 3504* (SP); **Rio de Janeiro**: Maricá, restinga de Itaipuaçu, sobre o solo arenoso num lote de restinga, 19 June 1995, *D.P. Costa et al. 2116* (RB); Mauá, Serra de Itatiaia, sobre rochas úmidas, 07 February 1925 *M.C.V. Bandeira s.n.* (RB 475038); Rio de Janeiro, Feema, Vista Chinesa, 22 September 1992, *D.P. Costa s.n.* (RB 382387); Rio de Janeiro, Leblon, sobre pedras da muralha, August 1926, *J.G. Kuhlmann 196* (RB); Rio de Janeiro, Parna-Tijuca, Corcovado, margens do trilho do bonde, próximo a curva do Ó, sobre paredão rochoso que margeia o trilho do bonde, margem direita da descida, 22°57'12"S, 43°12'67"W, 15 February 2007, *T.F. Vaz-Imbassahy et al. 116, 128* (RB); Rio de Janeiro, Parna-Tijuca, Corcovado, margens do trilho do bonde, escadria do Cristo Redentor próximo ao elevador, sobre base de pedra do poste de luz, na beira da escada, 22°57'12"S, 43°12'67"W, 15 February 2007n *T.F. Vaz-Imbassahy et al. 124, 128* (RB); Serra de Itatiaia, strabe von Itamonte nach Abrigo Rebouças, sickerfeuchter Fels na der Strabe oberhalb Brejo da Lapa, 2340 m, 3 June 1990, *A. Schäfer-Verwimp & I. Verwimp 12797* (NY, RB); **São Paulo**: Apiahy, in caverna, November 1881, *J.J. Puiggari 2028* (H as *Trichostomum cavernarum*); Eldorado Paulista, Caverna do Diabo, ca. 200 m, ca. 24º42'S, 48º20'W, humid hardwood Forest over limestone, 29 September 1984, *D.M. Vital & W.R. Buck 12539B* (NY).

According to Crum (1952), Paris (1898) changed the original name of this species to *Syrrhopodon schimperianus*, as *Syrrhopodon circinatus* had already been used by Mitten (1869). For this reason, *Pseudosymblepharis circinata* (Schimp.) Broth. was replaced by Crum (1952) as a new combination based on *Syrrhopodon schimperianus* Paris. *Pseudosymblepharis cavernarum* is only known from the type collection (endemic to southeastern Brazil), with the original material exhibiting ovate-lanceolate leaves, contorted above, upper laminal cells quadrate, thick-walled, pluripapillose (papillae bulging over the lumen), sheathing cells elongated, thick-walled, and porous, laminal cells of sheath long-rectangular, smooth, thin-walled, laminal cells at shoulder hyaline, extending up the margins cells forming a V. These are all distinctive features of *P. schimperiana*, which was considered by Costa (2014b) as conspecific with it.

Schäfer-Verwimp (1996) cited the genus and the species as new records for Brazil, but commented that it could have been reported earlier as *Tortella* or *Trichostomum*—and studies of collections from different Brazilian herbaria have confirmed this.

In Brazil, *P. schimperiana* is similar to *Trichostomum tenuirostre* (Hook. & Tayl.) Lindb. in their narrow leaf bases; however, the basal laminal cells near the costa are not porous in *Trichostomum*. There are two collections housed at the BM and NY herbaria identified as *Trichostomum aureum* Bartr. *n. sp.* that are ***nomen nudum*** because they were never described by Bartram, being only herbarium name, both specimens belong to *P. schimperiana.*

Pseudosymblepharis schimperiana differs from *P. schlimii* by the apex acuminated and leaf base enlarged and clasping.

2. ***Pseudosymblepharis schlimii*** (Müll. Hal.) M. Alonso, M.J. Cano & J.A. Jiménez, *J. Bryol.* 36: 27–32, 2014 (Alonso *et al.* 2014). Basionym:—*Trichostomum schlimii* Müll. Hal., *Bot. Zeitung Berlin* 15: 579, 1857 (Müller 1857). Type:—COLOMBIA. Santa Marta: 1524 m, *Schlim 914* (BM, lectotype by Alonso *et al.* 2014; G, PC0100173!, isotypes)

Illustrations: Alonso *et al.* (2014).

In Savanna (Gallery Forest) and Atlantic Rainforest (Dense Ombrophylous Forest, Mixed Ombrophylous Forest), 0–1500 m. On soil, rocks, and river banks. Brazil (GO, MT, MG, RO, SC); tropical America, from Mexico to the Southern part of Brazil and Bolivia (Alonso *et al.* 2014).

Specimens examined—BRAZIL. **Goiás**: Serra Geral do Paraná, on soil, gallery Forest and adjacent cerrado near riacho, ca. 3 km S of São João da Aliança, ca. 850 m, 11 March 1971, *H. S. Irwin, R. M. Harley & G. L. Smith 31763* (NY); **Rondônia**: 128 km SW of Ariqueaes at Mibrasa Camp, 5 km SE of camp office, along stream with coarse granitic outcrops and boulders and with some secondary vegetation, 18 May 1982, *K. McFarland, A.J. Fife, L.O.A. Teixeria, J.L. Santos, C.D.A. da Mota & P.S. Gomes 215* (NY).

Alonso *et al.* (2014) recently published a new combination for this taxon, transferring *Trichostomum schlimii* to the genus *Pseudosymblepharis*, citing new records for Bolivia, Brazil, the Dominican Republic, Ecuador, Guiana, Peru, and Venezuela.

It is characterized by leaves spiralled when dry, long, linear to linear-lanceolate, costa with two stereids bands, and basal marginal cells rectangular, extending up the margins cells forming a weak V.

Streptocalypta Müll. Hal.

A single species occurs in Brazil, on tree trunks, along stream banks.

1. *Streptocalypta lorentziana* Müll. Hal., *Linnaea* 42: 354, 1879 (Müller 1879). Type:—ARGENTINA. Urugunesis: entre Ríos Prov., Concepcion del Uruguay, 1877, *P.G. Lorentz s.n.* (H-BR!, isotype). Fig. 10 (N–R)

Phascum occultum Müll Hal., Index Bryol. 914. 1897, ***nom. illeg***. Original Material:—BRAZIL. subtropical, *E. Ule 5* (BM, G, GOET, LE!).

In Savana and Atlantic Rainforest (Dense Ombrophylous Forest), 0–700 m. On tree trunks. Brazil (MG, PR, RS, SC); Bolivia, Peru, Argentina, and Uruguay (Tropicos 2015).

Specimens examined—BRAZIL. **Minas Gerais**: Santana do Riacho, Serra da Bandeirinha, Posto do IBDF, sobre tronco vivo, mata perto da picada para o posto, 9 September 1987, *O. Yano & M.G.L. Wanderley 10748* (SP as *Weissia controversa*); **Santa Catarina**: Tubarão, August 1889, *E. Ule 5* (LE original material of *Phascum occultum* Müll. Hal., MG—Ex. Bryotheca Brasiliensis).

Apparently a rare species, known only from two collections. It is characterized by the costa in cross section with several layers of guide cells, with ventral stereids absent or nearly so.

Streptopogon Wils. in Mitt.

Three species occur in Brazil, in primary and secondary forests.

1. Leaf apex acuminate, costa excurrent (extending beyond the apex), completely filling the apex (proboscis); gemmae concentrated on the leaf apex around tip of costa ..... ***S. calymperes***
1'. Leaf apex acute, rounded to cucullate, costa subpercurrent (almost reaching the apex); gemmae on leaf margin or spreading on the upper distal leaf surface 2
2. Leaf apex rounded to abruptly cucullate; gemmae distributed on the upper distal leaf surface (apex and margin)..... ..... ***S. cavifolius***
2'. Leaf apex acute, plane; gemmae concentrated along the margins of leaf apex and upper 1/3 of leaf..... ***S. brasiliensis***

1. *Streptopogon brasiliensis* Casado ex D.P. Costa, *Syst. Bot.* 37: 584, 2012 (Costa 2012). Type:—BRAZIL. São Paulo: Serra da Bocaina at Cunha, forest meadow at Sitio da Grama, 1400 m, 28 October 1989, *A. Schäfer-Verwimp 11950* (L!, holotype; SV!, isotype). Fig. 10 (S–V)

In the Atlantic Rainforest (Dense Ombrophylous Forest, Mixed Ombrophylous Forest), 500–1400 m. On tree trunks or rocks. Endemic to southeastern and extreme southern Brazil (MG, RJ, RS, SC, SP).

Specimens examined—BRAZIL. **Minas Gerais**: Parque Nacional do Caparaó, Vale Verde, 20°30'S, 41°40'W, ca. 1200 m, moist Mata Atlântica, 30 October 1994, *W.R. Buck 26937* (NY, SP); **Rio Grande do Sul**: Marau, Praça im Zentrum, 29 December 1988, *Schäfer-Verwimp & Verwimp 10719* (SV); **Rio de Janeiro**: Parque Nacional de Itatiaia, May 1984, *Vital & Buck 9640* (NY); **Santa Catarina**: Mafra, Praça im Zentrum, 19 December 1988, *Schäfer-Verwimp & Verwimp 10442* (SV).

Streptopogon brasiliensis is similar to *S. cavifolius* Mitt., but differs by its leaf apex plane and acute,

multicellular propagules (gemmae) numerous at leaf margins, median leaf cells quadrate and thick-walled, and basal leaf cells porous.

2. *Streptopogon calymperes* Müll. Hal. ex. Geh., Abh. Naturwiss. Vereine Bremen 7: 207. 1882 (Geheeb 1882). Type:—MADAGASCAR. Ambatondrazaka, December 1877, *Rutenberg 22* (B, holotype assumed destroyed). Fig. 11 (A–D)

Streptopogon schenkii Müll. Hal., *syn. fide* Sharp *et al.* (1994).
Streptopogon calymperoides Müll. Hal., *nom. inval.* (no description).

In the Atlantic Rainforest (Dense Ombrophylous Forest), 800–2000 m. On tree trunks or rocks. Brazil (MG, RJ, SP); Mexico, Central America, West Indies, Western and Northern South America, Brazil, West-Central and East Tropical Africa, and Western Indian Ocean (Allen 2002).

Specimens examined— BRAZIL. **Minas Gerais**: Serra do Picú, December 1885, *H. Schenk 4789* (NY syntype of *S. schenkii*); **Rio de Janeiro**: Parque Nacional do Itatiaia, along entry road near border with Rio de Janeiro in vicinity of km 4, ca. 2000 m, 22º22'S, 44º45'W, humid montane forest roadbank, 5 July 1991, *D.M. Vital & W.R. Buck 19640* (NY); Serra da Mantiqueira, Camanducaia, Monte Verde, along road to Chapéu do Bispo, 1920 m, 13 May 1990, *A. Schärfer-Verwimp 12736* (RB); **São Paulo**: Cunha, Serra da Boacaina, Sitio da Grama, Waldweide, epiphystisch, 1400 m, 23º09'S, 44º50'W, 28 October 1989, *A. Schäfer-Verwimp & I. Verwimp 11946* (RB); Pindamonhangaba, Serra da Mantiqueira, Pico do Itapeva, ca. 6 km SE of Campos do Jordão, 22º46'S, 45º35'W, ca. 2000 m, exposed rocks and disturbed cloud forest with planted pines, 18 October 1994, *W.R. Buck 26342A* (NY). COSTA RICA. *H. A. Weddel s.n.* (NY duplicate of the original material of *Streptopogon calymperoides*).

This taxon can be distinguished by its apical leaf proboscis, with reddish-brown gemmae in globose clusters at the tip. The costa of *S. calymperes* sometimes appears excurrent as it fills the proboscis, but when the apex is closely examined at least one row of leaf cells can be seen between the costa and the apical margins. Casado (2000) cited this species as *S. schenckii* Müll. Hal. from Serra do Picu in Rio de Janeiro State; this moutain is located, however, in Minas Gerais State. *Streptopogon schenckii* is a synonym of *S. calymperes* (Sharp *et al.* 1994).

3. ***Streptopogon cavifolius*** Mitt., *J. Linn. Soc. Bot*. 12: 180, 1869 (Mitten 1869). Type:—ECUADOR. Andes Quitenses, Baños ad pedem montis Tunguragua, in ramulis praecipue malvacearum suffruticosarum, etaim in monte Guayarapata, 6000–10000 ped., *R. Spruce 140* (NY!, lectotype by Costa 2014a; BM!, E, G, LE!, NY!, P, S, syntypes). Fig. 11 (E–J)

In the Atlantic Rainforest (Dense Ombrophylous Forest and Deciduous Forest), 300–2000 m. On tree trunks, common in urban areas. Brazil (MG, PR, RS, SP); Mexico, Central America, West Indies, Western and Northern South America, Northeast, Central and East Tropical Africa, Western Indian Ocean, Malesia, North-Central Pacific (Allen 2002).

Specimens examined—BRAZIL. **Paraná**: Rio Negro, on tree trunk in urban area, *D.M. Vital 9446,* (SP); **Rio Grande do Sul**: Maraú, Praça im Zentrum, epiphytisch, 320 m, 29 December 1988, *A. Schäfer-Verwimp & Verwimp 10719* (SV); **São Paulo**: Mogi das Cruzes, Parque Municipal da Serra de Itapeti, tronco de árvore, 23°28`S, 46°09`W, 27 May 2006, *D.F. Peralta et al. 3664* (SP).

Vital et Visnadi (2000) cited the first record for Brazil, and according to those authors, the species exhibits wide ecological amplitude. The Brazilian material has plane leaves with straight margins, subpercurrent costa, and the leaf apex often bearing cylindrical and septate gemmae. Similar features were described by Matteri et Schiavone (1998) in specimens from Argentina.

Syntrichia Brid.

Five species occur in Brazil, on rotten logs, shaded rocks, and tree trunks, at low to high elevations. This genus does not appear to be very common in Brazil.

This key is based on Mishler (1994)

1. Leaves strongly bordered by thicker-walled, collenchymatous cells; costa percurrent; gemmae present..... ***S. amphidiacea***
1'. Leaves not bordered, collenchymatous cells or not; costa excurrent; gemmae present or absent 2

2. Leaves fragile, often broken and appearing eroded, not bordered or occasionally weakly bordered by thicker-walled cells, oblong-lingulate to spatulate, margin entire or crenulate; cells moderately thicker-walled, not collenchymatous; costa excurrent into a mucro or apiculus; gemmae absent 3
2'. Leaves not fragile, not bordered, spatulate, margin entire or occasionally serrulate near the apex; cells rather thick-walled, collenchymatous; costa excurrent into a short, smooth or serrulate awn; gemmae present 4
3. Leaves spreading to recurved when moist, apiculate, breaking irregular along the margin ..... ***S. fragilis***
3'. Leaves patent to spreading when moist, mucronate, breaking along the margins into laciniae ..... ***S. lacerifolia***
4. Leaf cells papillose-crenulate or smooth; costa excurrent as an awn or hyaline hair point; propagula on the stem apex or in the base of upper leaves; capsule cylindrical ..... ***S. laevipila***
4'. Leaf cells unipapillose; costa strongly serrate, percurrent or short-excurrent into a mucro or apiculus; propagula on the upper surface of costa (adaxial); capsule ovoid ..... ***S. papillosa***

1. *Syntrichia amphidiacea* (Müll. Hal.) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci.* 32: 267, 1993 (Zander 1993). Basionym:—*Barbula amphidiacea* Müll. Hal., *Linnaea* 38: 639, 1874 (Müller 1874). Type:—MEXICO. Monte Orizaba, *Frederick Müller,* inter allios muscos, Hb. Lorentz sub *Zygodon* (holotype not located). Fig. 11 (K–N)
Tortula amphidiacea (Müll. Hal.) Broth., *syn. fide* Zander (1993).

In the Atlantic Rainforest (Dense Ombrophylous Forest, Semi-deciduous Forest, and Mixed Ombrophylous Forest), 650–1650 m. On rotten wood, shaded rocks, and tree trunks (common in urban areas). Brazil (ES, MG, PR, RJ, SC, SP); Southeastern U.S.A., mexico, Central America, Western South America, and Malesia (Allen 2002).

Specimens examined—BRAZIL. **Espírito Santo**: Domingos Martins, auf schattigem Granitblock in einer Weide am "Morro do Cruzeiro", 20°26'S, 41°00'W, 1160 m, 11 October 1988, *A. Schäfer-Verwimp & I. Verwimp 10240* (MO); **Rio de Janeiro**: Teresópolis, park in the center of the town, epiphytic, 900 m, 24 July 1990, *A. Schäfer-Verwimp & I. Verwimp 13114* (SV).

Commonly it grows as an epiphyte in Brazil, more rarely on rocks or rotting logs, often mixed with other bryophytes. Based on collections of *S. amphidiacea* appears to be rather widespread and frequent in southeastern and southern Brazil.

It is characterized by multicellular, cylindrical gemmae on the ventral (and often dorsal) leaf surfaces.

2. *Syntrichia fragilis* (Taylor) Ochyra, *Fragm. Florist. Geobot*. 37: 212, 1992 (Ochyra 1992). Basionym:—*Tortula fragilis* Taylor, *London J. Bot.* 6: 333, 1847 (Taylor 1847). Type:—ECUADOR. Pichincha: November 1846, *W. Jameson 66* (FH, lectotype by Gallego 2005; FH, MO, NY, PC 0054240!, isolectotypes). Fig. 11 (O–P)

In the Atlantic Rainforest (Dense Ombrophylous Forest) and Savanna, 800–2000 m. On tree trunks, rocks, or stone walls in urban area. Brazil (MG, MS, RJ, RS, SP); Africa, America, South Asia, Europe, Macaronesia (Gallego 2005).

Specimens examined—BRAZIL. **Rio de Janeiro-Minas Gerais**: Parque Nacional do Itatiaia, along entry road near border of Rio de Janeiro, between Km 1.5 and Km 3, 1700–1900 m, 22°22'S, 44°45'W, humid montane forest, 4 July 1991, *D.M. Vital & W.R. Buck 19514* (NY); **São Paulo**: São Bento do Sapucaí, Serra da Mantiqueira, westanstieg zur Pedra do Baú, in weiden an granitblock, 1470 m, 30 September 1989, *A. Schäfer-Verwimp & Verwimp 11819* (SP).

According to Schäfer-Verwimp & Giancotti (1993), the records of *S. fragilis* by Egunyomi & Vital (1984) for Goiás State and by Guarim Neto & Yano (1985) for Mato Grosso State are based on misidentifications, and correspond to *Trichostomum weisioides* Müll. Hal. My examinations of these collections during the present study confirmed this conclusion.

3. *Syntrichia lacerifolia* (Williams) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci.* 32: 269, 1993 (Zander 1993). Type:—ARGENTINA. Tucuman, Tafí del Valle, 2000 m, *Lamb 5477* (ex LIL no. 12668) (FH-Bartram, holotype)
Illustrations: Williams (1916).

In Savanna, ca. 860 m. On tree trunks. Brazil (MG); Colombia, Ecuador, Peru, Bolivia, Argentina, and Brazil (Gallego *et al.* 2011).

Specimens examined—BRAZIL. **Minas Gerais**: Uberlândia, 18°50'S, 48°15'W, on bark of tree in Cerrado vegetation, 860 m, 31 May 1978, *D.M. Vital & R. Pursell 8304* (SP).

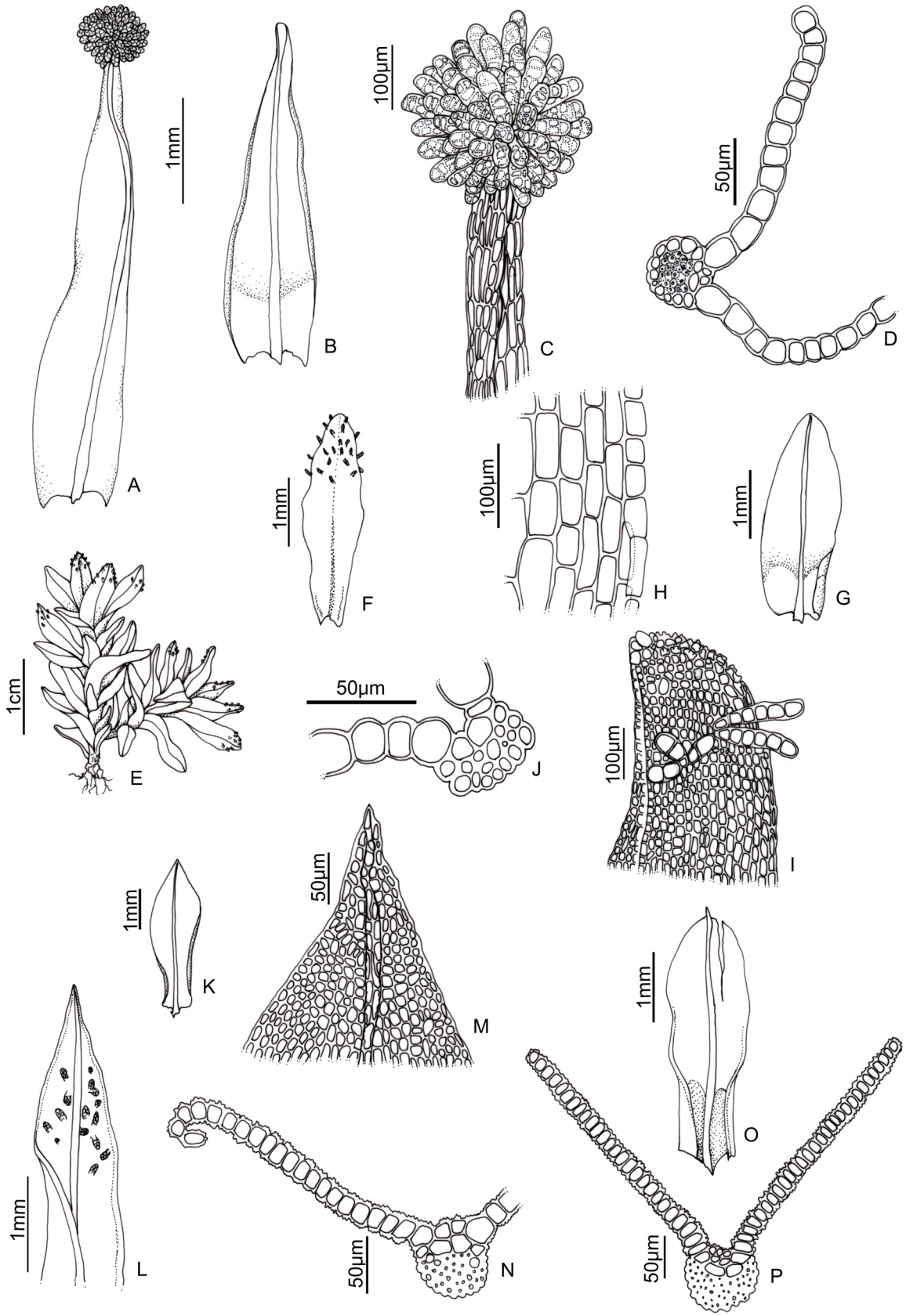

FIGURE 11. *Streptopogon calymperes* Müll. Hal. A–B. Leaves. C. Leaf apex. D. Leaf section. *Streptopogon cavifolius* Mitt. E. Habit. F–G. Leaves. H. Laminal cells. I. Leaf apex. J. Leaf section. *Syntrichia amphidiacea* (Müll. Hal.) R.H. Zander. K–L. Leaves. M. Leaf apex. N. Leaf section. *Syntrichia fragilis* (Taylor) Ochyra. O. Leaf. P. Leaf section.

According to Gallego *et al.* (2011), it is similar to *S. fragilis* because both have fragile leaves with unbordered and recurved margins, not constricted at the middle, and papillose laminal cells. However, the former has leaves spreading to recurved when moist (contrasting with leaves patent to spreading in *S. fragilis*) and leaves apiculate (mucronate), breaking along the margins into laciniae (irregular).

4. *Syntrichia laevipila* Brid., *Muscol. Recent. Suppl.* 4: 98, 1818 [1819] (Bridel 1818). Type:—ITALIA. around Rome & Naples, 1803 (B, lectotype by Gallego *et al.* 2004). Fig. 12 (A–B)
Syntrichia pagorum (Milde) J.J. Amann, *syn. fide* Gallego *et al.* (2004)
Tortula pagorum (Milde) De Not., *syn. fide* Kürschner (2000)

In the Atlantic Rainforest (Dense Ombrophylous Forest, Mixed Ombrophylous Forest and Deciduous Forest), Steppe, 0–900 m. On tree trunks, roadside soils, or rock walls (common in urban areas). Brazil (PR, RS, SC); Africa, North, Central and South America, Asia, Australia, Europe, and New Zealand (Gallego 2005).

Specimens examined—BRAZIL. **Rio Grande do Sul**: Bento Gonçalves, epiphytisch na Alleebäumen im Zentrum der Stadt, 650 m, 27 December 1988, *A. Schäfer-Verwimp & Verwimp 10690* (SP as *T. pagorum*); Caxias do Sul, Bairro Cinquentenário, sobre muro de pedras—beira da rua, 780 m, 9 February 2006, *J. Bordin & M. Sartori 414* (SP); Caxias do Sul, Bairro Lourdes, rua Pinheiro Machado, sobre tronco de Salix, 780 m, 12 November 2005, *J. Bordin 164b*, *165* (SP); Caxias do Sul, Bairro Lourdes, sobre tronco de *Senna*, 780 m, 14 April 2006, *J. Bordin & L. Bordin 471* (SP); Caxias do Sul, Bairro Petrópolis, rua Padre João Schiavo, sobre calçada, 780 m, 17 November 2005, *J. Bordin 185* (SP); Caxias do Sul, Bairro Pelegrino, sobre tronco de *Ligustrum*, Rua Coronel Flores, 3 October 2006, *J. Bordin & L.S. Bordin 328* (SP); Caxias do Sul, Parque Centenário, sobre tronco de árvore viva, 3 October 2006, *O.Yano & J. Bordin 29054* (SP); Caxias do Sul, próximo a rodoviária, sobre troncos, 780 m, 16 September 2005, *J. Bordin 132* (SP); Uruguaiana, im Zentrum an Alleebäumen, 70 m, 1 January 1989, *A. Schäfer-Verwimp & Verwimp 10741* (RB).

Schäfer-Verwimp (1996) cited several collections from localities near human habitations, commenting that this species is expected to occur in other towns in southern Brazil.

5. *Syntrichia papillosa* (Wils. ex Spruce) Jur., *Laubm.-Fl. Oesterr.-Ungarn*. 141, 1882 (Juratzaka 1882). Basionym:—*Tortula papillosa* Wils. ex Spruce, *London J. Bot.* 4: 193, 1845 (Spruce 1845). Type:—ENGLAND. in Howard park, July 1843, *W. Wilson* (BM!, holotype; F, isotype). Fig. 12 (C–G)

In the Atlantic Rainforest (Mixed Ombrophylous Forest), 1420 m. On tree trunks in a garden near the center of São Joaquim. Brazil (SC); North, Central and South Africa, America, Asia, Australia, Europe, Macaronesia, and New Zealand (Gallego 2005).

Specimens examined—BRAZIL. **Santa Catarina**: São Joaquim, in der Stadt epiphytisch in einem Privatgarten, 1420 m, 23 December 1988, *A. Schäfer-Verwimp & Verwimp 10570* (RB).

The only collection known to Brazil was made by Schäfer-Verwimp (1992) in Santa Catarina State in urban area. *Syntrichia papillosa* can be confused with *S. laevipila*, differing by cells unipapillose, costa strongly serrate, and propagula on the ventral surface cells of the costa (abaxial), cylindrical and rounded at the ends.

Timmiella (De Not.) Limpr.
One species in Brazil, disjunct between southeasttern Brazil and the southern Andes. Based on phylogenetic and morphological distinctions, Inoue et Tsubota (2014) excluded the genera *Timmiella* and *Luisierella* from Pottiaceae, accomodating them within a new family, Timmiellaceae Y. Inoue & H. Tsubota. Here I continue to include them in the Pottiaceae family.

1. *Timmiella barbuloides* (Brid.) Mönk., *Laub. Europ*. 273, 1927 (Mönkemeyer 1927). Basionym:—*Trichostomum barbuloides* Brid., *Musc. Rec. Suppl*. 1: 233, 1806 (Bridel 1806). Type:—EUROPE. *Bridel 406* (B 31041001!, holotype). Fig. 12 (H–K)
Barbula cirrhata Hornsch., *syn. fide* Wijk & Marg. (1959)

In the Atlantic Rainforest (Dense Ombrophylous Forest), 0–1100 m. On soil and rocks. Brazil (MG, RJ, SP); Bolivia, Brazil, Canary Island, Greece, Israel, Egypt, Central Asia, Iraq, and sub-Saharan Africa (Tropicos 2015).

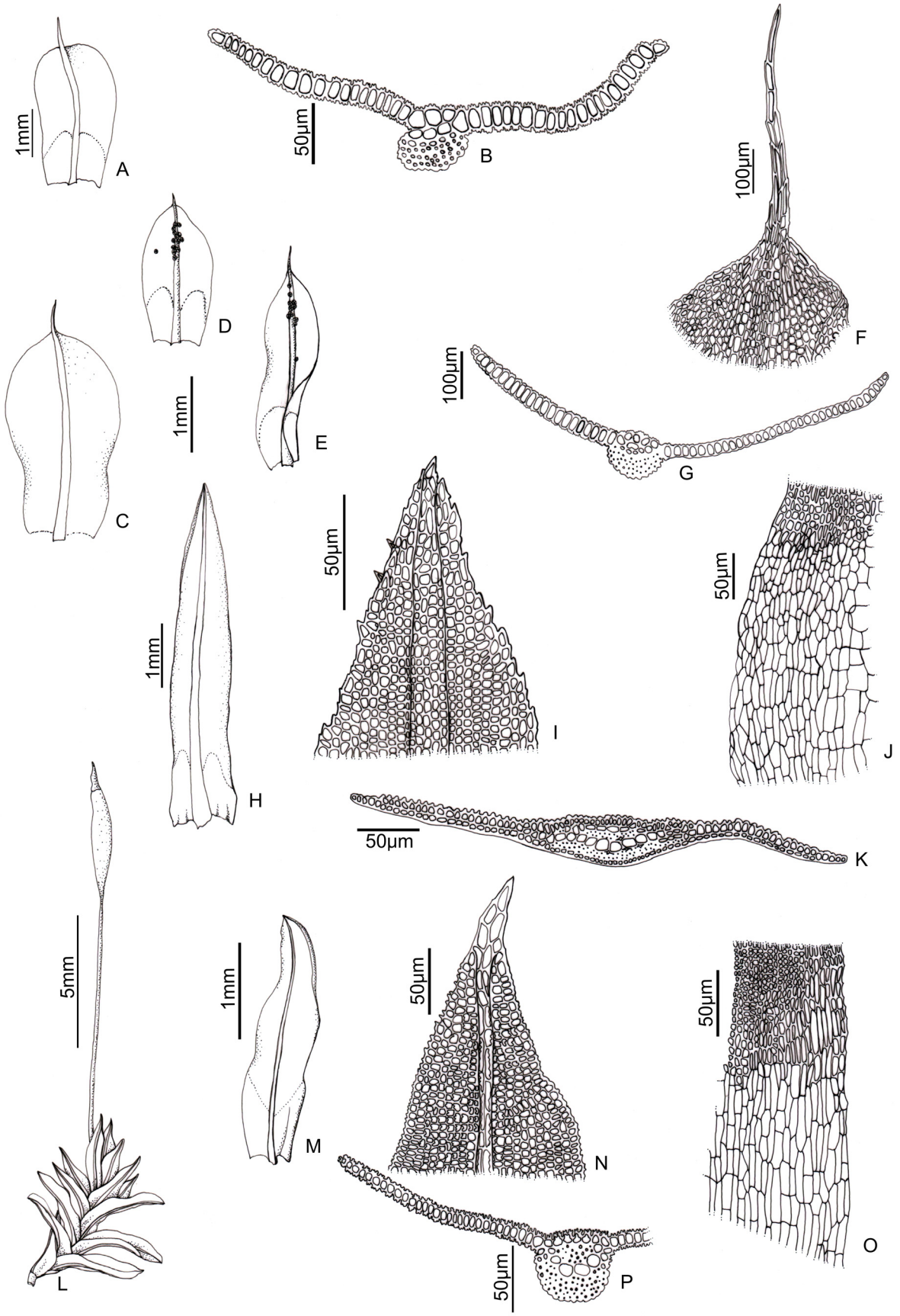

FIGURE 12. *Syntrichia laevipila* Brid. A. Leaf. B. Leaf section. *Syntrichia papillosa* (Wils. ex Spruce) Jur. C–E. Leaves. F. Leaf apex. G. Leaf section. *Timmiella barbuloides* (Brid.) Moenk. H. Leaf. I. Leaf apex. J. Basal cells. K. Leaf section. *Tortella humilis* (Hedw.) Jenn. L. Habit. M. Leaf. N. Leaf apex. O. Basal cells. P. Leaf section.

This taxon is only known from old collections of southeastern Brazil (Rio de Janeiro and Minas Gerais states) being cited as *Barbula cirrhata* or *Tortula cirrhata* by Arnott (1823), Hornschuch (1840), Mueller (1844), Hampe (1870, 1872, 1874a, 1877, 1879), and Hampe & Geheeb (1881). Although considered widespread globally, I did not find any collection to confirm its occurrence in Brazil.

It can be recognized by leaves broad-lanceolate, with lamina bistratose (upper laminal cells), cells smooth, and not directly one above the other in cross section.

Tortella (Lindb.) Limpr.

A globally widespread genus, with four species occurring in Brazil. The genus is characterized by the arrangement of the leaf basal cells in a V.

1. Leaf narrowly ligulate, costa subpercurrent, cross section with two rows of guide cells ..... ***T. linearis***
1'. Leaf ligulate, oblong-lanceolate to linear-lanceolate, costa shortly-excurrent to excurrent as a mucro, cross section with one row of guide cells 2
2. Costa more or less excurrent as an entire or serrulate point, wide at the base; margin more or less undulate. Peristome twisted ..... ***T. tortuosa***
2'. Costa short-excurrent to excurrent as a mucro, margin entire to crenulate, plane to more or less undulate. Peristome twisted or rudimentary 3
3. Leaf oblong-lanceolate (ca. 3.0 mm), concave, apex broadly acute to acuminate, mucronate, reflexed, costa excurrent as a mucro, margin crenulate, more or less undulate. Capsule long-cylindrical, with annulus persistent. Peristome twisted 2–3 times ..... ***T. humilis***
3'. Leaf long-ligulate to oblong-lanceolate (1.5–2.5 mm), apex acute, apiculate, shortly mucronate (hyaline); costa short-excurrent, margin entire to weakly crenulate, plane to erect. Capsule oblong, with annulus rudimentary and non-functional ..... ***T. lilliputiana***

1. *Tortella humilis* (Hedw.) Jenn., *Man. Mosses W. Pennsylvania* 96, 1913 (Jennings 1913). Basionym:—*Barbula humilis* Hedw., *Sp. Musc. Frond.* 25: 116, 1801 (Hedwig 1801). Type:—USA. Lancaster Pennsylvaniae, Jan 1897, *J. Cardot s.n.* (G!, holotype). Fig. 12 (L–P)

In Savanna, Atlantic Rainforest (Semi-deciduous, Dense Ombrophylous Forest and Mixed Ombrophylous Forest), Pantanal (seasonally flooded vegetation), Steppe, and urban areas, 0–1400 m. On soil, rocks, tree trunks, and tomb walls. Brazil (BA, ES, GO, MG, MS, PR, RJ, RS, SC, SP); Mexico, Guatemala, Cuba, Jamaica, Haiti, Northern Sout America, Easterm North America, Europe, and North Africa (Zander 1994).

Specimens examined—BRAZIL. **Bahia**: Toca de Onça, 27–29 June 1915, *J. N. Rose & P. G. Russell 20118* (NY); Lençóis, along BR 242, ca. 15 km NW of Lençóis at km 225, ca. 900 m, campo rupestre, 10 June 1981, *B.M. Boom & S.A. Mori 1084* (NY); **Distrito Federal**: calcareous zone, 25 km NE of Brasília, near Córrego Landim, edge of forest, 14 May 1966, *D.R. Hunt 5482B* (BM); **Goiás**: Formoso, na base de um tronco de árvore viva, no Cerradão, Fazenda Murici, 13°12'S, 48°47'W, 30 August 1979, *D.M. Vital 8502* (NY); **Minas Gerais**: Parque Nacional do Caparaó, Vale Verde, 20°30'S, 41°40'W, ca. 1200 m, moist mata atlântica, 30 October 1994, *W.R. Buck 26956* (NY); **Paraná**: Canta Galo, em barrancos rochosos as margens de estradas, May 1982, *G. Hatschbach 45254* (NY); Coatis, epífita, mata Ocotea-Sloanea, 8 October 1969, *G. Hatschbach 22402* (NY); Laranjeiras do Sul, Rio Tapera, ao longo do caminho, em locais pedregosos úmidos, 8 June 1968, *G. Hatschbach 19290* (NY); Morretes, Estrada da Graciosa, Grota Funda, em velho murro de arrimo a beria da estrada, 700 m, *G. Hatschbach 51268 & J. Cordeiro* (NY); Palmas, em parede de cimento úmido, 1100 m, 9 August 1990, *J.M. Silva & I. Rauscher 886* (NY); Palmeira, Rio dos Papagaios, BR 277, zona de campo, dos lageados úmidos de arenito, sem sombreado, 850 m, 21 September 1990, *G. Hatschbach & P. Ravenna 54465* (NY); Rio Branco do Sul, Bromado, sobre tronco de árvore, 24 August 1988, *R. Kummrow & G. Pringle 3072* (NY); **Rio Grande do Sul**: Bom Jesus, ad fl. Faxinal, ad lignum putridum, 900 m, 21 November 1952, *A. Sehnem 6011* (NY); Caxias do Sul, Conceição, sobre rochas no caminho, 28 June 1986, *R. Wasum et al. 1738* (NY); Caxias do Sul, Faxinal, sobre rochedos, no interior da matinha, 1 July 2005, *F. Marchett 292* (RB, SP); Ciríaco, ca. 1 km W of Cruzaltinha on BR 285, ca. 500 m, 28°17'S, 51°58'W, humid, hardwood forest, 23 September 1984, *D.M. Vital & W.R. Buck 12167* (NY); Gramado, ad lignum putridum in silva, 800 m, 27 December 1949, *A. Sehnem 4698* (NY, R, RB); Pareci Novo, Montenegro, ad lignum putridum, 150 m, 16 September 1952, *A. Sehnem 6168* (NY); Pedro Osório, no muro de um canal de drenagem, 31°43'S, 52°52'W, 15 July 1980, *D.M. Vital 9086* (NY); Santana da Boa Vista, em barrancos a beira da estrada, 14

September 1987, *R. Wasum et al. 3509* (NY); São Francisco de Paula, ad lignum putridum, 900 m, 19 December 1949, *A. Sehnem 4566* (NY); São Francisco de Paula, sobre cimento, em beira de estrada, 900 m, 15 November 1990, *R. Wasum et al. 7459* (NY); São Leopoldo, in humo, 40 m, 17 June 1942, *A. Sehnem 350* (NY); São Salvador, in trunco arboris, 550 m, 2 July 1946, *A. Sehnem 424* (NY); Vacaria, ad fl. Uruguay superio, ad arbore in silva, 900 m, 28 December 1951, *A. Sehnem 5938* (NY); Vacaria, ca. 3 km N of Rio das Antas on BR 116, ca. 800 m, 28º53'S, 51º07'W, on roadside vertical rocks, mostly dripping, 26 September 1984, *D.M. Vital & W.R. Buck 12215a, 1222,* (NY); **Rio de Janeiro**: without locality, *C. Montagne s.n.* (NY); Brasilis austral, *A. Glaziou s.n.* (NY); *A. Glaziou 7445* (NY); *A. Glaziou s.n.* (NY [2]); December 1878, *A. Glaziou s.n.* (NY); Morro Redondo, 10 November 1873, *Schwacke 922* (RB); *Milne s.n.* (NY); Angra dos Reis, Ilha Grande, 24 June 1915, *J.N. Rose & P.G. Russell 20387* (NY); Arraial do Cabo, Massambaba, restinga, no solo a beira da estrada, 21 June 1995, *D.P. Costa et al. 2184* (RB); Itatiaia, in saxis, July 1902, *P. Dusén s.n.* (NY [2]); Itatiaia, caminho para Véu da Noiva, 7 January 2009, *T.M. Crespo & M.G. Costa s.n.* (RB); Fazenda da Cachoeria, Monnerat, 26 June 1923, *M.C.V. Bandeira s.n.* (NY); vicinity of Itatiaia, Monte serrat, 26–30 June 1915, *J.N. Rose & P.G. Russell 20444* (NY); Itatiaia, caminho para o Véu da Noiva, 15 February 1994, *L.R. Andrade s.n.* (RB); Itatiaia, Serrinha, caminho para o Camping Club do Brasil, 7 November 1993, *I. Hupsel s.n.* (RB); Monnerat, Fazenda Cachoeira, sobre roca em lugar seco e de muita exposição, 26 June 1923, *M.C.V. Bandeira s.n.* (RB); Jurajuba Bay, on rocks, 1837, *G. Gardner 16* (NY); Nova Friburgo, Lumiar, caminho para a Pedra Riscada, sobre a pedra no chão da trilha, exposta, heliófila, 600 m, 5 May 1988, *D.P. Costa et al. 676* (RB); Stucky, estrada para Lumiar, à direita km 6 da estrada Friburgo-Lumiar, na mata sobre pedra à beira do rio coberto pela vegetação herbácea, úmido e umbrófila, 10 December 1987, *D.P.Costa & J.C. Gomes 445* (RB); Orgão Moutain, on rocks, 1837, *G. Gardner 34* (NY); Pedra Bonita, on an exposed rock, *G. Gardner 34(1)* (NY); Pedra Bonita, on an exposed rock, 1 February 1837–41, *G. Gardner 16c* (NY); Petrópolis, Araras, Pousada das Araras, sobre pedra na frente do chalé, 22º25'07"S, 43º12'03"W, 850 m, 14 December 2008, *D.P. Costa s.n.* (RB); Petrópolis, margem esquerda da rodovia Teresópolis-Rio, entre os km 86–87, musgos de coloração verde, saxícola, ambiente semi-umbrófila, 17 May 1988, *L.C. Giordano, V.L.G. Klein & M.A. Nadruz 382* (RB); Rio de Janeiro, estrada de Guaratiba, cescendo em pedra isolada, rupícola, 20 October 1966, *E.F. Guimarães & D. Sucre 43* (RB); Rio de Janeiro, Tijuca, 1873, *Schwacke 914* (RB); Rio de Janeiro, Tijuca, *J. Ball s.n.* (NY); Santa Maria Madalena, Parque Estadual do Desengano, sobre pedra em área aberta à beira da estrada próxima a entrada da fazenda, 1100 m, 28 October 2008, *D.P. Costa, T.M. Crespo & J.C. Silva 4921* (RB); Santa Maria Madalena, Parque Estadual do Desengano, sobre barranco de pedra na estrada próximo a entrada do sítio da Muribeca, 21º52'907''S, 41º55'849''W, 1000 m, 31 October 2008, *D.P. Costa, T.M. Crespo & J.C. Silva 5021* (RB); Santa Maria Madalena, Parque Estadual do Desengano, sobre pedra em área aberta na frente do rancho da Mata Atlântica, sítio Muribeca, 21º52'591''S, 41º54'949''W, 1100 m, 30 October 2008, *D.P. Costa, T.M. Crespo & J.C. Silva 4980* (RB); Santa Maria Madalena, Parque Estadual do Desengano, sobre barranco próximo a entrada do rancho da Mata Atlântica 1100 m, 30 October 2008, *D.P. Costa, T.M. Crespo & J.C. Silva 4992* (RB); **Santa Catarina**: Tubarão, September 1889, *E. Ule 14* (BM original material of *Barbula* [4] Müll. Hal., NY [2], MG [1], R [1]—Ex Ule Bryotheca brasiliensis); **São Paulo**: Eldorado Paulista, Caverna do Diabo, ca. 200 m, 24º42'S, 48º20'W, humid, hardwood Forest over limestone, 29 September 1984, *D.M. Vital & W.R. Buck 12564* (NY); São Paulo, Parque Estadual, Jardim Botânico, 810 m, 23º36'S, 46º38'W, secondary forest, 9 September 1984, *D.M. Vital & W.R. Buck 11420* (NY); São Paulo, Jardim Botânico, in dern Parkanlagen an Mauer, 750 m, 26 June 1988, *A. Schäfer-Verwimp & Verwimp 9704* (RB); São Paulo, cemitério da Consolação, 23°34'01"S, 46°37'32"W, 700 m, sobre o teto, parede e base das tumbas, 1 February 2001, *D.M. Vital s.n.* (RB, SP); Ubatuba, Parque Estadual da Serra do Mar, Núcleo Picinguaba, Casa da Fazenda, 23º33'72"S, 44º85'3"W, sobre rocha, 30–50 m, 28 October 2009, *D.P. Costa et al. s.n.* (RB).

Tortella humilis can be recognized by its short stem, fragile leaves, often fragmented, broad to narrowly acute, plane, and laminal cells small and obscure. According to Eckel (1998), the costa diminishes in size toward the leaf tip in cross section, as was confirmed by studies of the Brazilian collections.

Eckel (1998) considered this species similar to *Hyophila involuta*, as the cells on the ventral surface of the costa are similar in shape and size to the laminal cells, the leaf base is narrow, and with the presence of stem central strand. *Hyophila involuta* differs by having dentate leaf apices, and by the laminal cells (in cross section) bulging on the ventral surface.

2. *Tortella lilliputana* (Müll. Hal. ex Roth) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci*. 32: 104, 1993 (Zander 1993). Basionym:—*Phascum lilliputanum* Müll. Hal. ex Roth, *Aussereur. Laubm*. 212, 1911 (Roth 1911). Type:—BRAZIL. Santa Catarina: Tubarão, ad terram, August 1889, *E. Ule 133* (FH, LE!, MO, NY!, PC—Ex Bryotheca brasiliensis, isotypes). Fig. 13 (A–F)
Tetrapterum lilliputanum (Müll. Hal. ex Roth) Broth., *syn. fide* Zander (1993).

In the Atlantic Rainforest (Dense Ombrophylous Forest), 0–1300 m. On moist soils or rocky cliffs covered with a thin layer of soil. Brazil (GO, RJ, RS, SC); Central America and Brazil (Allen 2002).

Specimens examined—BRAZIL. **Goiás**: Pirinópolis, Parque Estadual dos Pirineus, Morro Cabeluda, 1280 m, sobre pedra na sombra no morro, 18 March 2006, *O. Yano & M.A.R. Sousa 28660* (SP as *Barbula indica*); **Santa Catarina**: Tubarão, em roça de cana de açúcar, August 1889, *E. Ule 8* (MG, NY, R—Ex Bryotheca brasiliensis).

It is characterized by the small plants (2–3 mm long); leaves ligulate; seta up to 2 mm long; capsule cleistocarpic with a rudimentary and non funcional annulus. According to Allen (2002), the species seems better placed in *Trichostomum*.

It was only known from two old collections from Santa Catarina (Tubarão) made by E. Ule between 1889–1890, one being the type-collection. Cited here after 117 years for the states of Goiás and Rio Grande do Sul. In Brazil, it is probably a rare species.

3. ***Tortella linearis*** (Sw. ex F. Weber & D. Mohr) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci.* 32: 104, 1993 (Zander 1993). Basionym:—*Barbula linearis* Sw. ex F. Weber et D. Mohr, *Index Mus. Pl. Crypt*. 2, 1803 (Swartz ex F. Weber & D. Mohr1803). Type:—JAMAICA. *Swartz s.n.* (BM!, NY!, isotypes). Fig. 13 (G–J)
Tuerckheimia linearis (Sw. ex Web. & Mohr) Britt., *syn. fide* Zander (1982)

In the Atlantic Rainforest, altitude not recorded. Brazil (BA, RJ); West Indies (Jamaica, Cuba, Haiti) and Brazil (Zander 1993, Tropicos 2015).

Specimens examined—BRAZIL. **Bahia**: Morro do Chapéu, on shrubby tree trunk, on top of hill, ca. 3 km SW of town center, 20 August 1976, *D.M. Vital 6560 p.p.* (SP).

Cited of Rio de Janeiro State as *Barbula linearis* by Hornschuch (1840) "prope Sebastianopolis, leg. by Armott". This is a very old collection from the Atlantic Rainforest, but I was not able to study any other material to confirm the occurrence of this species for Rio de Janeiro.

4. *Tortella tortuosa* (Hedw.) Limpr., *Die Laubm. Deutschl*. 1: 604, 1888 (Limpricht 1888). Basionym:—*Tortula tortuosa* Hedw., *Sp. Musc*. 124, 1801 (Hewig 1801). Type:—in montibus, Pedemontii, Helvetiae, Galliae, Scotiae, Sueciae, Thuringiae, Hercyniae, in silvis arenosis Palatinatus, in ripibus calcareis Franconiae, Austriae, nec non in Virginia. Junio et Julio sporangiae matura. Perennis, *O. Swartz s.n.* (G!, holotype). Fig. 13 (K–L)

In the Upper Montane Atlantic Rainforest (Dense Ombrophylous Forest). On soil, rocks, and rotten wood, 2000–2600 m. Brazil (RJ—Itatiaia, RS); Mexico, Guatemala, Europe, Asia, Africa, Arctic, Asiatic Russia, Central Asia, Japan (Eckel 1998).

Specimens examined—BRAZIL. **Rio de Janeiro**: Parque Naiconal de Itatiaia, along road to Agulhas Negras, 22°25'S, 44°40'W, 2000–2600 m, on wet bank, 18 October 1977, *L.R. Landrum 2155* (RB); **Rio Grande do Sul**: Mariano Mouro, without collector (PACA).

According to Zander (1994), the plants of this taxon have broad leaf bases and large stereid bands (may be mistaken for *Pseudosymblepharis*). Eckel (1998) commented that the epithet refers to the main characteristic of this species, its crisped leaves in spirals when dry, and their strongly undulate margins. Depauperate forms may be confused with *T. fragilis* (Hook. et Wilson) Limpr., which has leaves more rigid, more or less erect, not or only slightly contorted when dry, and fragile, with propagulum at the leaf apex.

Tortella tortuosa has leaves with apex narrowed, while the leaves of *T. fragilis* are abruptly narrowed (subulate). Eckel (1998) commented on the mucro, which is longer in *T. tortuosa* (to 10 cells) and shorter in *T. fragilis* is (5–6 cells or less).

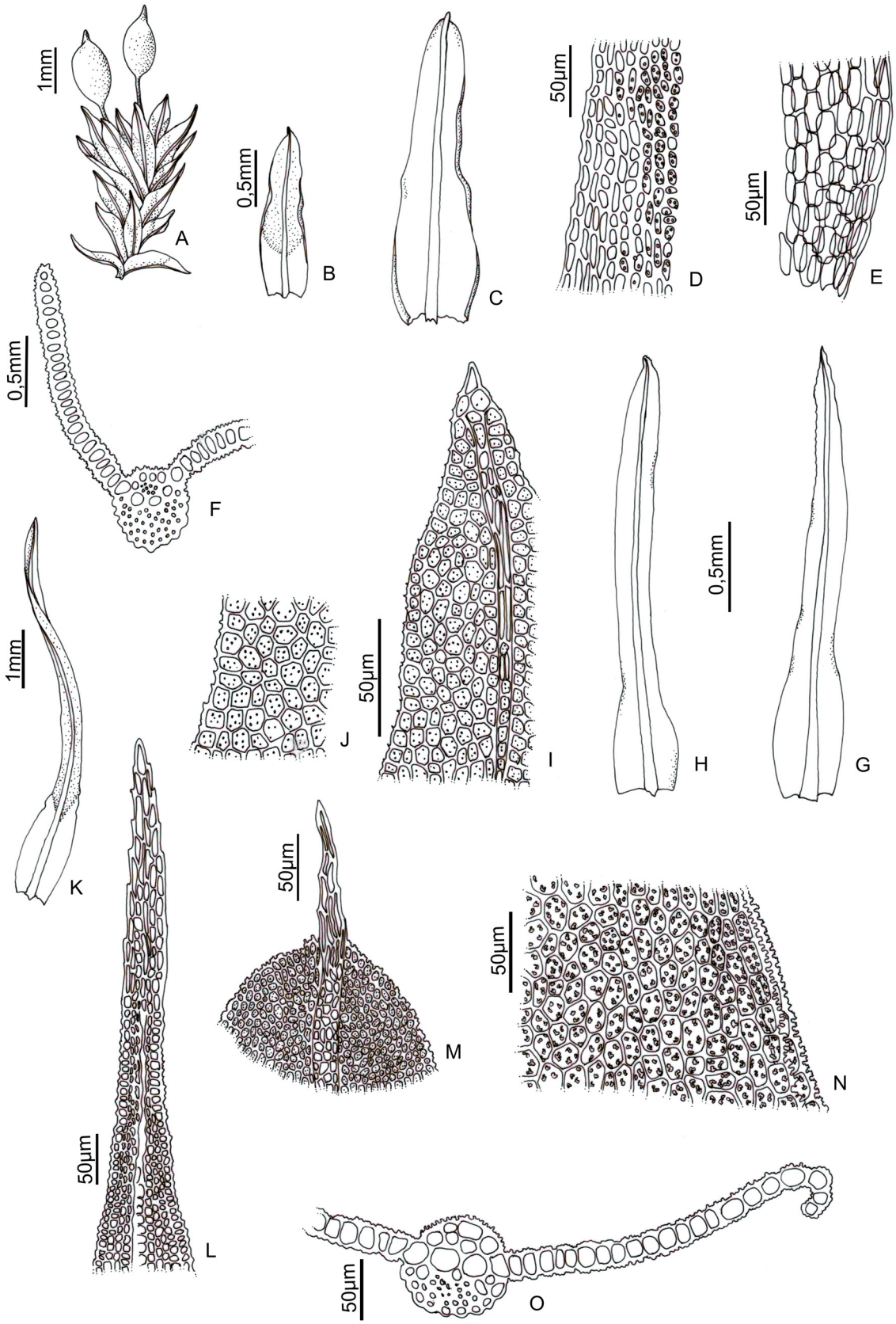

FIGURE 13. *Tortella lilliputana* (Müll. Hal. ex Roth) R.H. Zander. A. Habit. B–C. Leaves. D. Median cells. E. Basal cells. F. Leaf section. *Tortella linearis* (Sw. ex Web. & Mohr) R.H. Zander. G–H. Leaves. I. Leaf apex. J. Marginal cells. *Tortella tortuosa* (Hedw.) Limpr. K. Leaf. L. Leaf apex. *Tortula muralis* Hedw. M. Leaf apex. N. Laminal cells with papillae. O. Leaf section.

Names with types material not seen

Tortella cryptocarpa (Broth.) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci*. 32: 104, 1993 (Zander 1993). Basionym:—*Astomum cryptocarpum* Broth., *Bih. Kongl Svenska Vetensk.-Akad. Handl*. 3: 19, 1900 (Brotherus 1900). Type:—BRAZIL. *E. Ule s.n.* (S ?). Cited to Brazil, Rio Grande do Sul and Santa Catarina states (Brotherus 1900; Lindman 1906; Müller 1901; Roth 1911). I encountered the original material of *Phascum cryptocarpum* Müll. Hal., [BRAZIL. Santa Catarina: Tubarão, Aug 1889, *E. Ule 4*], housed at the LE and NY herbaria. This is an invalid name, without any description.

Tortella lindmaniana Broth., *Bih. Kongl Svenska Vetensk.-Akad. Handl*. 3: 17, 1900 (Brotherus 1900). Type:—BRAZIL. Mato Grosso, Palmeiras, *E. Ule 417.* (S ?). Cited to Brazil, Mato Grosso State (Brotherus 1900).

Further records

Astomum latifolium Broth., *Aussereur. Labm*. 190: 8, 1910 (Brotherus 1910).—Cited from Brazil, Rio Grande do Sul and Santa Catarina states (Lindman 1906, Müller 1901). **= Tortella fruchartii** (Müll. Hal.) R.H. Zander, *Bull. Buffalo Sco. Nat. Sci.* 32: 104, 1993 (Zander 1993), Basionym:—*Astomum fruchartii* (Müll. Hal.) Broth., *Bih. Kongl Svenska Vetensk.-Akad. Handl.* 3: 19. 1900 (Brotherus 1900). Type:—URUGUAY. Montevideo, Carrasco in terra, *Fruchard s.n.* (?, isotype). Probably it is endemic to Uruguay.

Tortella jugicola (Duby) Paris, *Index Bryol*. 5: 30, 1906 (Paris 1906).—Cited from Brazil, São Paulo State, Apiaí, *J.I. Puiggari s.n*. (G). According to Duby (1980a, b), is very similar to *T. caespitosa* (Schwägr.) Limpr., one of the many synonyms of *Tortella humilis*.

Tortula Hedw.

One species occurring in Brazil.

1. *Tortula muralis* Hedw., *Sp. Musc. Frond*. 123, 1801 (Hedwig 1801). Type:—EUROPE. faxis muris, tectis, regulis [Linn. Sp. Pl. 2. p. 1581. n. 8. Bryum tegulare humile pillosum & incanum Dill. H.M. 355. t.45. f. 14] (G!, lectotype by Guerra *et al.* 1992). Fig. 13 (M–O)

In the Atlantic Rainforest (Dense Ombrophylous Forest) and Savanna, 0–1400 m. On soil, rocks, or cement walls. Brazil (PE, PR, RJ, RS, SC, SP); Argentina, Brazil, Chile, Paraguay, Uruguay, Europe, temperate Asia, tropical Asia, Africa, North America, Australia, and New Zealand (Cano et Gallego 2008).

Specimens examined—BRAZIL. **Rio Grande do Sul**: Cachoeira do Sul, nas paredes de uma pequena ponte, 31°15'S, 52°50'W, 17 July 1980, *D.M. Vital 9238* (SP); Caxias do Sul, Campus da UCS, sobre paralelepídio, frente ao DML, junto do cordão da calçada, 20 September 2005, *J. Bordin 121* (SP); São José do Norte, sobre muro de uma casa, junto ao ancoradouro, 32°01'S, 52°03'W, 10 July 1980, *D.M. Vital 8983* (SP); Porto Alegre, ad murum arena conditum, 15 September 1892, *C.A.M. Lindmnan B41* (BM as *Tortula muricola*); Porto Alegre, Rua dos Voluntários da Prata, 10 October 1897, *Gartenmauer s.n.* (BM as *Barbula muricola*); ad murum arena conditum, 15 September 1892, *C.A.M. Lindmnan B41* (BM as *Tortula muricola*); Rio Grande (BM as *Barbula muralis*—Ex Herb. Hampe); Torres, sobre um barranco de rocha arenítica, 29°23'S, 49°52'W, 7 July 1980, *D.M. Vital 8904* (SP); Triunfo, sobre a ponte (2) de pedra, ao lado de Marica, 5 September 1975, *A. Sehnem & L.W. Aguiar s.n.* (SP); **Rio de Janeiro**: *Glaziou 6396* [3], *7454* [4] (BM as *Tortula muricola*—Ex Herb. Hampe); *Glaziou s.n.* (BM as *Barbula muricola*—Ex Herb. Schimperianum); **Santa Catarina**: in locis umbrosis ad muros, prope Destero, *Pabst 1847* (BM 000872817 as isotype of *Barbula muricola*—Ex Herb. Hampe); São Joaquim, Stadtzentrum, an alter Gartenmauer, 1420 m, 28º18'S, 49º57'W, 23 December 1988, *A. Schäfer-Verwimp & Verwimp 10566* (RB); **São Paulo**: Diadema, Cemitério de Diadema, sobre o teto, parede e base das tumbas, 700 m, 23°34'01"S, 46°37'32"W, 28 June 2003, *D.M. Vital s.n.* (SP); Guarulhos, Bairro das Pimentas, sobre muro velho, 13 November 1976, *O. Yano 561* (SP); prope urbem Iguape, 20–100 m, muris, 1 September 1901, *V. Schiffner 240* (BM as *Tortula muricola*); prope urbem São Paulo, 800 m, ad muros, 17 August 1901, *V. Schiffner 1171* (BM as *Tortula muricola*).

It is characterized by the small plants (< 4 mm), with leaves oblong-lanceolate, margins revolute and bordered by 1–2 rows of thick-walled cells, apex smooth in a hyaline hair-point, and peristome long and twisted (2–3 times).

Cano & Gallego (2008) found several syntypes of *T. muralis* var. *longipila* from Rio Negro (AM), identified as

Tortula longipila Dusén housed at the E, NY, O, PC herbaria. The authors selected as the lectotype the specimen housed at the G herbarium. *Tortula muralis* var. *longipila* can be distinguished from var. *muralis* by its long hair-point, capsule with annulus disposed in only one row, and by upper and middle laminal cells with low papillae, while the papillae are taller in *T. muralis*. However, all of these characteristics were considered by those authors to be included within the variability of *T. muralis*, thus considering it a synonym. I agree with these authors, as the Brazilian collections demonstrated the same variability.

Trachycarpidium Broth.
A single species in southeastern Brazil occuring in exposed sites.

1. ***Trachycarpidium lonchophyllum*** (G. Roth) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci*. 32: 213, 1993 (Zander 1993). Basionym:—*Astomum lonchophyllum* G. Roth, *Aussereur. Laubm.* 182, 1910 (Roth 1910). Type:—BRASIL. Santa Catarina: Tubarão, July 1889, *E. Ule 7* (G, GOET, JE, LE, MICH, PC, R!, isotypes). Fig. 14 (A–F)

In Savanna, 0–600 m. On soil. Brazil (SC, SP).

Specimens examined—BRAZIL. **São Paulo**: Pirassununga, Cerrado de Emas, no solo do cerrado entre gramíneas, 27 March 2006, *O. Yano & B.L. Morretes 28820* (SP as *T. verrucosum*).

This genus is characterized by very small plants, with long-lanceolate leaves, with a costa ending in a short awn, margins plane, and basal cells differentiated, extending upward along the margin (in a V). This Neotropical species is considered rare, and only known for Brazil from two collections — the type from Santa Catarina State, and another, more recent, from São Paulo State.

It is similar to *Trachycarpidium verrucosum* (Besch.) Broth., differing by the capsule with a large apiculus (half as wide as the capsule).

Trichostomum Bruch.
According to Zander (1993), this is a large genus, being found on all continenets except Antartica. Five species occur in Brazil, often in open and disturbed sites.

1. Leaf very fragile, margin undulate, apex obtuse, short mucronate ..... ***T. tenuirostre***
1'. Leaf not fragile, margin plane or incurved only above, apex acute, obtuse, round or cuspidate, short to long-mucronate .. 2
2. Leaves long-mucronate, basal cells 1/8–1/3 the leaf length (not like a V inverted) 3
2'. Leaves short-mucronate, basal cells 1/3 the leaf length (like a inverted V) 4
3. Leaf ligulate to lanceolate, margin plane, apex rounded to acute. Capsule cylindrical. Operculum erect-rostrate ..... ***T. brachydontium***
3'. Leaf oblong, margin convolute above, apex cuspidate. Capsule ovate. Operculum concial-subulate ..... ***T. termitarum***
4. Leaf ligulate, apex rounded. Capsule cylindrical ..... ***T. weisioides***
4'. Leaf oblong to oblong-lanceolate, apex rounded to obtuse. Capsule ovate-cylindrical ..... ***T. arboreum***

1. ***Trichostomum arboreum*** (Mitt.) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci.* 32: 91, 1993 (Zander 1993). Basionym:—*Weissia arborea* Mitt., *J. Linn. Soc. Bot.* 12: 138, 1869 (Mitten 1869). Type:—BRAZIL. Goiás: ad Missiones Douro, in arbores, *G. Gardner 5, 48* (BM!, NY!, syntypes). Fig. 14 (G–I)
Hyophila arborea (Mitt.) A. Jaeger, *syn. fide* Zander (1993)

In the Amazon Forest and Savanna (Gallery Forest), 0–800 m. On tree trunks, and soil-covered rocks. Endemic to Brazil (AM, GO, PA, RO, RR).

Specimens examined—BRAZIL. *Burchell 6376, 9193, 9202-a* (BM as *Hyophila arborea*); **Amazonas**: Rio Negro, between Manaus and São Gabriel, slopes and summit of Serra de Curicuriari, from Igarapé Arabú of the Rio Curicuriari to the summit, ca. 450 m at summit, 00º20'S, 66º50'W, on soil, common in campina at base, 9–12 July 1979, *W.R. Buck 2519* (NY); Rio Negro, between Manaus and São Gabriel, along BR 307, N from São Gabriel da Cachoeira to Cucuí, at Equador, roadside and adjacent secondary forest, 00º00'S, 66º00'W, on rotten log, 17 July 1979, *W.R. Buck 2577* (NY); Rio Negro, *R. Spruce 164*, s.d. (NY); **Goiás**: Presidente Kennedy, road from highway BR 153 to Itaporã 12 km west of village of Presidente Kennedy, Fazenda Pirmavera, along Ribeirão Feinho, 03º25''S, 48º37W, 400–500 m, moss on deep tree trunk, along crek in gallery forest, 31 January 1980, *T. Plowman, G. Davidse, N.A. Rosa, C.S. Rosário & M.R. Santos 8155b* (NY); road from highway BR 153 to Itaporã 12 km west

of village of Presidente Kennedy, Fazenda Pirmavera, along Ribeirão Feinho, 3º25''S, 48º37W, 400–500 m, moss on living tree trunks in cerrado, 4 February 1980, *T. Plowman, G. Davidse, N.A. Rosa, C.S. Rosário & M.R. Santos 8386* (NY); **Pará**: Distrito Açará, Thomé Assu, Pau Vermelho, upper branches of tall tree in virgin forest, 2 August 1929, *Y. Mexia 6038-a* (BM, NY); Serra do Cachimbo, Base aérea do Cachimbo and vicinity, km 780–820 on Cuiabá-Santarém highway (BR 163), ca. 20 km N of border of Mato Grosso, ca. 9º22'S, 54º54'W, ca. 430–480 m, broad, wet, sandy plain with sandstone exposures, low ridges and valley to the N and S, at the air base, at edge or rock on sand, near Rio Braço Norte, at the air base, 25–30 April 1983, *W.D. Reese 16124* (NY); Serra do Cachimbo, floresta de 30 m, ao longo da BR 163, km 845, musgo sobre tronco podre, 18 February 1977, *E. Lleras & J.H. Kirkbride 1177* (MG); **Roraima**: Pico Rondon, Bald Spur vicinity, 3 February 1984, *G.J. Samuels, G.T. Prance, A. Cress & T. Nicholas 0115* (NY); 5 Km S of Rio Sumuru, 209 Km N of Boa Vista palm forest along small stream in campo, ca. 700 m, 02 December 1977, *W.R. Buck, L. Araujo, W.C. Steward, J.F. Ramos & J. Ribamar 2050* (MG).

2. ***Trichostomum brachydontium*** Bruch, *Flora* 12: 393, 1829 (Bruch 1829). Type:—GREECE and SARDINIA. Wächst häufig an einer feuchten Erdwand bei Spezzia und auf Hügeln unter Gebüsch bei Cagliari, März und April, 1827, *F. Müller s.n.* (JE, holotype). Fig. 14 (J–M)
Trichostomum duidense E. B. Bartram, *syn. fide* Zander (1993)

In the Atlantic Rainforest (Dense Ombrophylous Forest), *Caatinga*, and Amazon Forest, 200–1200 m. On cliff rocks, and soil. Brazil (BA, ES, PA, PE, PR, RO); widespread throughout the world—South-Central U.S.A., Mexico, Central America, West Indies, South America, Europe, China, Japan, Asia, Arabian Peninsula, Macaronesia, Africa, Western Indian Ocean, India Subcontinent, Indo-China, Malesia, Australia, and New Zealand (Allen 2002).

Specimens examined—BRAZIL. Plantarum Brasiliae Tropicae, Catalogus Geographicus, *Burchell 7737-2* (NY); **Bahia**: Queimados, 9–11 June 1915, *J.N. Rose & P.G. Russell 19861* (NY); vicinity of Machado Portobello, 19–23 June 1915, *J.N. Rose & P.G. Russell 19934, 19997* (NY); Paulo Afonso, BR 110, road from Paulo Afonso to jeremoabo, 39–46 km S of Paulo Afonso, caatinga roadside, 300–400 m, rocks and sandy, dry soil, partial shade, 6 June 1981, *B.M. Boom & S.A. Mori 1047* (NY); Paulo Afonso, BR 110, road from Paulo Afonso to jeremoabo, 39–46 km S of Paulo Afonso, caatinga roadside, ca. 300–400 m, terrestrial on moist, sandy soil, partial shade, 7 June 1981, *B.M. Boom & S.A. Mori 1059* (NY); Paulo Afonso, BR 110, road from Paulo Afonso to Jeremoabo, 39–46 km S of Paulo Afonso, caatinga roadside, ca. 300–400 m, dry sand, partial shade, 7 June 1981, *B.M. Boom & S.A. Mori 1056, 1057, 1061* (NY); Salgada, 1 June 1915, *J.N. Rose & P.G. Russell 19712* (NY); **Pará**: Serra do Cachimbo, Base aérea do Cachimbo and vicinity, km 780–820 on Cuiabá-Santarém highway (BR 163), ca. 20 km N of border of Mato Grosso, ca. 9º22'S, 54º54'W, ca. 430–480 m, broad, wet, sandy plain with sandstone exposures, low ridges and valley to the N and S, at the air base, at edge or rock on sand, near Rio Braço Norte, at the air base, 25–30 April 1983, *W.D. Reese 16124* (NY); Serra do Cachimbo, Base aérea do Cachimbo and vicinity, km 780–820 on Cuiabá-Santarém highway (BR 163), ca. 20 km N of border of Mato Grosso, ca. 9º22'S, 54º54'W, ca. 430–480 m, broad, wet, sandy plain with sandstone exposures, low ridges and valley to the N and S, sandstone and humus near bank of Rio Braço Norte, at the air base, 25–30 April 1983, *W.D. Reese 16131* (NY); Serra do Cachimbo, Base aérea do Cachimbo and vicinity, km 780–820 on Cuiabá-Santarém highway (BR 163), ca. 20 km N of border of Mato Grosso, ca. 9º22'S, 54º54'W, 430–480 m, broad, wet, sandy plain with sandstone exposures, low ridges and valley to the N and S, base of leaning tree in thicker along Rio Braço Norte, at the air base, 25–30 April 1983, *W.D. Reese 16114B* (NY); Serra do Cachimbo, Base aérea do Cachimbo and vicinity, km 780–820 on Cuiabá-Santarém highway (BR 163), ca. 20 km N of border of Mato Grosso, ca. 8º45'S, 54º57'W, el ca. 350–500 m, sandstone exposures at the cataracts, igneous material to the N, dry humus on island on lip of falls, 2–8 May 1983, *W.D. Reese 16614* (NY); Serra do Cachimbo, Base aérea do Cachimbo and vicinity, km 780–820 on Cuiabá-Santarém highway (BR 163), ca. 20 km N of border of Mato Grosso, ca. 8º245'S, 54º57'W, sandstone exposures at the catarcts, igneous material to the N, el ca. 350–500 m, dry humus on island on lip of falls, 2–8 May 1983, *W. D. Reese 16536* (NY); **Paraná**: Guaíra, Parque Nacional de Sete Quedas, sobre pedra úmida 7 March 1982, *O. Yano 3983 p.p.* (SP); Pinhão, Fazenda Guarani, em barrancos na beira do rio, 19 April 2008, *J. Cordeiro et al. 2491* (SP); **Pernambuco**: BR 104, km 6, ca. 60 km nördlich von Caruarú, auf Erde in einer offenen Weide in (zerstörter) Caatinga-Vegetation, 530 m, 13 July 1990, *A. Schäfer-Verwimp & Verwimp 12981* (RB); **Rondônia**: 128 km SW of

Ariquemes at Mibrasa Mining Camp, 5 km SE of camp office, along stream with coarse granitic outcrops and boulders and with some secondary vegetation, 18 May 1982, *K. McFarland, A.J. Fife, L.O.A. Teixeira, J.L. Santos, C.D.A. Mota & P.S. Gomes 206, 209* (NY); na estrada entre Pimenta Bueno e Rpoulim de Moura, a 5 km da localidade de Jaboti entre as linhas 204 e 208 do INCRA, propriedade do Sr. Wilson Rodrigues, cerrado, solo pedregoso, 7 December 1982, *P. Lisboa et al. 2961* (MG).

Plants small to medium-sized, with leaves broad, lingulate, mucronate, weak border with thin-walled cells, and laminal cells hyaline at their bases.

According to Allen (2002), usually *T. tenuirostre* differs from *T. brachydontium* in having longer, narrower leaves that are not abruptly contracted to a mucro.

3. *Trichostomum tenuirostre* (Hook. et Taylor) Lindb., *Öfvers. Förh. Kongl. Svenska Vetensk.-Akad.* 21: 225, 1864 (Lindberg 1864). Basionym:—*Weissia tenuirostre* Hook. et Taylor, *Muscol. Brit*., ed. 2, 83, 1827 (Taylor 1827). Type:—SCOTLAND and IRELAND. Moist rocks, in fructification at Campsie, near Glasgow, Scotland, about Powerscourt Waterfall, near Dublin (E 0007505, isolectotype). Fig. 14 (N–Q)

Trichostomum subcirrhatum Hampe, *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn* 3, 6: 133, 1874 (Hampe 1874). Type:—BRAZIL. Rio de Janeiro: Mar 1873, *Glaziou 6363* (BM 000872450!, holotype, BM!, PC 0109861!, PC 0709204!, isotypes), ***syn. fide*** Costa *et al.* (2015).

Trichostomum carassense Broth. in Paris, *Index Bryol*. 1320, 1898 (Paris 1898). Original material:—BRAZIL. Minas Gerais: Serra do Caraça, ad terram in silva, Mar 1892, *E. Ule 128* (BM 000872457!), ***nom. inval.*** (no description).

In the Amazon Forest, Atlantic Rainforest (Open Ombrophylous Forest), and Savanna, 0–1100 m. On soil, tree trunks, and branches. Brazil (AM, BA, DF, GO, MG, MT, PA, RJ, RO, RR, RS); widespread throughout the world—North and Central America, West Indies, South America, Europe, Siberia, Russia, Asia, China, Arabian Peninsula, Africa, Western Indian Ocean, India Subcontinent, Indo-China, Malesia, Malesia, and New Zealand (Allen 2002).

Specimens examined—BRAZIL. **Amazonas**: Rio Negro, road Camanaus-Uaupés, near Camanaus, caatinga on white sand, terra firme, terrestrial, 1 November 1971, *G.T. Prance, P.J.M. Maas, D.B. Woolcott, G.P. Monteiro & J.F. Ramos 15990* (NY); Rio Negro, s.d., *R. Spruce 165* (NY); **Bahia**: Jequié, on soil along river (Rio de Contas), 31 March 1976, *D.M. Vital 5928* (SP); **Distrito Federal**: on base of tree, cerrado and gallery, Rio Sobradinho, immediately West of Sobradinho, ca. 1100 m, 10 February 1971, *H.S. Irwin, R.M. Harley & G.L. Smith 33233* (NY); **Goiás**: Formoso, fazenda Murici, hosp. sobre galhos de um piquizeiro, próximo a lagoa do Murici, Cerrado, 31 August 1979, *D. M. Vital 8524* (NY); Serra Geral do Paraná, on soil, gallery Forest and adjacent cerrado near riacho, ca. 3 km S of São João da Aliança, ca. 850 m, 11 March 1971, *H. S. Irwin, R. M. Harley & G. L. Smith 31763* (NY); **Minas Gerais**: Serra do Caraça, ad terram silvaticum, March 1892, *E. Ule 128* (BM 000872457 as *T. carassense*); **Pará**: Macau airstrip, on Rio Maicaru, 0º55'S; 54º26'W, ca. 800 ft., bright green, 25 July 1981, *J.J. Strudwicj, & G.L. Sobel 3598* (NY); **Rio de Janeiro**: Rio de Janeiro, PARNA Tijuca, Corcovado, trilho do trem do Corcovado sentido alto do pico para a entrada da trilha do Parque Lage, início da descida, sobre paredão à esquerda da trilha, 22°57'60"S, 43°12'42"W, 12 Abril 2006, *D.P. Costa et al. 4508* (RB); *Glaziou 9227* (BM 000872448 as *Trichostomum subcirrhatum*); **Rio Grande do Sul**: Santana da Boa Vista, sobre rochas, 14 November 1987, *J. Brinker et al s.n.* (NY); **Rondônia**: 128 km SW of Ariqueaes at Mibrasa Camp, 5 km SE of camp office, along stream with coarse granitic outcrops and boulders and with some secondary vegetation, 18 May 1982, *K. McFarland, A.J. Fife, L.O.A. Teixeria, J.L. Santos, C.D.A. da Mota & P.S. Gomes 215* (NY); Serra dos Parecis, a 27 km de Alta Floresta, na linha 65 da topografia BASEVI, sobre tronco podre, Mata de Terra Firme, solo roxo, 1 December 1982, *P. Lisboa, N.A. Rosa & M.R. Santos 2652* (MG); **Roraima**: BR 174, Manaus-Venezuela highway, on tree trunk, 5 km S of Rio Surumu, 209 km N of Boa Vista, palm forest along small stream in campo, 700 m, 2 December 1977, *W. R. Buck, I. Araujo, W.C. Stewart, J. F. Ramos & J. Ribamar 2050* (NY).

Trichostomum tenuirostre has leaves often fragile, lanceolate, with apex obtuse, short mucronate, margins undulate above, stereids band above and below the guide cells (adaxial band equal to, or slightly smaller than, the abaxial one).

Trichostomum brachydontium can be distinguished from *T. tenuirostre* by having broader leaves abruptly contracted to a mucro (Allen 2002).

Trichostomum subcirrhatum is only known from the type collection from Rio de Janeiro State. The plant is very similar to *T. tenuirostre*, the only difference being that its leaves are not so fragile (Costa *et al.* 2015).

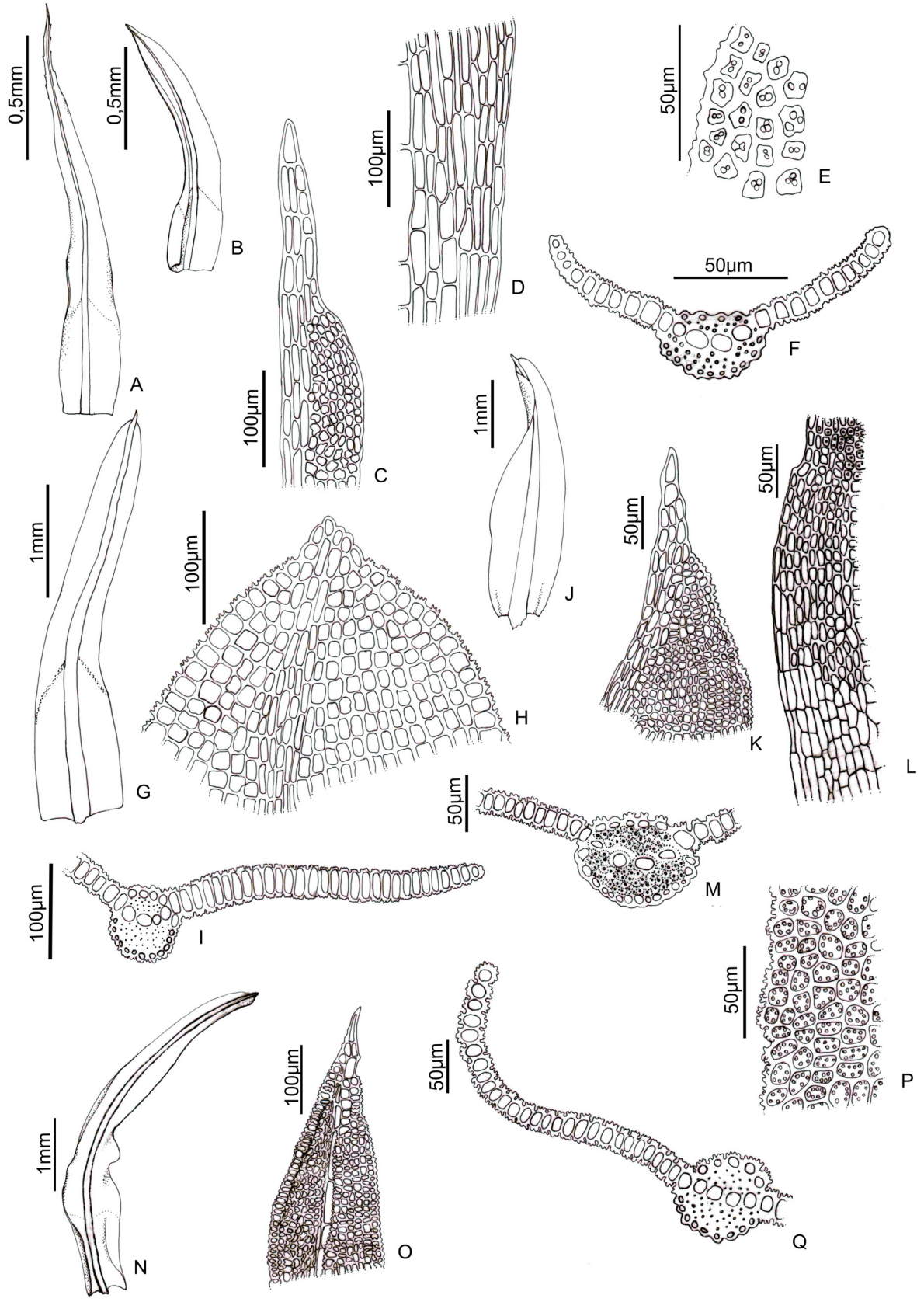

FIGURE 14. *Trachycarpidium lonchophyllum* (G. Roth) R.H. Zander. A–B. Leaves. C. Leaf apex. D. Basal cells. E. Laminal cells with papillae. F. Leaf section. *Trichostomum arboreum* (Mitt.) R.H. Zander. G. Leaf. H. Leaf apex. I. Leaf section. *Trichostomum brachydontium* Bruch. J. Leaf. K. Leaf apex. L. Basal cells. M. Leaf section. *Trichostomum tenuirostre* (Hook. & Taylor) Lindb. N. Leaf. O. Leaf apex. P. Marginal cells. Q. Leaf section.

Trichostomum carassense Broth. is an invalid name, without description. Brotherus (1924) cited this species as synonymous of *Trichostomum leptocylindricum*, however studing the original collection I realize that it belongs to *T. tenuirostre*.

4. *Trichostomum termitarum* (Müll. Hal.) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci*. 32: 92, 1993 (Zander 1993). Basionym:—*Weisia termitarum* Müll. Hal., *Hedwigia* 39: 267, 1900 (Müller 1900). Type:—BRASIL. Goiás: "auf termitenhügeln" prope Mossamedes, January 1893, *E. Ule 1065* (R!, holotype; JE, NY!, LE!, isotypes). Fig. 15 (A–D).

In Savanna, 80–650 m. On soils along streams or rivers. Endemic to Brazil (BA, GO, RS, SE).

Specimens examined—BRAZIL. **Bahia**: Paulo Afonso, 23 May 1978, *D.M. Vital 8170* (SP, as *Weissia controversa*); Riachão, 29 May 1978, *D.M. Vital 8254* (SP); Uauá, 21 May 1978, *D.M. Vital 8120* (SP); **Goiás**: Mossamedes, ad domicilia termitarum, January 1893, *E. Ule 208* (NY—Ex Bryotheca brasiliensis); **Rio Grande do Sul**: Pedro Osório, no solo úmido e barrancoso, no sopé de um morro, 31°43'S, 52°53'W, 15 July 1980, *D.M. Vital 9098, 9102* (SP); **Sergipe**: Cristianópolis, growing on the banks of the rio Real (left margin) at the place where the BR 101 crosses that river, 29 January 1974, *D.M. Vital 2862* (SP); Itabaiana, gowing in partial shade, on gullied ground, along a temporary river (rio Tobora), 29 January 1974, *D.M. Vital 2973* (SP).

Trichostomum termitarum has leaves with the base narrow, long, hyaline, reticular-rectangular, lamina entire, apex cuspidate, margin erect or only convolute above, costa wide, mucro short-excurrent, cells small-rounded, thick-walled, and reticulated.

5. *Trichostomum weisioides* Müll. Hal., *Bull. Herb. Boissier* 6: 92, 1898 (Müller 1898). Type:—BRASIL. Serra do Itatiaia, Mont Serrat, 1500 m, in solo sylvestre, March 1814, *E. Ule 1814* (R!, holotype; HBG, isotype). Fig. 15 (E–H).

In Savanna (Gallery Forest) and Atlantic Rainforest (Dense Ombrophylous Forest), 500–1500 m. On soils and tree trunks. Endemic to Brazil (DF, GO, MT, RJ).

Specimens examined—BRAZIL. **Distrito Federal**: Brasília, Bacia do Rio São Bartolomeu, musgo cor verde vivendo sobre cupinzeiro, a meia sombra de árvore, 21 January 1981, *E.P. Heringer et al. 6005* (RB); **Goiás**: Paraíso do Norte, growing 2 m up on a bent tree trunk, in a low and nearly sparse forest (cerradão), 17 November 1984, *D.M. Vital 3013* (SP).

The records of *Syntrichia fragilis* for Goiás and Mato Grosso by Egunyomi & Vital (1984) and Guarim Neto & Yano (1985) were based on misidentifications, and actually refer to *Trichostomum weisioides*, which is very similar to *T. arboreum* and can be distinguished only by its lingulate and short-mucronate leaves. These two taxa may be synonymous. It commonly grows as an epiphyte mixed with other bryophytes and can be easily overlooked.

Names with the types material not seen

Trichostomum leptocylindricum Müll. Hal., *Bull. Herb. Boissier* 6: 91, 1898 (Müller 1898). Type:—BRASIL. Minas Gerais: Caraça, Ouro Preto, Itabira do Campo, Apr 1892, *E. Ule 1058, 1430, 1428* (GOET, HBG, PC, W, syntypes). It is similar to *T. prionodon*, differing by having short peristome, usually rudimentary. They may be synonyms.

Trichostomum prionodon Müll. Hal., *Bull. Herb. Boissier* 6: 91, 1898 (Müller 1898). Type:—BRASIL. Serra do Itatiaia, ad saxa rupestria in Capão, 2000 m, Mar 1894, *E. Ule 1812* (HBG, isotype). It is similar to *T. leptocylindricum* Müll Hal. and they may be synonyms.

Trichostomum urceolare (Hampe) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci*. 32: 92, 1993 (Zander 1993). Basionym:—*Hyophila urceolaris* Hampe, *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn,* ser. 3, 2: 269–270, 1870 (Hampe 1870). Type:—BRASIL. Minas Gerais: Lagoa Santa, in silvis ad terram, Jan 1841, *Warming s.n.* (BM, holotype).

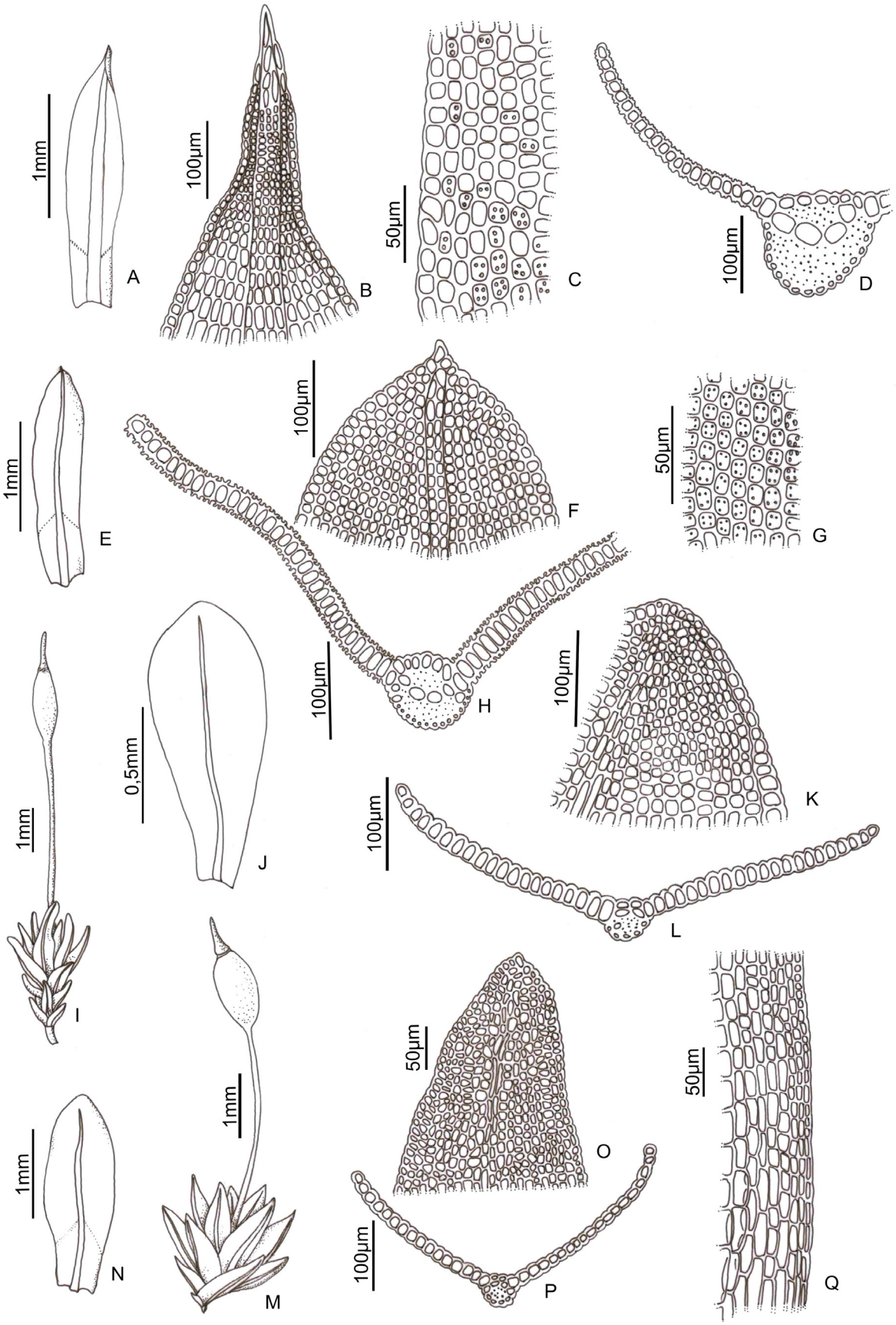

FIGURE 15. *Trichostomum termitarum* (Müll. Hal.) R.H. Zander. A. Leaf. B. Leaf apex. C. Marginal cells. D. Leaf section. *Trichostomum weisioides* Müll. Hal. E. Leaf. F. Leaf apex. G. Laminal cells with papillae. H. Leaf section. *Weisiopsis bahiensis* (Müll. Hal.) Broth. I. Habit. J. Leaf. K. Leaf apex. L. Leaf section. *Weisiopsis nigeriana* (Eguniomi & Olar.) R.H. Zander. M. Habit. N. Leaf. O. Leaf apex. P. Leaf section. Q. Marginal cells.

Excluded species

Trichostomum caespitosum (Bruch. ex Brid.) Jur., *Verh. Naturhist. Vereines Preuss. Rheinl. Westphalens* 22: 292, 1865 (Juratzaka 1865). **= Pottiopsis caespitosa** (Bruch) Blockeel et A.J.E. Sm. Cited by Brotherus (1924) for Brazil without locality. It is an European species.

Weisiopsis Broth.

According to Zander (1993), this is a small genus from southern and eastern Asia, Mexico, Central America, Brazil, Central and Southern Africa, and Madagascar. Two species occur in Brazil, both restricted to savanna.

1. Leaf tubulose (when dry), ligulate to spathulate, margins plane to slightly incurved, laminal cells mammillose-bulging on ventral surface, plane on the dorsal surface, capsule without bulging exothecial cells, peristome simple or absent ..... ***W. bahiensis***

1'. Leaf not or weakly tubulose (when dry), ligulate-rounded, margins plane, slightly crenulate, laminal cells mammillose-bulging on the ventral surface and dorsal surface, capsule with bulging exothecial cells, peristome absent .... ***W. nigeriana***

1. ***Weisiopsis bahiensis*** (Müll. Hal.) Broth., *Nat. Pflanzenfam*. 10: 271, 1924 (Brotherus 1924). Basionym:—*Pottia bahiensis* Müll. Hal., *Bot. Zeit*. 13: 764, 1855 (Müller 1855). Type:—America Austral, Brasilia (B ?, holotype). Fig. 15 (I–L)

In Savanna, ca. 300 m. On bank soils. Endemic to Brazil (PI).

Specimens examined—BRAZIL. **Piauí**: Elizeu Martins, 8º21'S, 43º47'W, in partial shade on banks on slope of a hill, 26 May 1978, *D.M. Vital 8215-A* (NY); Elizeu Martins, 8º21'S, 43º47'W, in partial shade on banks on slope of a hill, 26 May 1978, *D.M. Vital 8217* (SP).

Gradstein *et al.* (2001) considered this species as valid, although Crosby *et al.* (1999) ranked it as a species for which no new information could be found in the post-1962 literature. Yano (1981) cited *W. bahiensis* from Oeiras, Goiás State, although Oeiras is actually located in Piauí State. It is characterized by small plants, with tubulose, ligulate to spathulate leaves, margins plane to slightly incurved, guide cells flattened, and peristome single or absent.

2. ***Weisiopsis nigeriana*** (Egunyomi & Olar.) R.H. Zander, *Bull. Buffalo. Soc. Nat. Sci*. 32: 190, 1993 (Zander 1993). Basionym:—*Gyroweisia nigeriana* Egunyomi & Olar., *Bryologist* 81: 443, 1978 (Egunyomi et Olar 1978). Type:—NIGERIA. Cross River, Obudu cattle ranch, on rock surface, September 1975, *A. Egunyomi 379* (UIH, holotype; Herb. M. Bizot, isotype). Fig. 15 (M–Q)

In Savanna, 0–200 m. On rocks and soil. Brazil (PI, TO); Central America and South and East Tropical Africa (Allen 2002).

Specimens examined—BRAZIL. **Tocantins**: Miranorte, growing from base to 3 m up on tree trunks, in a humid but not particularly dense forest, 16 February 1974, *D.M. Vital 3003* (SP as *Weissia controversa*).

This taxon was cited for the first time for Brazil by Castro *et al.* (2002) from Piauí State. The plants from Tocantins (SP) differ from *W. nigeriana* only by having leaves that are lingulate with the costa subpercurrent. In Brazil, *W. nigeriana* may be confused with *Hyophila involuta*, *Luisierella barbula*, or *Plaubelia sprengelii*, which are similar on terms of the shape of their leaves, but differing in the laminal cells mamillose-bulging on the ventral surface, but plane and smooth on the dorsal surface.

Weissia Hedw.

According to Zander (1993), this is a large genus found on all continents except Antartica. The genus is characterized by stem with hyalodermis and central strand, leaf margins strongly involute, laminal cells pluripapillose, and two stereid bands in the costa. Three species occurr in Brazil, in open and disturbed sites.

This key is based on Allen (2002).

1. Leaf cells bulging-mammillose on the ventral surface, smooth on the dorsal surface. Monoicous. Peristome lacking ..... ***W. breutelii***

1'. Leaf cells pluripapillose on both surfaces (dorsal and ventral). Monoicous or Dioicous. Peristome present 2
2. Leaf long, linear-lanceolate (2.5–4.0 mm long), fragile and broken, costa stoutly excurrent, apex narrowly acute, apiculate. Dioicous. Peristome teeth long-ligulate, 3–10 teeth joined at base as a low membrane hidden by the annulus ..... ***W. jamaicensis***
2'. Leaf linear-lanceolate to lanceolate (1.3–2.3 mm long), not fragile, costa long-excurrent, apex acuminate, mucronate. Monoicous. Peristome teeth none, few and rudimentary or 16 oblong to triangular ..... ***W. controversa***

1. *Weissia breutelii* Müll. Hal., *Syn. Musc. Frond*. 1: 664, 1849 (Müller 1849). Type:—INSULA ANTILLARUM. St. Tomas: 1841, *J.C. Breutel s.n.* (MO!, NY!, isotypes). Fig. 16 (A–D)

Weissia canaliculata Hampe, *syn. fide* Costa (2014b).
Weissia glazioui R.H. Zander, *syn. fide* Costa (2014b).
Hymenostomum fasciculatum Hampe, *syn. fide* Costa *et al.* (2015)

In the Atlantic Rainforest (Semi-deciduous Forest and Dense Ombrophylous Forest) and Savanna, 0–900 m. On soils or rocks. Brazil (BA, ES, MA, RJ, RS, SC, SP); Central America, West Indies, and Brazil (Allen 2002).

Specimens examined—BRAZIL. **Bahia**: Nationalpark Chapada da Diamantina, felsiger Hang an der Strabe, auf Gestein in sickerfeuchter Rinne, 800 m, 11 July 1987, *A. Schäfer-Verwimp & Verwimp 8711* (RB); Mundo Novo, on soil, on base of the banks, 3 April 1976, *D.M. Vital 6009* (SP); **Espírito Santo**: Castelo, Serra do Forno Grande, na offenem Erdrain, 22º33'S, 41º09'W, 380 m, 12 October 1988, *A. Schäfer-Verwimp & Verwimp 10260* (RB); Itapemirim, unter hohem Gras am Rande eines Sekundärwaldes im Vale Verde do Itapemirim na der ES 490 ca. 3 km ver der Einmündung in die BR 101, 100 m, 20º56'S, 41º03'W, 380 m, 25 July 1989, *A. Schäfer-Verwimp & Verwimp 11595* (SP); **Maranhão**: Fortaleza dos Nogueiras, cachoeira Antônio Nogueira, parede da cachoeira, 4 July 2008, *E.S. Brito & G.M. Conceição 410* (SP); **Rio de Janeiro**: *A. Glaziou 7300* (NY isotype of *Weissia canaliculata*); *A. Glaziou 9257* (BM), *9264* (BM, G); Angra dos Reis, Ilha Grande, pedra, sombra, úmido, 13 July 1994, *M.I.M.N. Oliveira-e-Silva 1984* (SP); **São Paulo**: Apiaí, *Puiggari s.n.* (BM as *Hymenostomum striatum*); Marília, sítio próximo aos Canions, 22º12'S, 49º56'W, 19 November 2005, *D.F. Peralta & M.W.S. Lucas 3254* (SP); Matão, Projeto fauna e flora de fragmentos florestais remanescentes no noroeste paulista, Biota Noroeste, Floresta Estacional Semidecidual e Mata Ciliar, 20º05'26"S, 48º03'16"W, barranco, 12 December 2007, *D.P. Peralta & J. Prado 6064* (SP as *Tuerckheimia guatemalensis*).

Weissia breutelii differs from *W. controversa* Hedw. and *W. jamaicensis* (Mitt.) Grolle by having bulging-mammilose leaf cells on the ventral surface but smooth on the dorsal surface. This was also observed by Allen (2002) among Central America plants. The Brazilian collections of *W. glazioui* from the states of Rio de Janeiro, Rio Grande do Sul, and São Paulo are all very old (Hampe, Luisier, Puiggari, and Loefgren). According to Hampe (1879), *W. glazioui* is very similar to *Weissia canaliculata*. The collection of *W. canaliculata* housed at the NY herbarium has a label with the following observation by Zander: "near *Weissia breutelii* and I here are reducing to synonyms of it" (sic), and the synonym was published by Costa (2014b).

According to Hampe (1879), *Hymenostomum striatum* is very similar to *W. canaliculata* by the capsule being gymnostomous (without a peristome) and angled-striate. Zander (1993) replaced *Hymenostomum striatum* with *W. glazioui*. *Weissia glazioui* is only known from the type collection, being endemic to southeastern Brazil. The original material exhibits identical characteristics of the plants, leaves, and cells as *W. breutelii* and is considered conspecific with it. Costa *et al.* (2015) agreed with those authors and synonymized it with *W. breutelii*, because it is only known from the type collections from the Atlantic rainforest of Rio de Janeiro State, and it has the same form, size, and leaf shape of *Weissia breutelli*.

2. *Weissia controversa* Hedw., *Sp. Musc. Frond*. 67, 1801 (Hedwig 1801). Type:—Lipsiae ad rivulum post collem Bienitz. Humo theca loca, nec non sabulosa, uda, praeprimis regionum montosarum amat (G, holotype lost while on loan). Fig. 16 (E–J)

Weissia pabstiana Müll. Hal., *Bot. Zeitung. Berlin* 15: 382, 1857. Type:—BRASILIAE. Insula Santa Catharina: locis umbrosis solo limoso ad vias cavas prope Desterro, *Pabst s.n.* (isotype NY!), *syn. fide* Costa (2014b).

Weissia submicacea Müll. Hal., *Hedwigia* 39: 267, 1900 (Müller 1900). Type:—BRAZIL. Santa Catarina: prope Tubarão, Aug 1889, *E. Ule 719*; Aug 1891, *E. Ule 1015* (NY!, syntypes), ***syn. nov.***

Trichostomum exulatum R.H. Zander, *Bull. Buffalo Soc. Nat. Sci*. 32: 92, 1993 (Zander 1993). (*Phascum vernicosum* Müll Hal. ex Roth, *Aussereuer. Laubm*. 212, 1911 (Müller 1911). *Tetrapterum vernicosum* (Müll. Hal. ex G. Roth) Broth., *Nat. Pflanzenfam*. 10: 233, 1924 (Brotherus 1924). Type:—BRAZIL. Santa Catarina: Tubarão, Aug 1889, *E. Ule 8* (NY! [2], holotype, LE! [2] as *T. exulatum* var. *minus*, isotypes), ***syn. nov.***

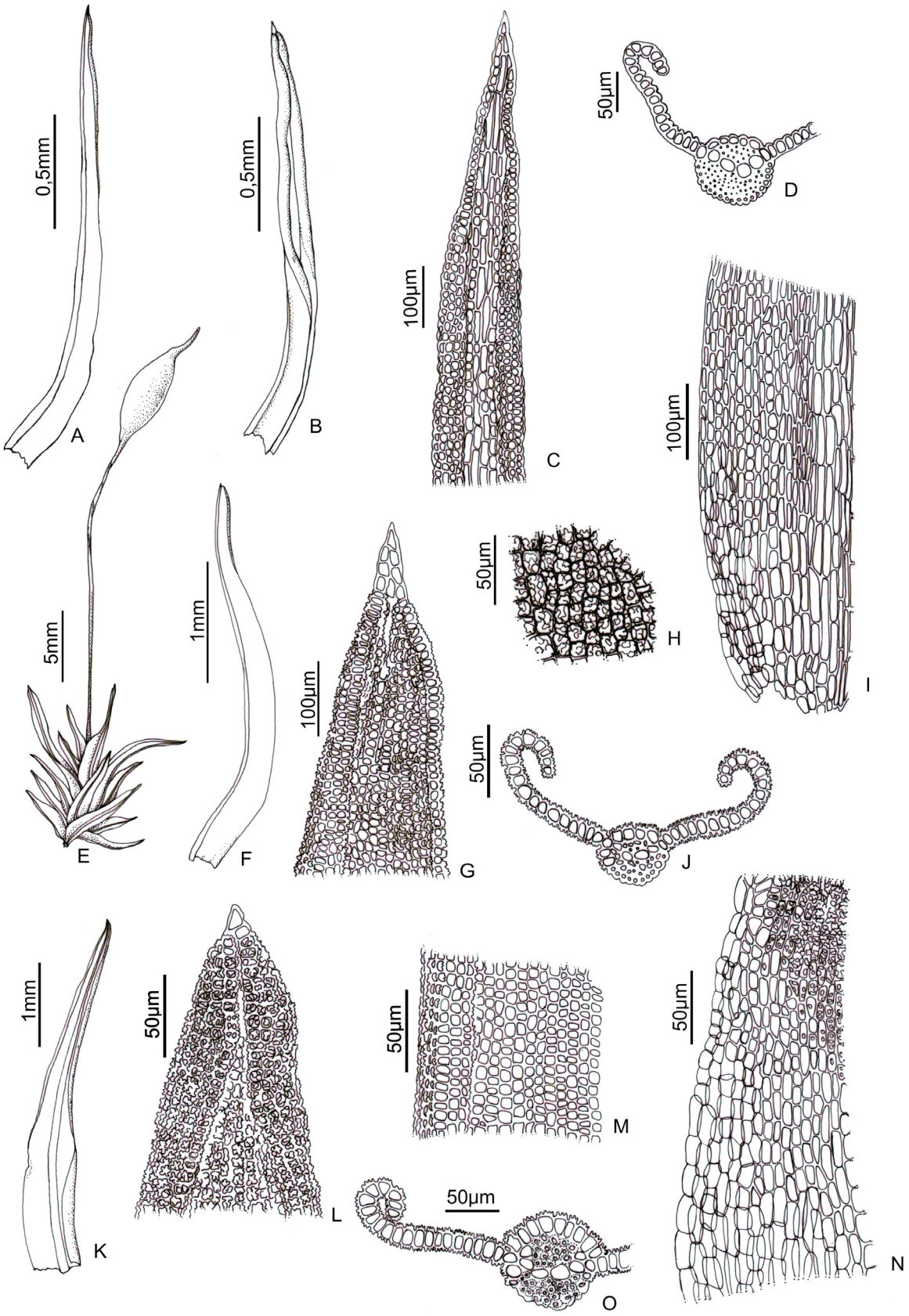

FIGURE 16. *Weissia breutelii* Müll. Hal. A–B. Leaves. C Leaf apex. D. Leaf section. *Weissia controversa* Hedw. E. Habit. F. Leaf. G. Leaf apex. H. Laminal cells with papillae. I. Basal cells. J. Leaf section. *Weissia jamaicensis* (Mitt.) Grout. K. Leaf. L. Leaf apex. M. Marginal cells. N. Basal cells. O. Leaf section.

In Savanna, Atlantic Rainforest (Mixed Ombrophylous Forest and Dense Ombrophylous Forest), and Steppe, 0–900 m. On soils, rocks, and tree trunks. Brazil (BA, ES, GO, MG, PR, RJ, RS, SC, TO); widespread throughout the world—America, West Indies, South America, Europe, Siberia, Russia, Asia, China, Mongolia, Arabian Peninsula, Macaronesia, Africa, Western Indian Ocean, India Subcontinent, Indo-China, Malesia, Malesia, Australia, and New Zealand (Allen 2002).

Specimens examined—BRAZIL. **Bahia**: Santa Teresinha, Serra da Jibóia, revestindo caixa de cimento beira da estrada, 8 May 1999, *E. Melo et al. 2690* (SP); **Goiás**: Parauna, on base of a tree trunk, 20 May 1976, *D.M. Vital 6330* (SP); **Paraná**: NP Foz do Iguaçu, im Regewald oberhalb der Fälle, na Erdarin, 25º38'S, 54º27'W, 160 m, 3 February 1988, *A. Schäfer-Verwimp & Verwimp 9320* (RB); Curitiba, 2200 m, *J. Weir 42* (BM 000710076, NY); **Rio Grande do Sul**: Navegantes, ebene Campos wiesen gernauf, 5 September 1898, *E.M. Reineck & J. Czermak 57* (BM as *Weissia pabstiana*); Porto Alegre, in feuchten bergschluchlen von Belém Velho auf erde, 31 October 1897, *E.M. Reineck & J. Czermak 60* (BM as *Weissia pabstiana*); in waldern unter der Praça Julho de Castilho, 27 July 1897, *E.M. Reineck & J. Czermak 97* (BM [2] 000710071 as *Weissia pabstiana*); **Rio de Janeiro**, *Glaziou 5612* (NY); Tijuca, June 1880, *Roosmallen 287* (BM 000710075); **Santa Catarina**: Tubarão, em roça de milho, July 1889, *E. Ule 7* (MG, NY—Ex Bryotheca Brasiliensis); Tubarão, July 1889, *E. Ule 32* (BM [3], original material of *Weissia capilliseta*, NY, R—Ex Bryotheca Brasiliensis); Tubarão, September 1889, *E. Ule 31* (BM, LE as *Weissia pabstiana*, MG—Ex Bryotheca Brasiliensis, R); Serra Geral, ad terram, August 1891, *E. Ule 127* (LE, NY—Ex Bryotheca brasiliensis); **Tocantins**: Miranorte, na base do tronco vivo, 16 February 1974, *D.M. Vital 3003* (SP).

According to Price (2005), the type material of *W. controversa* was lost while on loan. For Anderson & Lemmon (1972), the species occurs throughout North America, often in disturbed areas. Tolerant of full shade to full sunlight, it favors bare soils and rocks, road banks, pastures, lawns, and waste places that are sparsely vegetated disturbed sites, but is also found on bare patches of soil in wooded areas. This species is not tolerant of high moisture, preferring xeric or mesic habitats.

A widespread species in Brazil, being found in disturbed areas (recent collections) and forested areas (old collections); the occurrence of this taxon in other regions and states is expected.

Weissia controversa presenting short to long-lanceolate leaves, base ovate, shoulders weak or absent, apex plane to channeled, acute, margins incurved or inrolled when dry. Capsule stegocarpic, ovate to cylindrical. In *Weissia submicacea* the leaves are larger with margin less involute, but these characteristics are included in the variation found in *W. controversa*. The syntypes of *Weissia submicacea* housed at the NY herbarium were collected by *E. Ule* on the same dates and vicinity of the type of *Trichostomum exulatum* (August 1891). *Trichostomum exulatum* is only known from the type collection (endemic southern Brazil) presenting all the characteristics include in the variation observed in *Weissia controversa* (leaves lanceolate, base elliptical, margin plane to slightly incurved, capsule ovate to cylindrical).

3. *Weissia jamaicensis* (Mitt.) Grout., *Moss Fl. N. Amer*. 1: 157, 1938 (Grout 1938). Basionym:—*Tortula jamaicensis* Mitt., *J. Linn. Soc. Bot*. 12: 147, 1869 (Mitten 1869). Type:—JAMAICA. Inter Marchantias, *Wilds s.n.* (NY!, holotype). Fig. 16 (K–O)

In Savanna (Gallery Forest) and Atlantic Rainforest (Dense Ombrophylous Forest, Semi-deciduous Forest and Mixed Ombrophylous Forest), 100–800 m. On roadside rocks and river banks. Brazil (ES, GO, MG, PR, RJ, SP); North, Central, and South America (Allen 2002).

Specimens examined—BRAZIL. *Burchell 7258* (NY); **Espírito Santo**: Itaperuna, along BR 393, ca. 23 km SW of Bom Jesus do Itabapoana, ca. 21º28'S, 42º00'W, on roadside rocks, 14 September 1984, *D.M. Vital & W.R. Buck 11487* (NY); **Goiás**: Formoso, 13º37'S, 48º48'W, em um barranco úmido junto a nascente Água Quente, 25 December 1984, *D.M. Vital 12658* (SP); **Rio de Janeiro**: Rio de Janeiro, PARNA-Tijuca, Corcovado, 22º57'60", 43º12'42"W, trilha do trem do Corcovado sentido alto do pico para a entrada da trilha do Parque Lage, início da descida, paredão à margem esquerda da trilha, 645 m, 12 April 2006, *D.P. Costa et al. 4507, 4511*, *4512* (RB); **São Paulo**: Serra de Paranapiacaba, Adrianópolis, Felshang am Rio Ribeira, auf schattiger Erde, 220 m, 2 May 1987, *A. Schäfer-Verwimp & Verwimp 8441* (RB, SP).

Weissia jamaicensis has long, linear-lanceolate, fragile, often broken leaves, and the upper laminal cells densely papillose. *Weissia controversa* has similar leaves, differing by its smaller size and autoicous sexual condition.

Names with type material not seen

Weissia micacea (Schlcht.) Müll. Hal., *Syn. Musc. Frond.* 1: 662, 1849 (Müller 1849). Basionym:—*Gymnostomum micaceum* Schltdl., *Linnaea* 10: 443, 1836 (Schlechtendal 1836). Type:— BRASILIANE. Rio de Janeiro: crescit gregarium in solo sterili micaceo, ubi detexit clar. Beseke (?). According to Zander (1993), this species occurs in Am3 (West Indies) and Am5 (Brazil). Müller (1900) considered *Weissia submicacea* to be very similar to *Weissia micacea*, differing only by its leaves being larger, margin less involute, and less globose-elliptic capsule. These two taxa are probably synonyms.

Weissia obtusata Müll. Hal., *Hedwigia* 39: 268, 1900 (Müller 1900). Type:—BRASILIA. Goyaz: in declivibus sylvestribus, Jan 1893, *E. Ule 1548* (BM?, holotype). No material collected by E. Ule in Goiás State was encountered in any of the herbaria consulted.

Weissia obtusifolia Müll. Hal., *Bot. Zeitung (Berlin)* 3: 91, 1845 (Müller 1845).—Cited by Mitten (1869) for Ceará State, was considered as insufficiently known by Crosby *et al.* (1999).

Weissia riograndensis (Broth.) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci.* 32: 184, 1993 (Zander 1993). Basionym:—*Hymenostomum riograndese* Broth., *Bih. Kongl. Svensk.-Akad. Handl.* 3: 19, 1900 (Brotherus 1900). Type:—BRASIL. Rio Grande do Sul: Porto Alegre, ad terram fossarum (Brotherus n° 129).

Species that I could not confirm its presence in Brazil

These following species have been cited by different authors and I could not study the specimens on which are based the records and then I could not confirme their presence in Brazil.

Aschisma carnicolium (F. Weber & D. Mohr.) Lindb., *Utkast Eur. Bladmoss*. 28, 1878 (Lindberg 1878).—Cited from Brazil for Bahia and Pernambuco by Yano (2011). According to Zander (1993), this is an European species.

Aschisma occultum Roth., *Aussereur. Laubm*. 172, 18: 1. 1911 (Roth 1911).—Cited for Santa Catarina, Tubarão (Müller 1901; Roth 1911). **= Uleobryum occultum** Müll. Hal. ex G. Roth) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci.* 32: 218, 1993 (Zander 1993). According to Zander & During (1999), this species occurs in Brazil and Australia, cited as *U. curtissi* I.G. Stone, a synonym of *U. occultum*. No material collected by E. Ule in Santa Catarina State was encountered in any of the herbaria consulted.

Bryoerythrophyllum inaequalifolium (Taylor) R.H. Zander, *Bryologist* 83: 232, 1980 (Zander 1980).—Cited from Brazil for Piauí (Elizeu Martins) and São Paulo (Mogi das Cruzes, Serra do Itapeti) by Yano (2011). According to Allen (2002), this species occurs in Southeastern U.S.A., Mexico, Central America, Western and South America, China, Macaronesia, Northeast Tropical Africa, Indian Subcontinent, and Malesia. The samples from SP hebarium that I studied from this two sites belong to other species, *Weisiopsis bahiensis* (sampled by *D.M. Vital 8215-A, 8217*) and *Streptopogon cavifolius* (sampled by *Peralta et al. 3664*).

Hyophila minutissima (Mitt.) A. Jaeger, *Ber. THätigk. St. Gallischen Naturwiss*. 1871–1872: 358, 1873 (Jaeger 1873).—Cited for Brazil for Goiás by Schäfer-Verwimp (1992). **= Tisserantiella minutissima** (Mitt.) R. H. Zander (Rhachitheciaceae).

Mironia stenotheca (Thér) R.H. Zander, *Bull. Buffalo Soc. Nat. Sci.* 32: 112, 1993 (Zander 1993).—Cited from Brazil for Paraná and Rio Grande do Sul states (Yano 2006). According to Allen (2002) and Zander (1993) this taxa occurs in Mexico and Central America, and possibly these two collections belong to another species, because there are three Central American species similar to *M. stenotheca* in having fully recurved or revolute leaf margins, as *Pseudocrossidium replicatum*.

Phascum carinatum Hampe, *Vidensk. Meddel Dansk Naturhist. Foren. Kjoebenhavn* 4, 1: 76, 1879 (Hampe 1879).—Cited from Brazil, Rio de Janeiro by Hampe (1879). **= Bruchia carinata** Hampe (Bruchiaceae).

Pottia ligularifolia Müll. Hal., *Hedwigia* 34: 123, 1895 (Müller 1895).—Cited for Goiás and Minas Gerais states (Brotherus 1895a; Warnstorf 1917). Type:—BRASIL. Minas Geraes: in regione fluminis Paranahyba, in terra, Mar 1893, *E. Ule 1502* (HBG, lectotype). **= Zanderia octoblepharis** (A. Jaeger) Goffinet (Rhachitheciaceae).

Sebillea brasiliensis Bizot, *Rev. Bryol. Lichénol*. 40: 120, 1974 (Bizot 1974).—Cited by Bizot (1974) for Brazil, Minas Gerais State, Uberaba. It was considered insufficiently known by Crosby *et al.* (1999). According to Zander (1993), neither the genus and species names were validly published (the description not cited the type), and although the Bizot herbarium is now at PC herbarium, the type is not in PC, and may have been lost. The author also commented that the illustration of this taxon is probably from a Dicranaceae.

Tetrapterum lamprothecium (Müll. Hal.) Broth., *Nat. Pflanzenfam*. 10: 253, 1924 (Brotherus 1924).—Cited by Angely (1961) and Sehnem (1955) for Brazil, Paraná and Rio Grande do Sul states. According to Zander (1993), this taxon occurs only in Am6 (Chile and Argentina), and was considered insufficiently known by Crosby *et al.* (1999). Until the present moment, I could not confirm the presence of this species in Brazil because I did not studied these collections.

Names with type material not seen
Astomum latifolium Broth., *Aussereur. Laubm*. 190: 17, 1910 (Brotherus 1910).—Cited for Rio Grande do Sul state by Bauer (1905) and Roth (1911). **= Tortella fruchartii** (Müll. Hal.) R.H. Zander. According to Zander (1993), this species occurs in Am5 (Brazil) and Am6 (Chile, Argentina, Paraguay, and Uruguay).

Astomum mollifolium (Müll. Hal.) Broth., *Nat. Pflanzenfam*. 1: 394, 1901 (Brotherus 1901).—Cited for Goiás by Brotherus (1895a) and Roth (1911). According to Zander (1993), this species occurs in Am5 (Brazil).

Oxystegus lignicola (Herzog) Hilp., *Beih. Bot. Centralbl., Abt*. 2, 50: 667, 1933 (Hilpert 1933).—Cited by Herzog (1924) for Brazil, Minas Gerais State. **= Trichostomum lignicola** Herzog. According to Zander (1993), this species occurs in Am5 (Brazil).

Pottia thraustophylla (Ångstr.) Paris, *Index Bryol*. 1029, 1898 (Paris 1898).—Cited by Ångström (1876) for Brazil, Minas Gerais State. According to Zander (1993), this species occurs in Am5 (Brazil).

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