

Diversity and conservation of Pottiaceae (Pottiales) in the Atlantic Rainforest

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ABSTRACT

The taxonomy, diversity and conservation status of all species of the family Pottiaceae in the Atlantic Rainforest of Rio de Janeiro State in southeastern Brazil are presented. The Atlantic Rainforest is a globally recognized biodiversity hotspot. The treatments are based on field expeditions and studies of herbarium collections. Twenty eight species from 18 genera are discussed. A key to the genera and species is provided, with comments on their distributions and altitudinal ranges, with illustrations and evaluation of the conservation status.

Keywords: Brazil, conservation status, phylogeography, Pottiaceae, taxonomy

Introduction

The family Pottiaceae (belonging to the order Pottiales) was created by Schimper (1855) and, comprises 77 genera and 1457 species (Zander 1993; extrapolated from Crosby *et al.* 1999). The family is diverse in tropical America, especially in humid regions, and includes 55 genera and 361 species (about 250 valid species, extrapolated from Gradstein *et al.* 2001). Thirty-three genera and 64 species are recognized in Brazil (Costa *et al.* 2011; Costa 2014a). Zander (1993) considered South America to be one of the centers of morphological diversity to Pottiaceae.

According to Zander (1996), Pottiaceae is the largest moss family in terms of the number of genera (77); 22 are considered critical, as they are rare and contain only one to three species. Three of these genera occur in Brazil (*Erythrophyllopsis*, *Ganguleea*, and *Hymenostyliella*), with only one species each, being found in sub-mountainous areas, on riverbank rocks, and on the vertical faces of granitic rocks along riversides.

Pottiaceae is among the 12 largest moss families in Brazil according to Costa *et al.* (2011) and Costa (2014a), with 33 genera and 64 species, although several genera (e.g., *Barbula*, *Didymodon*, *Syntrichia*, *Trichostomum*, *Tortula*, and *Weissia*), will require thorough regional revisions that should result in reductions in the number of recognized species. These taxa are found in open and often rather dry habitats, with their greatest diversity occurring in the montane regions.

Historical Background

Publications focusing on Brazilian mosses are very extensive, comprising almost 400 titles. The earliest paper, by Christian Friedrich Hornschuch, can be found in the *Flora Brasiliensis* (Vol. 1, part 2, 1840) describing 194 species collected in the states of Rio de Janeiro and Minas Gerais. Numerous new species for Brazil were described at the end of the 19th century/beginning of the 20th century by Müller (1898; 1900; 1901) based on the collections of Glaziou (Rio de Janeiro), Puiggari (São Paulo: Apiahy), Lindman (Rio Grande do Sul), Dusén (Serra do Itatiaia), Ule (southern Brazil and Amazonia). More recent contributions are cited in the Brazilian checklist published by Costa *et al.* (2011).

Although there have been many studies mentioning species of Pottiaceae in Brazil, the overwhelming majority are floristic inventories or new records for different states, and there has been only a single taxonomic treatment for the genus *Streptopogon* (Costa 2012) and new synonyms (Costa 2014b). Various authors list a total of ca. 15 genera and ca. 45 species of Pottiaceae in Rio de Janeiro State, although Costa *et al.* (2011) and Costa (2014a) recently reduced the total number of taxa previously recognized there by approximately 60%. Rio de Janeiro State now includes 28 recognized species; three taxa have been excluded as they are considered poorly known (with no material available to study or supporting records). There is no general key available for the genera and species of Pottiaceae known to Rio de Janeiro State or Brazil.

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The present study sought to provide a synopsis of the family Pottiaceae in the Atlantic Rainforest of Rio de Janeiro State, and considers 44% of the total species number recognized for the family in Brazil (18 genera and 28 species) and includes a key to the genera and species, one lectotypification, illustrations, as well as notes on their taxonomy, distributions, and habitats. Also provided is information on the conservation status of each species, outlining the major threats in the state, documenting their diversity, and drawing attention to the conservation of these threatened ecosystems.

Material and methods

Materials from the following herbaria were examined: BM, FH, G, H, HBR, JE, MO, PC, R, RB, SP, and S. Samples gathered during field trips carried out since 1989 are housed at the RB herbarium. I also included are data from the following texts: Plants of the Atlantic Rainforest (Costa *et al.* 2009) and List of Species of Flora of Brazil (Costa 2014a).

The geographic distributions, the altitudinal ranges and the conservation statuses of the taxa are based on Costa *et al.* (2011) and Costa (2014a) and complemented with herbaria data. Brazil is divided into five regions (and 28 states) and arranged in five phytogeographic domains: Amazon, Cerrado, Atlantic Forest, Caatinga and Campos Sulinos (Fiaschi & Pirani 2009). The Brazilian states are ordered here according to their north-south and east-west locations, with their abbreviations: RR = Roraima, AP = Amapá, PA = Pará, AM = Amazonas, AC = Acre, RO = Rondônia, CE = Ceará, PB = Paraíba, PE = Pernambuco, AL = Alagoas, SE = Sergipe, BA = Bahia, GO = Goiás, MT = Mato Grosso, MS = Mato Grosso do Sul, MG = Minas Gerais, ES = Espírito Santo, RJ = Rio de Janeiro, SP = São Paulo, PR = Paraná, SC = Santa Catarina, RS = Rio Grande do Sul.

Conservation status is abbreviated as follows: LC = Least concern, DD = Data Deficient, VU = vulnerable. The analyses of their conservation statuses are based on the IUCN Action Plan for bryophytes (Hallingbäck *et al.* 1996; Hallingbäck & Hodgetts 2000), including: (1) distributions, (2) the numbers of localities in which they occur, and (3) habitat losses in recent years – three of the five criteria cited in the Guidelines for Application of IUCN Red List Criteria at Regional Levels (Hallingbäck *et al.* 1998).

Results and discussion

The bryoflora of Rio de Janeiro State is reasonably well-known in comparison with other Brazilian states (Costa *et al.* 2005a; 2011). Eighteen genera and 28 species of Pottiaceae are recognized in the Atlantic Rainforest of Rio de Janeiro State in this study, representing 5% of the total number of moss taxa recorded for that state, 44% of the Pottiaceae taxa recorded for Brazil, and 8% of the taxa known for tropical America (Costa 2014a, Gradstein *et al.* 2001). These percentages demonstrate the importance of the diversity of this family in the Atlantic Rainforest of southeastern Brazil and confirm Zander's (1977) inclusion of the family among the main moss families found in floristic inventories in the Neotropics.

Taxonomy

Pottiaceae Schimp.—Plants small to robust, turfs short, dense to loose, dark green to brown or black. Stems erect, simple to branched, radiculose, in cross-section hyalodermis present or absent, outer cells differentiated or not, central strand present. Leaves crowded, ovate, narrowly lanceolate or lingulate; apex acute to acuminate, decurrent or not; margins planar or recurved, entire to dentate above; costa subpercurrent to excurrent, occasionally hyaline, in cross-section 1-2 stereid bands, guide cells in 1(-2) layers, lamellae or filaments on the upper surface of costa present or not, median laminal cells isodiametric, smooth to papillose, thin- or thick-walled, basal laminal cells elongate, uniform or extending along the margin, rectangular, thin- or thick-walled. Gemmae occasionally present in the leaf axils or lamina apex. Monoicous or dioicous. Perichaetia terminal (rarely lateral on short terminal branches). Seta short to elongate, smooth, twisted or not. Capsule immersed to exserted, erect to suberect, cylindrical, short to long-ovoid or subglobose. Operculum short-conic or long-rostrate. Peristome rudimentary or with 16 or 32 teeth. Calyptra cucullate, naked, smooth. Spores spherical, papillose. Type: *Pottia* (Rchb.) Fűrnr.

Note: The following synopsis includes all accepted names, original literature citations, types, one lectotype, materials examined, distributions, habitats and conservation statuses of the 28 species of Pottiaceae recognized from Rio de Janeiro State.

Subfamilies, Tribes, and Genera of Pottiaceae from Rio de Janeiro

1. Subfamily Chionolomoideae (1 genus, 1 species): *Pseudosymblepharis*.
2. Subfamily Trichostomoideae (3 genera, 3 species): *Pleurochaetae*, *Tortella*, *Trichostomum*.
3. Subfamily Merceyoideae (2 tribes, 5 genera, 13 species):
 - Tribe Barbuleae (3 genera, 5 species) *Anoetangium*, *Barbula*, *Streptopogon*.
 - Tribe Leptodontieae (2 genera, 8 species) - *Hymenostylium*, *Leptodontium*.
4. Subfamily Pottioideae (2 tribes, 9 genera, 11 species):
 - Tribe Hyophileae (5 genera, 6 species) - *Ganguleea*, *Hyophila*, *Hyophiladelphus*, *Plaubelia*, *Weissia*.
 - Tribe Pottieae (4 genera, 5 species) - *Chenia*, *Dolotortula*, *Syntrichia*, *Tortula*.

Key to the Pottiaceae species from Rio de Janeiro state

1. Costa with one stereid band (in cross section).....	2
1. Costa with two stereid bands (in cross section).....	18
2. Costal epidermis present (in cross section).....	9
2. Costal epidermis absent (in cross section).....	3
3. Leaf lingulate.....	4
3. Leaf lanceolate, oblong-lanceolate to ovate-lanceolate.....	5
4. Margin reflexed in the lower 1/2, crenulated in the upper 1/2.....	14. Leptodontium stellatifolium
4. Margin recurved in the lower 1/2-2/3, dentate to denticulate in the upper 1/3.....	12. Leptodontium flexifolium
5. Leaf strongly dentate near the base.....	13. Leptodontium luteum
5. Leaf not dentate at the base.....	6
6. Leaf with apex narrowly acute, margin recurved, revolute and incurved in the lower 1/3-1/2, high sheathing base (>2/3).....	7
6. Leaf with apex acute to obtuse, margin recurved in the lower 1/3-2/3, slightly sheathing base (< 1/2).....	8
7. Margin revolute and incurved, costa percurrent or ending 1-3 cells below apex.....	16. Leptodontium wallisii
7. Margin recurved, costa subpercurrent ending 4-8 cells below apex.....	10. Leptodontium araucarieti
8. Margin serrate; papillae scattered grouped over each lumen; inner basal cells rectangular to long-rectangular, porose to not porose.....	15. Leptodontium viticulosoides
8. Margin denticulate; papillae centrally grouped over each lumen; inner basal cells short rectangular, not porose.....	11. Leptodontium filicola
9. Costal epidermis present in both surfaces (dorsal and ventral).....	10
9. Costal epidermis present in only one surface, dorsal or ventral.....	14
10. Leaves mucronate.....	6. Ganguleea angulosa
10. Leaves not mucronate (obtuse, acute, acuminate, rounded or abruptly cucullate).....	11
11. Leaf margins recurved.....	12
11. Leaf margins planar.....	13
12. Leaf apex acute; costa excurrent (extending beyond the apex), completely filling the apex (proboscis); gemmae concentrated on the leaf apex around tip of costa.....	21. Streptopogon calymperes
12. Leaf apex acute; costa subpercurrent (almost reaching the apex); gemmae concentrated along the margins of leaf apex and the upper 1/3 of leaf.....	20. Streptopogon brasiliensis
13. Leaves oblong-elliptical.....	17. Plaubelia sprengei
13. Leaves lingulate to spatulate.....	4. Chenia leptophylla
14. Dorsal costal epidermis present.....	1. Anoetangium aestivum
14. Ventral costal epidermis present.....	15
15. Leaves with a strong multistratose border.....	5. Dolotortula mniifolia
15. Leaves without a strong multistratose border.....	16
16. Leaf margins planar.....	23. Syntrichia fragilis
16. Leaf margins recurved.....	17
17. Leaves mucronate.....	25. Tortula muralis
17. Leaves not mucronate (acute).....	22. Syntrichia amphidiaceae
18. Costal epidermis present on both surfaces (dorsal and ventral).....	19
18. Costal epidermis present in only one surface, dorsal or ventral.....	23
19. Leaf margins recurved.....	2. Barbula arcuata
19. Leaf margins planar.....	20
20. Leaves lanceolate, ovate or elliptical, oblong- to ligulate-lanceolate or narrowly lanceolate to linear-lanceolate.....	21
20. Leaves oblong, obovate or spatulate.....	22
21. Hydroid strand present.....	9. Hyophiladelphus agrarius
21. Hydroid strand absent.....	8. Hyophila involuta
22. Leaves narrowly ovate to elliptical.....	3. Barbula indica
22. Leaves oblong- to ligulate-lanceolate or narrowly lanceolate to linear-lanceolate.....	26. Trichostomum weisioides
23. Dorsal costal epidermis present.....	7. Hymenostylium recurvirostrum
23. Ventral costal epidermis present.....	24
24. Leaf margins incurved.....	25
24. Leaf margins plane.....	26
25. Leaf cells bulging-mammilose on the ventral surface, smooth on the dorsal surface.....	27. Weissia breutelii
25. Leaf cells pluripapillose on both surfaces (dorsal and ventral).....	28. Weissia jamaicensis
26. Costa short excurrent.....	27
26. Costa subpercurrent.....	24. Tortella humilis
27. Leaves with apex acute.....	18. Pleurochaete luteola
27. Leaves with apex acuminate.....	19. Pseudosymblespharis schimperiana

1. *Anoetangium aestivum* (Hedw.) Mitt., J. Linn. Soc., Bot. 12: 175. 1869. *Gymnostomum aestivum* Hedw., Sp. Musc. Frond. 32. 1801. Type: **LOCIA PALUSTRIS ANGLIAE, HELVETIAE, LIPSIAE**. In argillae-fondina inventum habet Schreber, mihi tamen necdum obvium (lectotype: G!). Fig. 1 (A-C).

This species was only known from two states in Brazil, both in the southeastern region, up to 800 m, being here cited for additional states in the following regions of Brazil: northern (Maranhão State, at sea level), southeastern (Minas Gerais State, at ca. 1900 m), and southern (Santa Catarina State, at sea level). This taxa was cited to Petrópolis by Brotherus (1924 as *A. euchloron* (Schwaegr.) Mitt.). Although this collection was not available for study, this species probably occurs in Rio de Janeiro state based on its distribution throughout the country. In Brazil, *Anoetangium aestivum* can be confused with *Molendoa sendtneriana* (Bruch, Schimp. & W. Gümbel) Limpr., which differs by having two stereid bands, small plants with costa ending below the apex, and leaves with part of the lamina bistratose. This species has stems with sclerodermis and central strand present, leaves sharply keeled or grooved along the costa, planar margins, and non-porose leaf cells, costae narrow, with a single, dorsal stereid band, and 2–3 ventrally exposed guide cells.

Distribution, Habitat and Conservation: Widespread globally. In Brazil, reported from MA, MG, RJ, SC, and SP. On moist soil and rocks, 0–1900 m, in the Atlantic Rainforest (LC).

Representative specimens examined: **BRAZIL. Maranhão:** Carolina BR-010, Transamazônica, IV/1983, *Silva et al.* 1095 (NY); **Minas Gerais:** Pico da Piedade, IV/1922, *Rolfs s.n.* (NY); **Santa Catarina:** Desterro (Nossa Senhora do Desterro is the oldest name for Florianópolis), VII/1886, *Ule s.n.* (RB); Serra do Rio do Rastro, IX/1984, *Vital & Buck* 12427 (NY); **São Paulo:** Monte Alto, Serra Tabarana, VI/1997, *Pietrobon-Silva* 1787 (SP).

2. *Barbula arcuata* Griff., Calcutta J. Nat. Hist. 2: 491. 1842.

Type: **INDIA. Griffith 27** (holotype: BM!). Fig. 1(D-H) *Barbula arcuata* has a sclerodermis and central strand; the leaves are linear-lanceolate, with apex obtuse, denticulate, with entire margins; the costa is broad, up to 1/3 of the width of the base, its cells are smooth, rectangular, and show guide cells in cross section, epidermal cells only on the ventral surface, and stereids on the dorsal surface. Peristome without teeth. According to 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) in Goiás State, being cited now the second time in the country and for the first in the northern and southeastern regions.

Distribution, habitat and conservation: Widespread globally. In Brazil, reported from AM, GO, MG, RJ and SP. On hu-

mid soils along river banks, sometimes submerged, or on moist rocks, 0–900 m, in the Amazon Forest, Savanna, and Atlantic Rainforest (LC).

Representative specimens examined: **BRAZIL.** without locality, *Brotherus* 2103 (RB); *Weiss s.n.* (NY); **Amazonas:** Fonte Boa, III/1924, *Kuhlmann* 1585 (RB, as *B. lurida*); **Goiás:** Chapada dos Veadeiros, VII/1988, *Schäfer-Verwimp* 9867 (RB); **Minas Gerais:** Tiradentes, XII/1993, *Yano et al.* 21712 (SP); **Rio de Janeiro:** Corcovado, III/1895, *Ule* 216 (BM, MG, as *B. amblyacra*).

3. *Barbula indica* (Hook.) Spreng., Nomencl. Bot. 2: 72. 1824. *Tortula indica* Hook., Musci Exot. 2: 135. 1819. Type: **INDIA ORIENTALI.** Madras, Tranquebar, *Rötter s.n.* (holotype LINN; isotype NY!). Fig. 1 (I-L).

This species was reported for the first time in Brazil by Schäfer-Verwimp (1991) in Espírito Santo State, appearing to that author to be quite common from southeastern to northeastern Brazil, as was corroborated by the present study. According to Zander (1979), *Barbula indica sensu strictu* has leaves narrowly oval to elliptical, with planar 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 appears to be quite common in southeastern and northeastern Brazil.

Distribution, habitat and conservation: Pantropical. In Brazil, reported from AC, AM, BA, DF, ES, GO, MG, MS, MT, PA, PE, RJ, RS, SE and SP. On sandy soils, shady rocks, road banks, steep slopes, 0–1600 m, in the Amazon Forest, Atlantic Rainforest, Savanna (Gallery Forest), Pantanal (seasonally inundated), and Restinga (LC).

Representative specimens examined: **BRAZIL. Acre:** Reserva Extrativista do Alto Juruá, XI/2000, *Costa et al.* 3897 (RB); **Distrito Federal:** Recanto das Emas, III/2001, *Câmara et al. s.n.* (UB); **Espírito Santo:** Anchieta, V/1991, *D.M. Vital s.n.* (SP); **Goiás:** Anápolis, V/2004, *M.A.S. Carvalho* 147 (SP); **Mato Grosso:** Cáceres, ao largo do Rio Paraguai, VI/1984, *Saddi & Vital* 6162-B (UB); **Minas Gerais:** Formoso, I/1985, *Vital* 12753 (SP); Providência, III/1924, *Bandeira* 195 (NY, RB as *B. sambakiana*); **Goiás:** Anápolis, Praça Henrique Curado, II/2004, *Carvalho* 147 (SP); **Rio de Janeiro:** arbo-reto do Jardim Botânico do Rio de Janeiro, I/2001, *Costa & Molinaro* 241 (RB); **São Paulo:** Paranapiacaba, IX/1990, *Schäfer-Verwimp & Verwimp* 13147 (RB); Ubatuba, Parque Estadual da Serra do Mar, Praia da Fazenda, X/2009, *Costa et al.* 5033 (RB); **Rio Grande do Sul:** Caxias do Sul, Parque dos Macaquinhos, X/2005, *Bordin* 154/ (SP).

4. *Chenia leptophylla* (Müll. Hal.) R.H. Zander, Bull. Buffalo Soc. Nat. Sci. 32: 258. 1993. *Phascum leptophyllum* Müll. Hal., Flora 71: 6. 1888. Type: **AFRICA.** Somerset

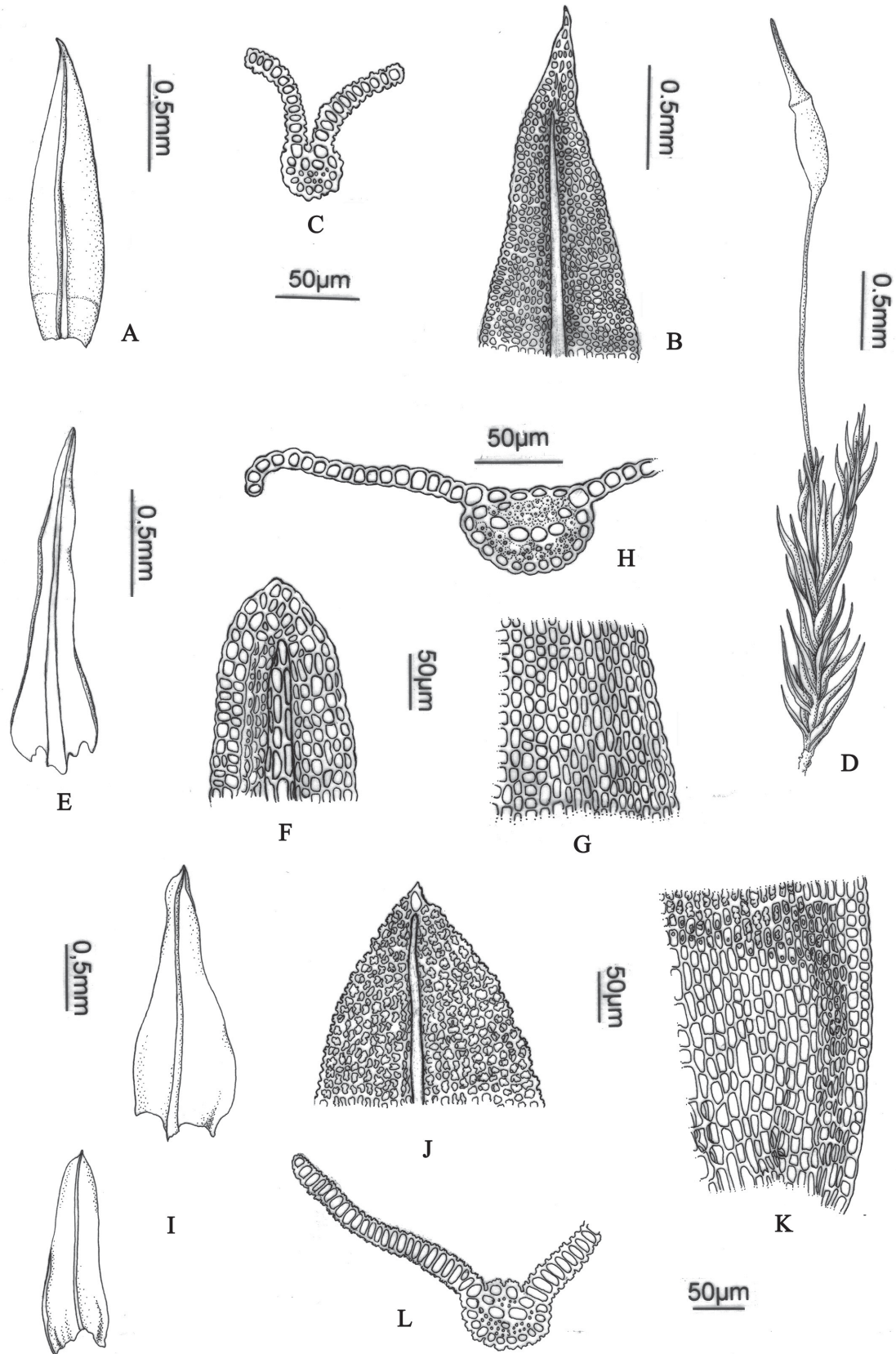


Figure 1. A-C. *Anoectangium aestivum*. A. Leaf. B. Leaf section. C. Leaf apex (Vital & Buck 12427, NY). D-H. *Barbula arcuata*. D. Habit. E. Leaf. F. Leaf apex. G. Marginal cells. H. Leaf section (Schäfer-Verwimp 9867, RB). I-M. *Barbula indica*. I. Leaves. J. Leaf apex. K. Basal cells. L. Leaf section (Costa & Molinaro 241, RB).

East, Monte Boschberg, 1882, Mac Owan *s.n.* (holotype: destroyed in B; isotype H!). Fig. 2 (A-D).

The leaves of *Chenia leptophylla* are obovate, with margins irregularly dentate. The first record of this species for Brazil was published by Schäfer-Verwimp (1991) from a single specimen collected in a more natural habitat in a mountainous region of Espírito Santo State. This taxon is probably common in urban areas in southeastern Brazil, but overlooked.

Distribution, habitat and conservation: Widespread globally. In Brazil, reported from ES, MA, MG, PR, RJ, RS and SP in urban and disturbed areas, on stone walls, humus, at the bases of roadside walls, and on bare soil, 0-1600 m, in Savanna and Atlantic Rainforest (LC).

Representative specimens examined: **BRAZIL. Espírito Santo:** Domingos Martins, X/1988, *Schäfer-Verwimp & Verwimp 10241* (RB, SP); **Maranhão:** São Luis, Reserva Florestal do Sacavém, V/2002, *Correia s.n.* (SP); **Rio Grande do Sul:** Antonio Prado, I/2009, *Tonini 6* (SP); Caxias do Sul, Jardim Botânico, I/2004, *Wasum & Bordin 2140* (SP); Caxias do Sul, Bairro Exposição, I/2006, *Bordin 321* (SP); Caxias do Sul, Bairro Salgado Filho, I/2006, *Bordin & Bordin 345* (SP); Caxias do Sul, Viaduto da Rota do Sol, II/2006, *Bordin & Bordin 375* (SP); **Rio de Janeiro:** Angra dos Reis, III/1995, *Oliveira-e-Silva 2818* (HBR as *Tortula rhizophylla*), **São Paulo:** Morumbi, Parque do Colégio Visconde de Porto Seguro, III/1991, *Schäfer-Verwimp 14361* (RB).

5. Dolotortula mniifolia (Sull.) R.H. Zander, *Phytologia* 65: 426. 1989. *Barbula mniifolia* Sull., Proc. Amer. Acad. Arts 5: 277. 1861. Type: **CUBA. Wright 33** (holotype: BM!). Fig. 2 (E-I).

According to Vital & Pursell (1992), this species occurs at moderate elevations in Mexico, the West Indies, Central America, and the South American Andes, as well as north-eastern and southeastern Brazil – representing an extensive range for the species.

Distribution, habitat and conservation: Tropical America. In Brazil, reported from BA, CE, ES, RJ and SP. Occurs in urban areas, on the ground, or along stream margins on calcareous soils, or shady river banks, 0-540 m, in the Atlantic Rainforest (LC).

Representative specimens examined: **BRAZIL. Bahia:** Salvador, II/1997, *Bastos 805*. (ALCB); **Ceará:** Crato, s.d. (SP); **Espírito Santo:** Anchieta, IV/1991, *Vital s.n.* (SP); **Rio de Janeiro:** Campus da Universidade Federal, V/1991, *Vital s.n.* (SP); **São Paulo:** Conchas, VIII/1983, *Vital 11087* (SP); Laranjal Paulista, VIII/1983, *Vital 11082* (SP).

6. Ganguleea angulosa (Broth. & Dix.) R.H. Zander, *Phytologia* 65: 427. 1989. *Merceyopsis angulosa* Broth.

& Dixon, *J. Bot.* 48: 302. 1910. Type: **INDIA. Sikkim-Himalaya**, 16 Dec 1899, *Decoly & Schaul s.n.* (holotype: H!, isotype: BM!). Fig. 2 (J-N).

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 & Giacconti (1993) were the first records for the Southern Hemisphere, being cited now from Itatiaia (Serra da Mantiqueira) and Nova Friburgo (Serra do Mar) in Rio de Janeiro State. Considered a rare moss, with leaves narrowing toward the base, sporophyte lateral, and capsule plicate without peristome.

Distribution, habitat and conservation: Southeastern Brazil, the Himalayas of India and Nepal. In Brazil, reported from RJ and SP. On shady rocks along riverbanks and on the vertical faces of riverside granitic rocks, 160-700 m, in the Atlantic Rainforest (VU).

Representative specimens examined: **BRAZIL. Rio de Janeiro:** Itatiaia, VII/1991, *Vital & Buck 20053* (NY, SP); Nova Friburgo, VI/1989, *Costa 250* (RB); Resende, Serra de Itatiaia, IV/1987, *Schäfer-Verwimp 8403* (NY, RB, SP); **São Paulo:** Mogi das Cruzes und Bertioaga, VIII/1991, *Schäfer-Verwimp 14844* (NY, SP).

7. Hymenostylium recurvirostrum (Hedw.) Dixon, *Rev. Bryol. Lichénol.* 6: 96. 1934. *Gymnostomum recurvirostrum* Hedw., *Sp. Musc. Frond.* 33. 1801. Type: **POLAND AND GERMANY. Ehrhart s.n.** (lectotype: G!). Fig. 2 (O-S).

Characterized by the absence of a hyalodermis and central strand, the leaves are oblong-lanceolate or lingulate, one margin recurved and the other erect, laminal cells with one or more low papillae, costa without ventral epidermis and with two stereid bands, capsule without peristome. Can be confused with *Molendoa sendtneriana*, *Anoectangium aestivum*, and *Gymnostomum aeruginosum* Sm. in Brazil, being distinct from *G. aeruginosum* by having a stem central strand, costa with large ventral epidermal cells, margin planar, and non-porose leaf cells; from *A. aestivum* by having an apiculus ending in 1-3 cells, costa deeply grooved, only 2-3 cells wide on the ventral surface, without ventral stereid band, and non-porose leaf cells; and from *M. sendtneriana* by having multiple papillae centered over the cell lumina (Allen 2002).

Distribution, habitat and conservation: Widespread globally. In Brazil, reported from DF, GO, MG, RJ and SP on rocks near streams and waterfalls, 200-2350 m, in Savanna and Atlantic Rainforest (LC).

Representative specimens examined: **BRAZIL. Distrito Federal:** III/1971, *Irwin, Harley & Smith 31701* (NY); **Goiás:** Alto Paraíso, VII/1988, *Schäfer-Verwimp & Verwimp 9910* (RB, SP); **Rio de Janeiro:** Parque Nacional do Itatiaia, Abri-

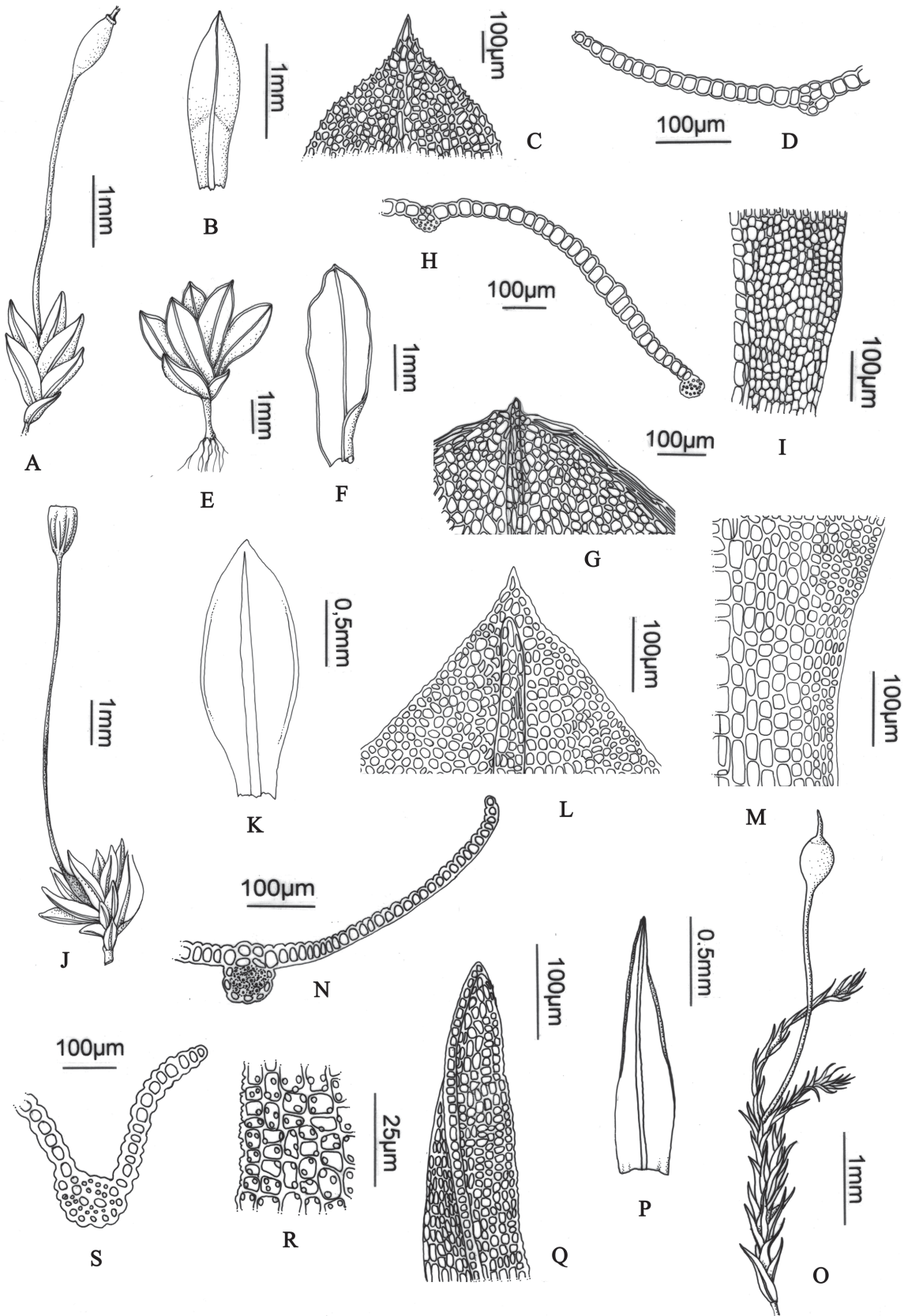


Figure 2. A-D. *Chenia leptophylla*. A. Habit. B. Leaf. C. Leaf apex. D. Leaf section (Schäfer-Verwimp & Verwimp 10241, RB). E-I. *Dolotortula mniifolia*. E. Habit. F. Leaf. G. Leaf apex. H. Leaf section. I. Laminar cells (Vital s.n., SP). J-N. *Gangulea angulosa*. J. Habit. K. Leaf. L. Leaf apex. M. Marginal cells. N. Leaf section. O-S. *Hymenostylium recurvirostrum*. O. Habit. P. Leaf. Q. Leaf apex. R. Papillae. S. Leaf section (Costa et al. 4953, RB).

go Rebouças, II/2002, *Soares Filho s.n.* (RB); Santa Maria Madalena, Parque Estadual do Desengano, X/2008, *Costa et al.* 4953 (RB); **São Paulo**: Eldorado Paulista, IX/1984, *Vital & Buck* 12538 (NY).

8. *Hyophila involuta* (Hook.) A. Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1871-72: 354. 1873. *Gymnostomum involutum* Hook., Musci Exot. 2: 154. 1819.
Type: **NEPAL**. *Gardner s.n.* (holotype: BM!). Fig. 3 (A-E). Easily recognized when dry by the 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) in the Brazilian collections studied.

Distribution, habitat and conservation: Widespread globally. In Brazil, reported from AL, AM, BA, CE, DF, ES, GO, MG, MS, MT, PA, PB, PE, PI, PR, RJ, RO, RR, RS and SP. On shady soils, old stone walls in urban areas, or rocks, 0-1400 m, in the Amazon Forest, Atlantic Rainforest, Caatinga (dry land vegetation), and Savanna (Gallery Forest), being very common in urban areas (LC).

Representative specimens examined: **BRAZIL. Alagoas**: Messias, VI/1981, *Boom & Mori* 1042, 2/ (NY); **Amazonas**: São Gabriel da Cachoeira, VII/1980, *Buck* 2620A (NY); **Bahia**: Irecê, I/1967, *Vital* 1082 (SP); **Ceará**: Baturité, Serra de Guarimiranga, I/1990, *Yano & Mello* 13896 (SP); **Distrito Federal**: 25 km N of Brasília, near Cia. Cimento Tocantins, III/1971, *Irwin et al.* 31674 (NY); **Goiás**: Formoso, I/1985, *Vital* 12761/ (SP); **Mato Grosso**: Guia, VI/1981, *Vital* 9949 (NY); **Mato Grosso do Sul**: Ribas do Rio Pardo, I/1979, *Yano* 1346 (SP); **Minas Gerais**: São Roque de Minas, IX/1984, *Vital & Buck* 11874 (NY); **Pará**: Belém, III/1992, *Lisboa & Borges* 1167 (MG); **Paraná**: Guaíra, X/1978, *Vital* 8352 (NY); **Praia**: Campina Grande, I/1976, *Vital* 5423 (SP); **Pernambuco**: Rio Formoso, IX/1984, *Yano et al.* 9144 (SP); **Piauí**: Piripiri, I/1976, *Vital* 5413 (SP); **Rio de Janeiro**: Jardim Botânico do Rio de Janeiro, II/2000, *Molinari & Costa* 83 (RB); *Glaziou* 7196 (NY, PC); Morro de Nova Cintra, IX/1893, *Ule* 1659 (R); Santa Maria Madalena, Parque Estadual do Desengano, X/2008, *Costa, Crespo & Silva* 5022, 5023, 5024 (RB); **Rondônia**: Ariquemes, Alto Condeias, IV/1982, *Fife, McFarland, Teixeira, Nelson, Santos, Motas & Gomes* 4141 (NY); **Roraima**, rodovia Caracará-Boa Vista, VIII/1974, *Conceição s.n.* (SP); **São Paulo**, Iperó, Flona de Ipanema, XII/2009, *Yano & Bordin* 32068 (SP);

9. *Hyophiladelphus agrarius* (Hedw.) R.H. Zander, Bryologist 98: 372. 1995. *Barbula agraria* Hedw., Sp. Musc. Frond. 116. 1801. Type: **JAMAICA**. *Swartz s.n.* (lectotype: G!). Fig. 3 (F-J).

Characterized by leaves oblong-obovate to spatulate, with costa cells elongated and smooth on the ventral and dorsal surfaces, stereid bands above and below the guide cells

in cross section, and ventral surface lamina cells bulging. 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 observed in some collections from Brazil.

Distribution, habitat and conservation: Widespread globally. In Brazil, reported from AC, AL, AM, BA, DF, CE, DF, ES, FN, GO, MA, MG, MS, MT, PA, PB, PE, PI, PR, RJ, RO, RS, SE and SP. On soil, limestone rocks, and walls in urban areas, 0-650 m, in the Amazon Forest, Atlantic Rainforest, Savanna, and Restinga (coastal, sandy vegetation) (LC).

Representative specimens examined: **BRAZIL. Acre**: Cruzeiro do Sul, VI/1971, *Maas, Kubitzki, Stewart, Barros, Pinheiro & Lima* P13330, (MG, NY); **Amazonas**: Manaus, Praça da Igreja N.S. da Conceição, VIII/1974, *Griffin III, Vital & Yano* 826 (MG); **Bahia**, Ilhéus, Morro do Pernambuco, VII/1991, *Vital & Buck* 20061 (NY); **Ceará**: Maranguape, Serra de Maranguape, III/1990, *Marcelli* 7611 (SP); **Maranhão**: Governador Archer, III/2008, *Brito & Barroso* 323 (SP); **Pará**: Belém, Bairro do Marco, II/1994, *Ilkiu-Borges & Ilkiu-Borges* 379 (MG); **Pernambuco**, Recife, Cordeiro, VIII/1986, *Silva s.n.* (RB); **Rio Grande do Sul**, Sapiranga, VI/1989, *Rossato et al.* 5896 (NY); **Rio de Janeiro**: Araruama, VI/1995, *Costa et al.* s.n (RB); Arraial do Cabo, Restinga da Massambaba, X/1991, *Costa & Yano* 1592 (RB); Reserva Ecológica de Massambaba, VI/1995, *Costa et al.* 2188 (RB); Parati, Sono ao Saco do Mamanguá, X/1990, *Costa et al.* 1250 (RB); Rio de Janeiro, arboreto do Jardim Botânico, XI/1999, *Costa & Martins* 3626 (RB).

10. *Leptodontium araucarieti* (Müll. Hal.) Paris, Ind. Bryol. Suppl. 224. 1900. *Trichostomum araucarieti* Müll. Hal., Bull. Herb. Boissier 6: 93. 1898. Type: **BRAZIL**. Santa Catarina, May 1890, *Ule* 658 (lectotype: FH!; isolectotype: s HBG, M, NY!, S-PA, US). Fig. 3 (K-O). Distribution, habitat and conservation: bTropical America. In Brazil, reported from MG, PR, RJ, RS, SC and SP. On soil and rocks, 300-2500 m, in the Atlantic Rainforest (LC). All of the samples examined from Rio de Janeiro showed leaves short, between 1.0-2.0 mm long.

Representative specimens examined: **BRAZIL. Minas Gerais**: Serra de Itatiaia, VI/1989, *Schäfer-Verwimp & Verwimp* 11188 (RB, SP); **Rio Grande do Sul**: Camará do Sul, Fortaleza, VI/1992, *Wasum et al.* 8662, 8885, 8667 (NY); Caxias do Sul, Ana Rech, VI/1989, *Brinkler et al.* 5834 (NY); **Rio de Janeiro**: Itatiaia, Macieiras, I/1925, *Bandeira s.n.* (NY, RB); Itatiaia, Pico das Agulhas Negras, XI/1925, *Príncipe Pedro d'Orleans de Bragança s.n.* (RB); Itatiaia, Três Picos, X/1989, *Costa et al.* 1007 (RB); Nova Friburgo, Pico da Caledônia, III/1989, *Costa* 885 (RB); Rio de Janeiro, Parna-Tijuca, XI/2006, *Costa et al.* 4625 (RB); **Santa Catarina**: Serra Rio do Rastro, X/1984, *Vital & Buck* 12411A (NY).

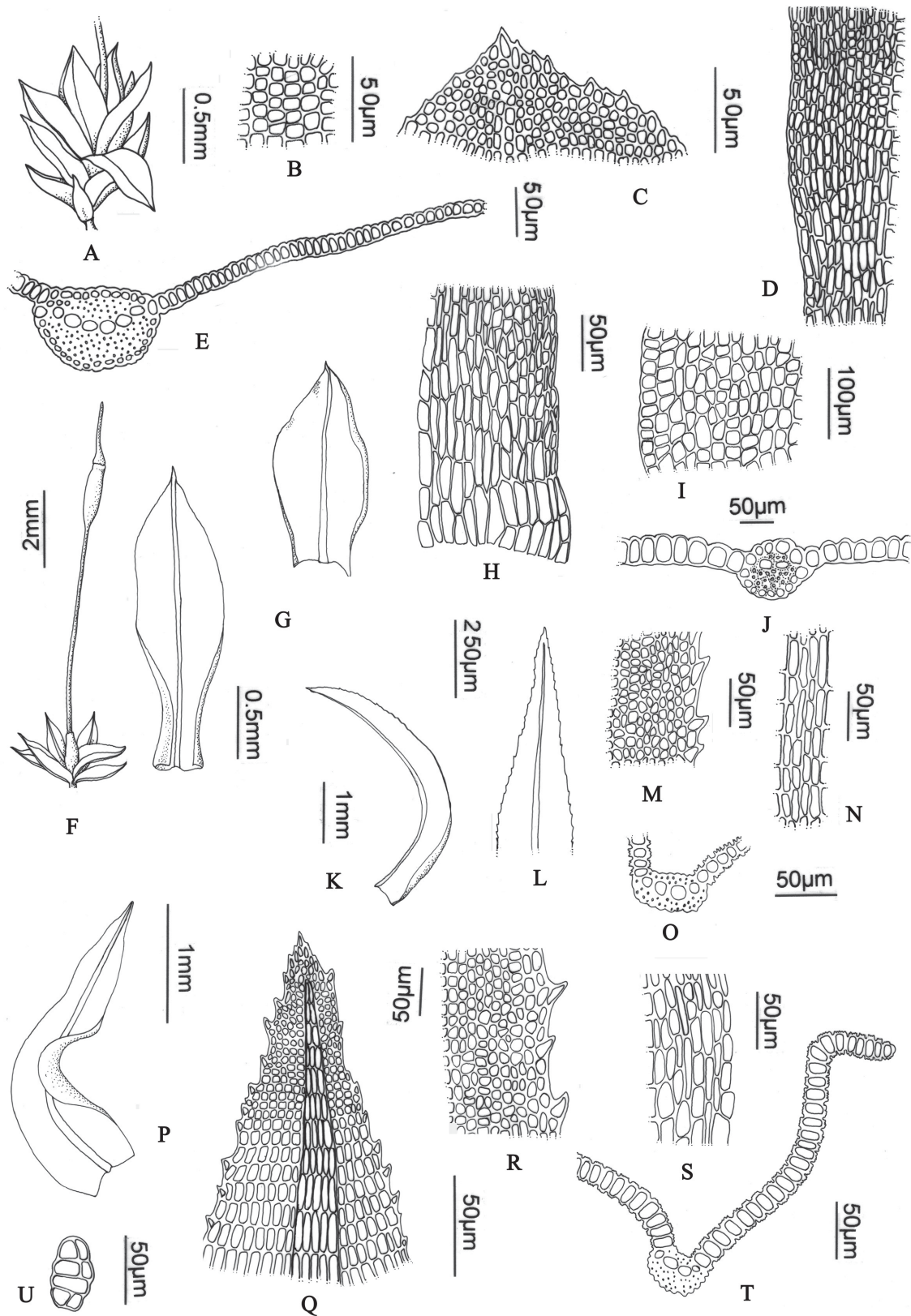


Figure 3. A-E. *Hyophila involuta*. A. Habit. B. Leaves. C. Leaf apex. D. Marginal cells. E. Leaf section (Molinaro & Costa 83, RB). F-J. *Hyophiladelphus agrarius*. F. Habit. G. Leaves. H. Basal cells. I. Laminal cells. J. Leaf section (Costa & Yano 1592, RB). K-O. *Leptodontium araucarieti*. K. Leaf. L. Leaf apex. M. Marginal cells. N. Basal cells. O. Leaf section (Costa et al. 1007, RB). P-T. *Leptodontium filicola*. P. Leaf. Q. Basal cells. R. Marginal cells. S. Laminal cells. T. Leaf section. U. Propagula (Costa et al. 4283, RB).

11. *Leptodontium filicola* Herzog, *Biblioth. Bot.* 87: 34. 1916. Type: **BOLIVIA**. San Mateo, Sunchal, 1911, *Herzog 4512* (holotype: JE!). Fig. 3 (P-T).

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

Distribution, habitat and conservation: Tropical America. In Brazil, reported from MG, RJ, RS and SC. On tree trunks and rocks, 800-2500 m, in the Atlantic Rainforest (VU).

Representative specimens examined: **BRAZIL. Minas Gerais:** Caparaó Novo, IX/1984, *Vital 11694* (SP); **Rio de Janeiro:** Itatiaia, *Schiffner 1861* (FH); Teresópolis, Serra dos Órgãos, *Rizzini 1048* (FH); **Santa Catarina:** São Joaquim, XI/2003, *Costa et al. 4283* (RB).

12. *Leptodontium flexifolium* (Dicks.) Hampe in Lindb., *Öfvers. Förh. Kongl. Svenska Vetensk.-Akad.* 21: 227. 1864. *Bryum flexifolium* Dicks., *Fasc. Pl. Crypt. Brit.* 4: 29. 1801. Type: **ENGLAND**. *Dickson s.n.* (holotype: BM!). Fig. 4 (A-E).

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

Distribution, habitat and conservation: Widespread globally. In Brazil, reported only from RJ in Serra de Itatiaia (Agulhas Negras). Occurs on layers of humus on exposed rocks, approximately 2500 m above sea level, in Upper Montane Atlantic Rainforest (VU).

Representative specimens examined: **BRAZIL. Rio de Janeiro:** Serra de Itatiaia, VII/1991, *Schäfer-Verwimp & Verwimp 14659* (RB).

13. *Leptodontium luteum* (Taylor) Mitt., *J. Linn. Soc., Bot.* 12: 50. 1869. *Didymodon luteus* Taylor, *London Jour. Bot.* 5: 48. 1846. Type: **ECUADOR**. Quito, Pichincha, *Jameson s.n.* (holotype: FH). Fig. 4 (F-J).

The first record outside the Andes was provided by Schäfer-Verwimp (1996) for Itatiaia (Serra da Mantiqueira), specimens from the Desengano State Park (Serra dos Órgãos) are the second record for Brazil. According Zander (1972), this species is known from high elevations (1830-4000 m) in the Andes and Africa, having been collected on volcanoes and páramos. It also occurs at high elevations in Brazil in Serra da Mantiqueira and Serra do Mar.

Distribution, habitat and conservation: Tropical America and Tanzania. In Brazil, reported from MG and RJ (Itatiaia).

On soil, rotten wood, or tree branches, 1750-2130 m, in the Atlantic Rainforest (VU).

Representative specimens examined: **BRAZIL. Rio de Janeiro:** Itatiaia, X/1989, *Schäfer-Verwimp 11188* (NY); Santa Maria Madalena, Parque Estadual do Desengano, X/2008, *Costa et al. 4957, 4959* (RB).

14. *Leptodontium stellatifolium* (Hampe) Broth., *Nat. Pflanzenfam.* 1(3): 400. 1902. *Anacalypta stellatifolia* Hampe, *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn* 4: 37. 1872. Type: **BRAZIL. Rio de Janeiro,** *Glaziou 5205* (holotype: BM!, isotypes S-PA, NY!, PC!). Fig. 4 (K-N).

The distinguishing characters of this endemic taxon are leaves crowded and lingulate, with the margins minutely crenulated, with costa and inner basal cells orange. There are two collections housed at the NY herbarium, both by Glaziou in Rio de Janeiro State, one of which was cited by Zander (1972) as the isotype (*Glaziou 5205*).

Distribution, habitat and conservation: Endemic to south-eastern and southern Brazil, being reported from ES, MG, RJ, SC and SP. On rocks or soil, 1000-2890 m, in the Atlantic Rainforest (LC).

Representative specimens examined: **BRAZIL. Espírito Santo:** Parque Nacional do Caparaó, Terreirão to Pico da Bandeira, IX/1984, *Vital & Buck 11754E* (NY); **Minas Gerais:** Parque Nacional do Caparaó, Pico da Bandeira from Tronqueira to Terreirão, IX/1984, *Vital & Buck 11722* (NY); Parque Nacional do Itatiaia, VII/1991, *Vital & Buck 19638* (NY); Parque Nacional do Itatiaia, IV/1988, *Schäfer-Verwimp & Verwimp 9567* (RB); **Rio de Janeiro:** *Glaziou 7064* (NY, PC); Itatiaia, Parque Nacional do Itatiaia, VII/1991, *Vital & Buck 19734* (NY); Itatiaia, VI/1902, *Dusén s.n.* (NY); Itatiaia, Maciço das Prateleiras, II/2010, *Ribeiro & Medina 147* (RB); Itatiaia, IV/2006, *Yano & Shinzato 28835* (SP, as *Bryoerythrophyllum ferruginascens*); Itatiaia, 1977, *Frahm 1181* (NY); Itatiaia, VI/1991, *Vital & Buck 19734* (NY); Itatiaia, XII/1989, *Schäfer-Verwimp 11160* (NY); **São Paulo:** Piquete, Morro do Careca, IX/2006, *Peralta et al. 4053, 4070* (SP).

15. *Leptodontium viticulosoides* (P. Beauv.) Wijk & Margad., *Taxon* 9: 51. 1960. *Neckera viticulosoides* P. Beauv., *Prodr. Aethéogam.* 78. 1805. Type: **REUNION**. *Bory-St.-Vicent s.n.* (holotype not located). Fig. 4 (O-R). This species is characterized by cirrhatate leaves, with papillose laminal cells, and papillae low and hemispherical. 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 (reported from BA, MG, RJ, RS, SC and SP, between 0-1850 m) with many synonymizations done by him, for example, *Lepto-*

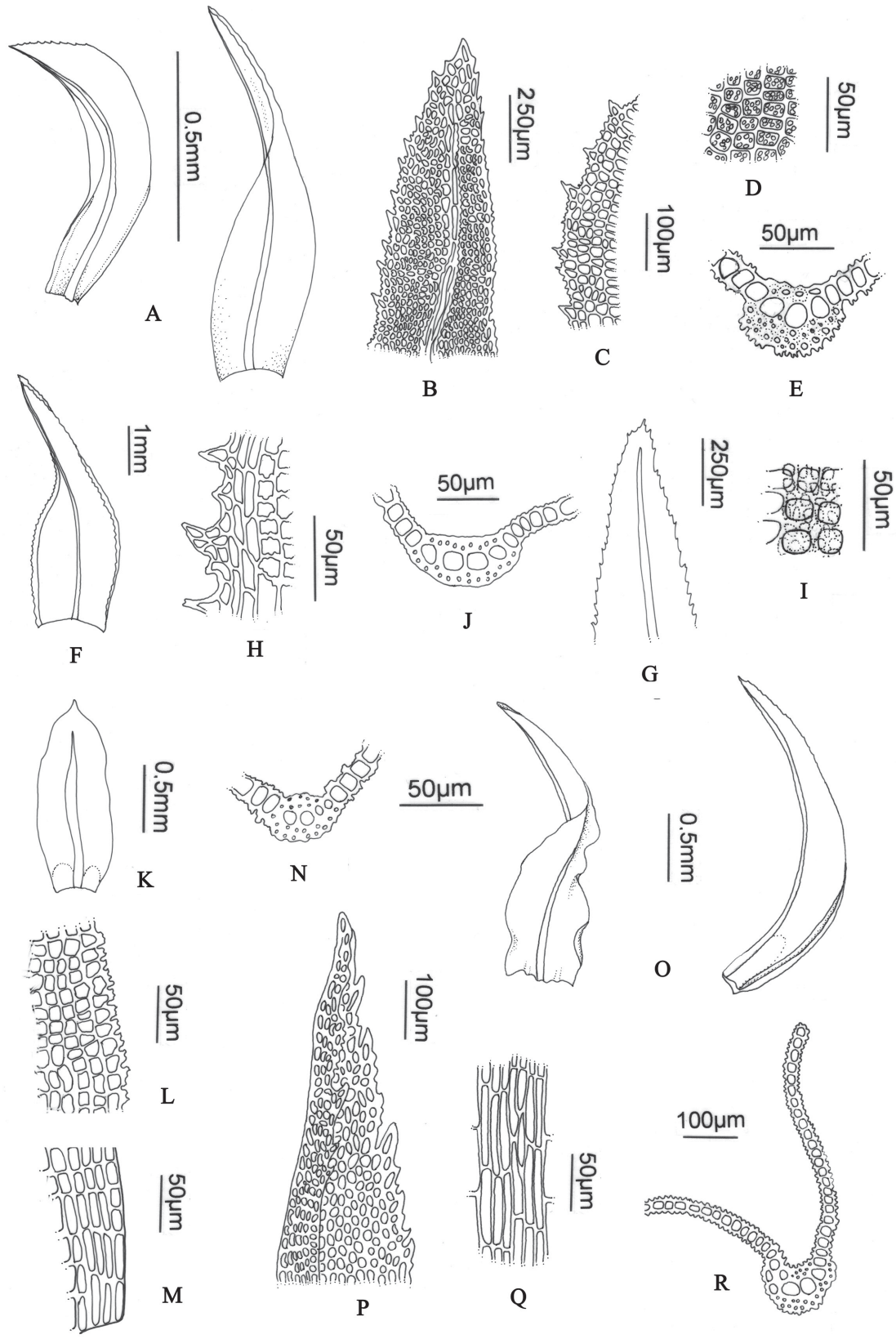


Figure 4. A-E. *Leptodontium flexifolium*. A. Leaves. B. Leaf apex. C. Marginal cells. D. Papillae. E. Leaf section (Schäfer-Verwimp & Verwimp 14659, RB). F-J. *Leptodontium luteum*. F. Leaf. G. Leaf apex. H. Marginal cells. I. Laminal cells. J. Leaf section (Costa et al. 4957, RB). K-N. *Leptodontium stellatifolium*. K. Leaf. L. Marginal cells. M. Basal cells. N. Leaf section (Ribeiro & Medina 147, RB). O-R. *Leptodontium viticulosoides*. O. Leaves. P. Marginal cells. Q. Basal cells. R. Leaf section (Costa 1066, RB).

dontium 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 NY herbarium and identified as var. *panamense*; examinations confirmed that they do in fact belong to this variety, differing from the typical variety (var. *viticulosoides*) by the 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*. Zander's treatment (1972) was adopted here.

Distribution, Habitat and Conservation: Pantropical. In Brazil, reported from BA, ES, MG, PR, RJ, RS, SC and SP. On soil, rocks, tree trunks, and rotten wood, 100-2200 m, in the Atlantic Rainforest (LC).

Representative specimens examined: **BRAZIL. Bahia:** Rio de Contas, Pico das Almas, X/1994, *Visnadi & Vital* 2605a (RB); **Espírito Santo:** Castelo, Parque Estadual do Forno Grande, IX/2004, *Kollmann* 7036 (SP); **Minas Gerais:** Parque Nacional de Itatiaia, VII/1991, *Vital & Buck* 19873 (NY); **Paraná:** Paulo de Frontin, I/2005, *Wasum* 2546 (SP); **Rio Grande do Sul:** Fazenda Boa Vista, IV/1988, *Wasum et al.* 3981 (NY); Cambará do Sul, Fortaleza, X/1986, *Wasum et al.* 2140, 2143 (NY); Cambará do Sul, Parque Nacional de Aparados da Serra, Itaimbezinho, IX/1984, *Vital & Buck* 12262 (NY); Caxias do Sul, Vila Oliva, I/1947, *Sehnem* 6135 (NY); Esmeralda, IX/1987, *Wasum et al.* 3259 (NY); Parque Estadual do Espigão Alto, VI/1996, *Lemos-Michel* 3647 (SP); Porto Alegre, I/1942, *Sehnem s.n.* (NY); São Francisco de Paula, XII/1949, *Sehnem* 4612, 4663 (NY); São Francisco de Paula, Floresta Nacional, XII/1995, *Wasum et al. s.n.* (SP); São Matheus do Sul, Usina de Xisto, I/2005, *Wasum* 2512 (SP); Serra do Faxinal, XII/1950, *Sehnem* 5302 (NY); **Rio de Janeiro:** *Glaziou* 3940 (NY isotype of *L. viticulosoides* var. *panamense*), *Glaziou* 6369 (NY, PC); Itatiaia, VI/1902, *Dusén s.n.* (NY); Itatiaia, IX/1955, *Fidalgo & Kauffmann Fidalgo Eg-16* (RB); Itatiaia, 1974, *Vital* 4861 (MO); Itatiaia, VII/1977, *Frahm* 1617 (MO); Nova Friburgo, X/1066, *Costa* 1066 (RB); Parati-Cunha, VII/1977, *Frahm* 1609 (MO); Rio de Janeiro-Minas Gerais, montis Itatiaia, IX/1901, *Schiffner* 453 (BM as *Leptodontium saxicolum*); Rio de Janeiro-Minas Gerais, montis Itatiaia, IX/1901, *Schiffner* 1874 (BM [2] as *Leptodontium saxicolum*); **Santa Catarina:** Serra Geral, VII/1890, *Ule* 56 (NY); Serra Rio do Rastro, IX/1984, *Vital & Buck* 12408 (NY); Campo dos Padres, Bom Retiro, XII/1948, *Reitz* 2424, 2484, 2527 (NY); **São Paulo:** Pindamonhangaba, Pico Itapeva, X/1994, *Buck* 26436 (NY, SP); Monte Jaraguá, *Schiffner s.n.* (NY - Kryptogamae Exsiccatae Mus. Hist. Natur. Vindobonensi n° 2591).

16. Leptodontium wallisii (Müll. Hal.) Kindb., Enum. Bryin. Exot. 63. 1888. *Trichostomum wallisii* Müll. Hal., Linnaea 38: 603. 1874. Type: **COLOMBIA.** Nova

Granata, Antioquia, Paramo de Ruiz, 1872, *Wallis s.n.* (isotypes: BM!, JE, NY!, S-PA). Fig. 5 (A-C).

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

Distribution, habitat and conservation: Tropical America and Africa. In Brazil, reported from RJ and SP. On soil or rocks, 0-2750 m, in the Atlantic Rainforest (VU).

Representative specimens examined: **BRAZIL. Rio de Janeiro:** Itatiaia, VII/1977, *Vital* 7414 (MO, SP); Itatiaia, VII/1977, *Frahm* 1613 (MO); Santa Maria Madalena, Parque Estadual do Desengano, X/2008, *Costa et al.* 4972 (RB); **São Paulo:** Ubatuba, Parque Estadual da Serra do Mar, X/2009, *Costa et al.* 5031 (RB).

17. Plaubelia sprengelii (Schwägr.) R.H. Zander, Bull. Buffalo Soc. Nat. Sci. 32: 176. 1993. *Barbula sprengelii* Schwägr., Sp. Musc. Frond. 1: 64. 1823. Type: **HISPA-NIOLA** lectam misit cl. Sprengel – ex descr. (holotype: G! - Ex herb. Hedwig-Schwaegrichen). Fig. 5 (D-G).

Although this species is widespread in Brazil, only one collection is currently known from Rio de Janeiro State. Can be confused with *Hyophila involuta*, differing by the presence of enlarged and bulging epidermal cells on the ventral costal surface.

Distribution, habitat and conservation:—North, Central, and South America. In Brazil, reported from AC, AM, BA, DF, FN, GO, MA, MG, MT, PE, RJ, RR and SP. On shady rocks, soil, rotten wood, or rock walls in urban areas, 0-900 m, in the Amazon Forest, Savanna, and Atlantic Rainforest (LC).

Representative specimens examined: **BRAZIL. Amazonas:** São Gabriel, VII/1979, *Buck* 2619a (NY); Manaus, 1882, *Schwacke* 4160 (RB); **Bahia:** VII/1915, *Rose & Russell* 19892 (NY); Iraquara, VI/1981, *Boom, Mori & Funch* 1214 (NY, SP); **Distrito Federal:** Universidade de Brasília, II/1971, *Irwin et al.* 29738 (NY); **Fernando de Noronha,** XII/1989, *Yano et al.* 13609 (RB); V/1978, *Vital* 8327, 8339 (NY, SP); **Goiás:** Formoso, XII/1988, *Vital s.n.* (SP); Morrinhos, IV/1976, *Vital* 6144 (SP); **Maranhão:** I/1983, *Correa s.n.* (SP); **Minas Gerais:** Lagoa Santa, IX/1984, *Vital & Buck* 11832, 11855 (NY); Gruta da Lapinha, VII/1988, *Schäfer-Verwimp* 9969 (RB); **Rio de Janeiro:** Angra dos Reis, VII/1994, *Oliveira-e-Silva s.n.* (HBR); **Roraima:** XII/1977, *Buck et al.* 2034 (NY); **São Paulo:** São Luiz de Paraitinga, Parque Estadual da Serra do Mar, X/2009, *Costa et al.* 2215 (RB).

18. *Pleurochaete luteola* (Besch.) Thér., Smithsonian Misc. Collect. 78: 14. 1926. *Trichostomum luteolum* Besch., Mém. Soc. Sci. Nat. Math. Cherbourg 16: 178. 1872. Type: **MEXICO**. Veracruz, Orizaba, *Fr. Müller s.n.* (holotype: PC!). Fig. 5 (H-L).

A robust species, similar to the genus *Pseudosymblepharis* Broth., but the leaves are bordered along nearly 2-3 their length by enlarged, bulging, hyaline cells that are denticulate above, and with the upper and basal cells distinctly different. Schäfer-Verwimp & Giaconiti (1993) recorded this genus for the first time in southern Brazil, being here cited for the second time for that country, and for the first time in the southeastern region.

Distribution, habitat and conservation: Tropical America. In Brazil, reported from GO, MG, PR, RJ, RS and SP. On rocks, soil, or tree trunks, 0-2000 m, in the Atlantic Rainforest, Savanna, and Steppe (LC).

Representative specimens examined: **BRAZIL. Goiás:** Formoso, VIII/1979, *Vital 8502* (SP); **Minas Gerais:** Itatiaia, Brejo da Lapa, IV/2007, *Yano 29505* (SP); **Paraná:** Antonina, I/2005, *Wasum 2426* (SP, as *Barbula riograndensis*); **Rio Grande do Sul:** Caxias do Sul, II/2006, *Bordin 402* (SP); Lavras do Sul, VII/1980, *Vital 9201* (SP); São Matheus do Sul, VII/2005, *Wasum 2710* (SP); **Rio de Janeiro:** Cabo Frio, VI/1995, *Costa et al. 2215* (RB); Petrópolis, Pedra Maria Comprida, VIII/1968, *Sucre 3499 & Braga 1027* (RB); **São Paulo:** Matão, XII/2007, *Peralta & Prado 6066* (SP); Taubaté, VIII/1987, *Vital 15095* (SP).

19. *Pseudosymblepharis schimperiana* (Paris) H.A. Crum, Bryologist. 55: 139. 1952. *Syrrhopodon schimperiana* Paris, Index Bryol. 1254. 1898. Type: **MEXICO**. Veracruz, Orizaba, 1853, *Müller s.n.* (holotype: BM!). Fig. 5 (M-P). According to Crum (1952), Paris (1898) changed the original name of this species to *Syrrhopodon schimperianus* because *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), and the original material exhibits leaves ovate-lanceolate, contorted above, upper laminal cells quadrate, thick-walled, pluri-papillose (papillae bulging over lumen), sheathing cells elongated, thick-walled, and porous, laminal cells of sheath long-rectangular, smooth, thin-walled, cells at shoulder hyaline, extending along margin with inner cells typical of limb in a “v”; these are distinctive features of *P. schimperiana* and considered by Costa (2014b) as conspecific with it. Schäfer-Verwimp (1996) cited the genus and the species as a new record for Brazil, but commented that it could have been reported earlier as *Tortella* or *Trichostomum* – and studies of the collections from different Brazilian herbaria

have confirmed that possibility. In Brazil *P. schimperiana* is similar to *Trichostomum tenuirostris* (Hook. & Tayl.) Lindb. by their narrow leaf bases; however, the upper basal cells near the costa are not porous in *Trichostomum*. There is one specimen housed at the NY herbarium identified as *Trichostomum aureum* Bartr. *n. sp.* that is a **nomen nudum** because it was never described by Bartram, being only a herbarium name. Zander studied this collection in 1986 (label information) and identified it as *P. schimperiana*.

Distribution, habitat and conservation: Tropical America, Africa. In Brazil, reported from AL, DF, GO, MG, MS, MT, PE, PR, RJ, RS, SC and SP. On soil, rocks, tree trunks, and rotten wood, also in urban areas, 0-2500 m, in the Atlantic Rainforest, Savanna (Gallery Forest), Steppe, and Restinga (LC).

Representative specimens examined: **BRAZIL. Alagoas:** Serra de Pão de Açúcar, VI/1981, *Andrade Lima 81-6696* (SP, as *Hyophila involuta*); **Goiás:** 1971, *Irwin et al. 31874, 31874a* (NY); **Minas Gerais:** Fazenda Aguada, X/1930, *Mexia 5141-a* (NY, as *Trichostomum aureum* Bartr. *n.sp.*); **Mato Grosso do Sul:** Indaiá do Sul, II/1996, *Pietrobon-Silva 2941* (SP); **Pernambuco:** Bom Conselho, I/1974, *Vital 2885* (SP, as *Hyophila involuta*); **Rio Grande do Sul:** Caxias do Sul, I/2006, *Bordin 313, 326* (SP); Caxias do Sul, Parque Centenário, X/2006, *Yano & Bordin 29072* (SP); Santana da Boa Vista, XI/1987, *Wasum et al. 3504* (SP); **Rio de Janeiro:** Maricá, restinga de Itaipuaçu, VI/1995, *Costa et al. 2116* (RB); Mauá, Serra de Itatiaia, II/1925, *Bandeira s.n.* (RB); Serra de Itatiaia, Brejo da Lapa, VI/1990, *Schäfer-Verwimp & Verwimp 12797* (NY, RB); Rio de Janeiro, Corcovado, II/2007, *Vaz-Imbassahy et al. 116, 124, 128* (RB); Rio de Janeiro, Leblon, VIII/1926, *Kuhlmann 196* (RB); Rio de Janeiro, Vista Chinesa, IX/1992, *Costa s.n.* (RB); **São Paulo:** Eldorado Paulista, IX/1984, *Vital & Buck 12539B* (NY).

20. *Streptopogon brasiliensis* Casado ex D.P. Costa, Syst. Bot. 37: 584. 2012. Type: **BRAZIL**. São Paulo, Serra da Bocaina at Cunha, 28 Oct 1989, *Schäfer-Verwimp 11950* (holotype L!; isotype herb. Schäfer-Verwimp!). Fig. 6 (A-D).

Streptopogon brasiliensis is similar to *S. cavifolius* Mitt., but differing by leaf apex planar and acute, multicellular propagules (gemmae) numerous at leaf margins, median leaf cells quadrate and thick-walled, and basal cells porous.

Distribution, habitat and conservation: Tropical America, Argentina, Africa, and Madagascar. In Brazil, reported from MG, RJ, RS, SC and SP. On tree trunks or rocks, 800–2000 m, in the Atlantic Rainforest (LC).

Representative specimens examined: **BRAZIL. Minas Gerais:** Parque Nacional do Caparaó, X/1994, *Buck 26937* (NY); **Rio Grande do Sul:** Marau, Praça im Zentrum, XII/1988, *Schäfer-Verwimp & Verwimp 10719* (SV); **Rio de**

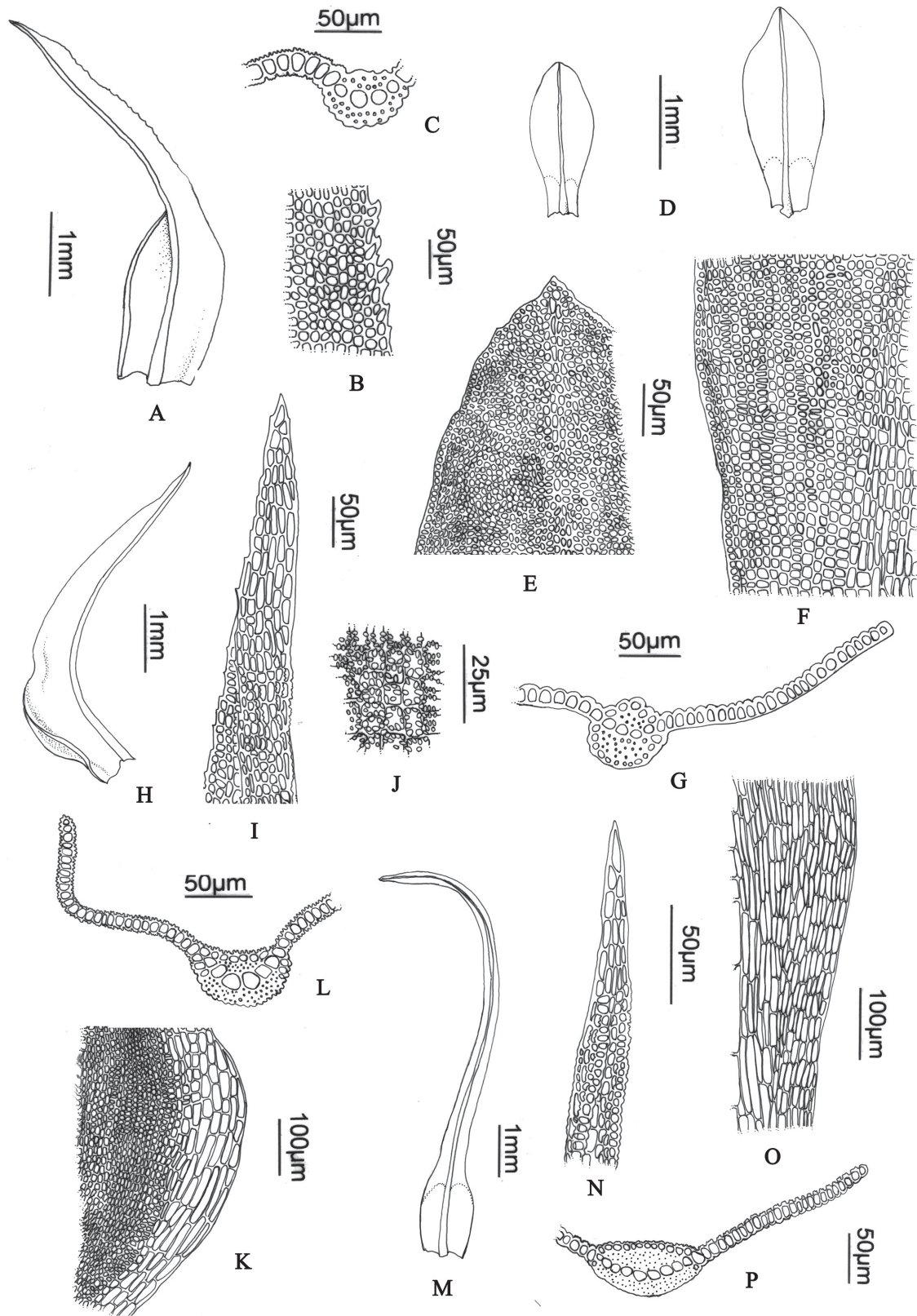


Figure 5. A-C. *Leptodontium wallisii*. A. Leaf. B. Leaf section. C. Marginal cells (Costa et al. 4972, RB). D-G. *Plaubelia sprengelii*. D. Leaves. E. Leaf apex. F. Basal cells. G. Leaf section (Costa et al. 2215, RB). H-L. *Pleurochaete squarrosa* var. *luteola*. H. Leaf. I. Leaf apex. J. Papillae. K. Marginal basal cells. L. Leaf section (Costa et al. 2215, RB). M-P. *Pseudosymblepharis schimperiana*. M. Leaf. N. Leaf apex. O. Basal cells. P. Leaf section (Costa et al. 2116, RB).

Janeiro: Parque Nacional do Itatiaia, V/1984, *Vital & Buck 19640* (NY); **Santa Catarina:** Mafra, Praça im Zentrum, XII/1988, *Schäfer-Verwimp & Verwimp 10442* (SV).

21. Streptopogon calymperes Müll. Hal. ex. Geh., Abh. Naturwiss. Vereine Bremen 7: 207. 1882. Type: **MADAGASCAR.** Ambatondrazaka, 6 Dec 1977, *Rutenberg 22* (holotype: B assumed destroyed). Fig. 6 (E-G).

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. for Serra do Picu in Rio de Janeiro State; this site is located, however, in Minas Gerais State. *Streptopogon schenckii* is a synonym of *S. calymperes* (Sharp *et al.* 1994).

Distribution, habitat and conservation: Tropical America and Africa. In Brazil, reported from MG, RJ and SP. On tree trunks or rocks, 800-2000 m, in the Atlantic Rainforest (LC).

Representative specimens examined: **BRAZIL. Minas Gerais:** Parque Nacional do Itatiaia, VII/1991, *Vital & Buck 19640* (NY); Serra do Picú, XII/1885, *Schenk 4789* (NY, syntype of *Streptopogon schenckii*); **Rio de Janeiro:** Parque Nacional do Itatiaia, VII/1991, *Vital & Buck 19640* (NY); Serra da Mantiqueira, Camanducaia, Monte Verde, V/1990, *Schäfer-Verwimp 12736* (RB); **São Paulo:** Cunha, X/1989, *Schäfer-Verwimp & Verwimp 11946* (RB); Pindamonhangaba, Pico do Itapeva, X/1994, *Buck 26342A* (NY).

22. Syntrichia amphidiacea (Müll. Hal.) R.H. Zander, Bull. Buffalo Soc. Nat. Sci. 32: 267. 1993. *Barbula amphidiaceae* Müll. Hal., Linnaea 38: 639. 1874. Type: **MEXICO.** Veracruz, Orizaba, *Frederick Müller*, Hb. Lorentz sub *Zygodon* (holotype not located). Fig. 6 (H-J).

Commonly grows as an epiphyte in Brazil, more rarely on rocks or rotting logs, often as single plants mixed with other bryophytes and therefore easily overlooked. In light of the collections of *S. amphidiacea*, it appears to be rather widespread and frequent in southeastern and southern Brazil. Although no collections from Rio de Janeiro were examined, its distribution would appear to include Rio de Janeiro State.

Distribution, habitat and conservation: Southeastern U.S.A., Tropical America, and Malaysia. In Brazil, reported from ES, MG, PR, RJ, SC and SP. On rotten wood, shaded rocks, tree trunks (common in urban areas), 650-1650 m, in the Atlantic Rainforest (DD).

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

Representative specimens examined: **BRAZIL. Espírito Santo:** Domingos Martins, VII/1988, *Schäfer-Verwimp & Verwimp 10240* (SV); **Rio de Janeiro:** Teresópolis, VII/1990, *Schäfer-Verwimp & Verwimp 13114* (SV); **Santa Catarina:** São Joaquim, XII/1988, *Schäfer-Verwimp & Verwimp 10569A* (SV).

23. Syntrichia fragilis (Taylor) Ochyra, Fragm. Florist. Geobot. 37: 212. 1992. *Tortula fragilis* Taylor, London J. Bot. 6: 333. 1847. Type: **ECUADOR.** Quito, Pichincha, Nov 1846, *Jameson s.n.* 66 (lectotype here designated: BM!, isolectotype: MO). Fig. 6 (K-L).

According to Schäfer-Verwimp & Giancotti (1993), the records of *S. fragilis* by Egunyomi & Vital (1984) in Goiás State and by Guarim Neto & Yano (1985) in Mato Grosso State are based on misidentifications, and correspond to *Trichostomum weisioides* Müll. Hal.; examinations of these collections during the present study confirmed this conclusion. Although no collections from Rio de Janeiro were examined, its distribution would appear to include Rio de Janeiro State.

Distribution, habitat and conservation: Widespread globally. In Brazil, reported from MG, MS, PR, RJ, RS and SP. On tree trunks, rocks, or stone walls in urban area, 600-2000 m, in the Atlantic Rainforest and Savanna (LC).

Representative specimens examined: **BRAZIL. Minas Gerais:** Uberlândia, Cerrado vegetation, V/1978, *Vital & R. Pursell 8304*, (SP); **Paraná,** Castro, Praça Getulio Vargas, XII/1991, *Schäfer-Verwimp & Verwimp 15140* (RB); **Rio de Janeiro-Minas Gerais:** Parque Nacional do Itatiaia, VII/1991, *Vital & Buck 19514* (NY); **São Paulo:** São Bento do Sapucaí, Pedra do Baú, IX/1989, *Schäfer-Verwimp & Verwimp 11819* (SP).

24. Tortella humilis (Hedw.) Jenn., Man. Mosses W. Pennsylvania 96. 1913. *Barbula humilis* Hedw., Sp. Musc. 116. 1801. Type: **USA.** Lancaster Pennsylvaniae, Jan 1897, *Cardot s.n.* (holotype: G!). Fig. 7 (A-E).

Can be recognized by a short stem, fragile leaves, often fragmenting, broad to narrowly acute, planar, 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 the Brazilian collections studied.

Distribution, habitat and conservation: Widespread. In Brazil, reported from BA, ES, GO, MG, MS, PR, RJ, RS, SC and SP. On soil, rocks, and tree trunks, 0-1400 m, in Savanna, Atlantic Rainforest, Pantanal (seasonally flooded vegetation), and Steppe (LC).

Representative specimens examined: **BRAZIL. Bahia:** Lençóis, BR 242, VI/1981, *Boom & Mori 1084* (NY); **Distrito Federal:** 25 km NE of Brasília, Córrego Landim, V/1966, *Hunt 5482B* (BM); **Goiás:** Formoso, VIII/1979, *Vital 8502*

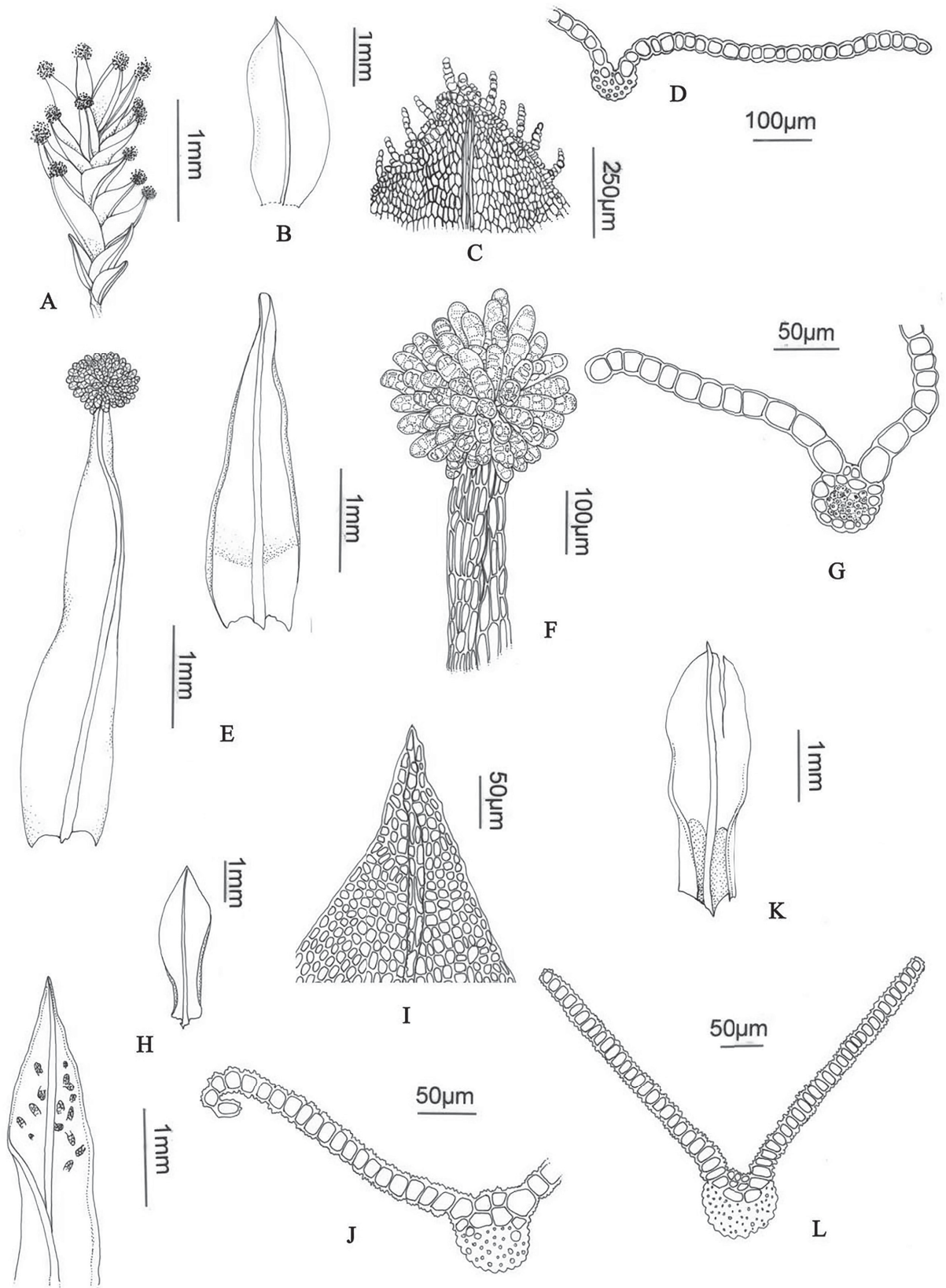


Figure 6. A-D. *Streptopogon brasiliensis* A. Habit. B. Leaf. C. Leaf apex. D. Leaf section (Schäfer-Verwimp 11950, isotype SV). E-G. *Streptopogon calymperes*. E. Leaves. F. Leaf apex. G. Leaf section (Vital & Buck 19640, NY). H-L. *Syntrichia amphidiacea*. H. Leaves. I. Leaf apex. J. Leaf section (Schäfer-Verwimp & Verwimp 10240, SV). K-L. *Syntrichia fragilis*. K. Leaf. L. Leaf section (Schäfer-Verwimp & Verwimp 15140, RB).

(NY); **Minas Gerais**, Parque Nacional do Caparaó, Vale Verde, X/1994, *Buck 26956* (NY); **Paraná**: Canta Galo, V/1982, *G. Hatschbach 45254* (NY); **Rio Grande do Sul**, Bom Jesus, XI/1952, *Sehnem 6011* (NY); **Rio de Janeiro**: *Montagne s.n.* (NY); *Glaziou s.n.* (NY – 3 samples); XII/1878, *Glaziou 7445* (NY); XII/1878, *Glaziou s.n.* (NY); Morro Redondo, XI/1873, *Schwacke 922* (RB); *Milne s.n.* (NY); Angra dos Reis, Ilha Grande, VI/1915, *Rose & Russell 20387* (NY); Arraial do Cabo, Massambaba, V/1995, *Costa et al. 2184* (RB); Itatiaia, IX/1902, *Dusén s.n.* (NY); Itatiaia, Vêu da Noiva, I/2009, *Crespo & Costa s.n.* (RB); Fazenda da Cachoeira, Monnerat, VI/1923, *Bandeira s.n.* (NY); Itatiaia, Monte Serrat, VI/1915, *Rose & Russell 20444* (NY); Itatiaia, Vêu da Noiva, II/1994, *Andrade s.n.* (RB); Itatiaia, Serrinha, XI/1993, *Hupsel s.n.* (RB); Jurajuba Bay, 1837, *Gardner 16* (NY); Nova Friburgo, Lumiar, V/1988, *Costa et al. 676* (RB); Nova Friburgo, Stucky-Lumiar, XII/1987, *Costa & Gomes 445* (RB); Morro Redondo, XI/1873, *Schwacke 922* (RB); Orgão Mountain, 1837, *Gardner 34* (NY); Pedra Bonita, II/1837, *Gardner 16c, 34(1)* (NY); Tijuca, *Ball s.n.* (NY); Petrópolis, rodovia Teresópolis-Rio, V/1988, *Giordano, Klein & Nadruz 382* (RB); Petrópolis, Araras, XII/2008, *Costa s.n.* (RB); Rio de Janeiro, estrada de Guaratiba, X/1966, *Guimarães & Sucre 43* (RB); Rio de Janeiro, Tijuca, 1873, *Schwacke 914* (RB); Santa Maria Madalena, Pedra Dubois, XII/1988, *Profice 48* (RB); Santa Maria Madalena, Parque Estadual do Desengano, X/2008, *Costa et al. 4921, 4980, 4992, 5021* (RB); **Santa Catarina**: Tubarão, IX/1889, *Ule 14* (BM, MG, R); **São Paulo**: Ubatuba, Parque Estadual da Serra do Mar, X/2009, *Costa et al. s.n.* (RB).

25. *Tortula muralis* Hedw., Sp. Musc. Frond. 123. 1801. Type: **EUROPA**. *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], (lectotype designated by Guerra, Ros & Carrión 1992, G!). Fig. 7 (F-H).

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 very long and twisted (2-3 times). Cano & Gallego (2008) found several syntypes of *T. muralis* var. *longipila* housed at the E, NY, O, and PC herbaria, identified as *Tortula longipila* Dusén from Rio Negro (AM), and selected the specimen at NY as the lectotype. *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 in *T. muralis* the papillae are taller. However, all of these characteristics are considered by those authors to be included within the natural variability of *T. muralis*, and they considered it a synonym of that taxon. I agree with these authors because the Brazilian collections showed the same variability.

Distribution, habitat and conservation: Widespread globally. In Brazil, reported from PE, PR, RJ, RS, SC and SP. On soil, rocks, or cement walls, 0-1400 m, in the Atlantic Rainforest and Savanna (LC).

Representative specimens examined: **BRAZIL. Rio Grande do Sul**: Cachoeira do Sul, VII/1980, *Vital 9238* (SP); Caxias do Sul, Campus da UCS, IX/2005, *Bordin 121* (SP); São José do Norte, VII/1980, *Vital 8983* (SP); Torres, VII/1980, *Vital 8904* (SP); Triunfo, 5 Sep 1975, *Sehnem & Aguiar s.n.* (SP); **Rio Grande do Sul**: Cachoeira do Sul, VII/1980, *Vital 9238* (SP); **Rio de Janeiro**: *Glaziou 6396* (BM, NY, PC as *Tortula muricola*); **Santa Catarina**: São Joaquim, XII/1988, *Schäfer-Verwimp & Verwimp 10566* (RB); **São Paulo**: Diadema, VI/2003, *Vital s.n.* (SP); Guarulhos, Bairro das Pimentas, 13 Nov 1976, *Yano 561* (SP).

26. *Trichostomum weisioides* Müll. Hal., Bull. Herb. Boissier 6: 92. 1898. Type: **BRASILIEN**. Serra do Itatiaia, Mont Serrat, 1894, *Ule 1814* (holotype: R!; isotype: HBG). Fig. 7 (I-L).

The records of *Syntrichia fragilis* for Goiás and Mato Grosso by Egunyomi & Vital (1984) and Guarim Neto & Yano (1985), respectively, are based on misidentifications, and actually refer to *T. weisioides*. *Trichostomum weisioides* is very similar to *T. arboreum* (Mitt.) R.H. Zander and can be distinguished only by leaves lingulate and short-mucronate. These two taxa may be synonymous. This species is known only from the type collection in Rio de Janeiro State. As it commonly grows as an epiphyte (rarely on the ground) mixed in with other bryophytes, it can easily be overlooked.

Distribution, habitat and conservation: Endemic to Brazil, being reported from DF, GO, MT and RJ. On soil and tree trunks, 500-1500 m, in Savanna (Gallery Forest) and Atlantic Rainforest (DD).

Representative specimens examined: **BRAZIL. Distrito Federal**: Brasília, I/1981, *Heringer et al. 6005* (RB); **Goiás**: Paraíso do Norte, XI/1984, *Vital 3013* (SP as *Syntrichia fragilis*).

27. *Weissia breutelii* Müll. Hal., Syn. Musc. Frond. 1: 664. 1849. Type: **INSULA ANTILLARUM ST. TOMAS**. 1841, *Breutel s.n.* (isotypes: MO!, NY!). Fig. 7 (M-O).

Weissia breutelii differs from the other two Brazilian *Weissia* species (*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, and were made by Hampe, Luisier, Puiggari, and Loefgren. According to Hampe (1879), *W. glazioui* is characterized by leaves involute, canaliculated, narrow, with the basal laminal cells being thin-walled. This author also noted that this species is very similar to *Weissia canaliculata*. The collection of *W. canaliculata* housed at the NY herbarium has a label by Zander with the following observation: "near

Weissia breutelii and I here are reducing to synonyms of it” (sic), although the synonym was not published by him. According to Hampe (1874), *Hymenostomum striatum* is very similar to *W. canaliculata* by the capsule being gymnostomous (without a peristome) and angled-striate, and Zander (1993) replaced *Hymenostomum striatum* with *W. glazioui*. *Weissia glazioui* was only known from the type collection, being endemic to southeastern Brazil; the original material exhibits the same characteristics of the plants, leaves and cells as *W. breutelii* will, being considered here as conspecific with it. As these synonyms were not published. Costa (2014b) agreed with both authors and these two taxa were synonymized with *W. breutelii*.

Distribution, habitat and conservation: Tropical America. In Brazil, reported from BA, ES, MA, RJ, RS, SC and SP. On soil or rocks, 0-900 m, in the Atlantic Rainforest and Savanna (LC).

Representative specimens examined: **BRAZIL. Bahia:** Nationalpark Chapada da Diamantina, VII/1987, Schäfer-Verwimp & Verwimp 8711 (RB); Mundo Novo, IV/1976, Vital 6009 (SP); **Espírito Santo:** Castelo, X/1988, Schäfer-Verwimp & Verwimp 10260 (RB); Itapemirim, VII/1989, Schäfer-Verwimp & Verwimp 11595 (SP); **Maranhão:** Fortaleza dos Nogueiras, VII/2008, Brito & Conceição 410 (SP); **Rio de Janeiro:** Glaziou 7300 (NY, holotype of *Weissia canaliculata*); Angra dos Reis, Ilha Grande, VII/1994, Oliveira-e-Silva 1984 (SP); **São Paulo:** Marília, XI/2005, Peralta & Lucas 3254 (SP); Matão, XII/2007, Peralta & Prado 6064 (SP, as *Tuerckheimia guatemalensis*).

28. *Weissia jamaicensis* (Mitt.) Grout, Moss Fl. N. Amer. 1: 157. 1938. *Tortula jamaicensis* Mitt., J. Linn. Soc., Bot. 12: 147. 1869. Type: **JAMAICA.** *Wilds s.n.* (holotype: NY!). Fig. 7 (P-T).

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

Distribution, habitat and conservation: Americas (North, Central, and South America). In Brazil, reported from ES, GO, MG, PR, RJ and SP. On roadside rocks and river banks, 100-800 m in Savanna (Gallery Forest) and Atlantic Rainforest (DD).

Representative specimens examined: **BRAZIL.** *Burchell* 7258 (NY); **Espírito Santo:** Itaperuna, IX/1984, Vital & Buck 11487 (NY); **Goiás:** Formoso, XII/1984, Vital 12658 (SP); **Rio de Janeiro:** PARNA-Tijuca, Corcovado, IV/2006, Costa *et al.* 4507, 4511, 4512 (RB); **São Paulo:** Adrianópolis, V/1987, Schäfer-Verwimp & Verwimp 8441 (RB, SP).

Excluded records or doubtful reports

The following three taxa are considered poorly known because no material was available to study.

Timmiella barbulooides (Brid.) Moenk., Die Laubmoose Europas 273. 1927. Type: EUROPE, *Bridel* 406 (holotype: B!). In Brazil reported from MG, RJ and SP. All of the collections are very old, and were cited as *Barbula cirrhata* by Arnott (1823), Hornschuch (1840), Hampe (1870; 1872; 1874; 1879), and Hampe & Geheeb (1881). I could not study these collections and no other material has been found to confirm this species for Brazil.

Tortella linearis (Sw. ex Web. & Mohr) R.H. Zander, Bull. Buffalo Soc. Nat. Sci. 32: 104. 1993. Type: JAMAICA, *Swartz s.n.* (isotype: NY!). Reported from RJ in Brazil as *Barbula linearis* by Hornschuch (1840) “prope Sebastianopolis, leg. by Armott”. Known only from this very old collection from the Atlantic Rainforest; this collection could not be studied and no other material has been found to confirm this species for Brazil.

Tortella tortuosa (Hedw.) Limpr., Laubm. Deutschl. 1: 604. 1888. Type: IN MONTIBUS, PEDEMONTII, HELVETIAE, GALLIAE, SCOTIAE, SUECIAE, THURINGIAE, HERCYNIAE, *Swartz s.n.* (holotype G). Reported from RJ (Itatiaia) in Brazil, this collection could not be studied and no other material has been found to confirm this species for Brazil.

Distribution

Many of the species 28.5% (eight taxa) demonstrated wide distributions in Brazil, occurring in a number of different biomes (Amazonia Rainforest, Savanna, and Atlantic Rainforest), while others were restricted to the mountainous regions of southeastern and southern Brazil (25%, seven taxa). Four taxa (14%) are restricted to southeastern Brazil, occurring in mountainous sites in the Atlantic Rainforest. Five taxa (18%) can be encountered in Savanna and Atlantic Rainforest, which seems to be a common geographical distribution for the family. A total of fifteen taxa (53.5%) occur only in the Atlantic Rainforest in Brazil, which is considered the main biome for this family in Brazil.

Conservation status

According to Costa *et al.* (2005b) the bryoflora of Rio de Janeiro State includes 125 taxa that are vulnerable (VU), 25 endangered (EN), and 153 insufficient data (DD). Rio de Janeiro is considered one of the centers of diversity and endemism in Brazil (Guedes-Bruni & Lima 1997, Rocha *et al.* 2003, Gradstein & Costa 2003), with high numbers of taxa with distributions predominantly restricted to the southeastern region of the country, or

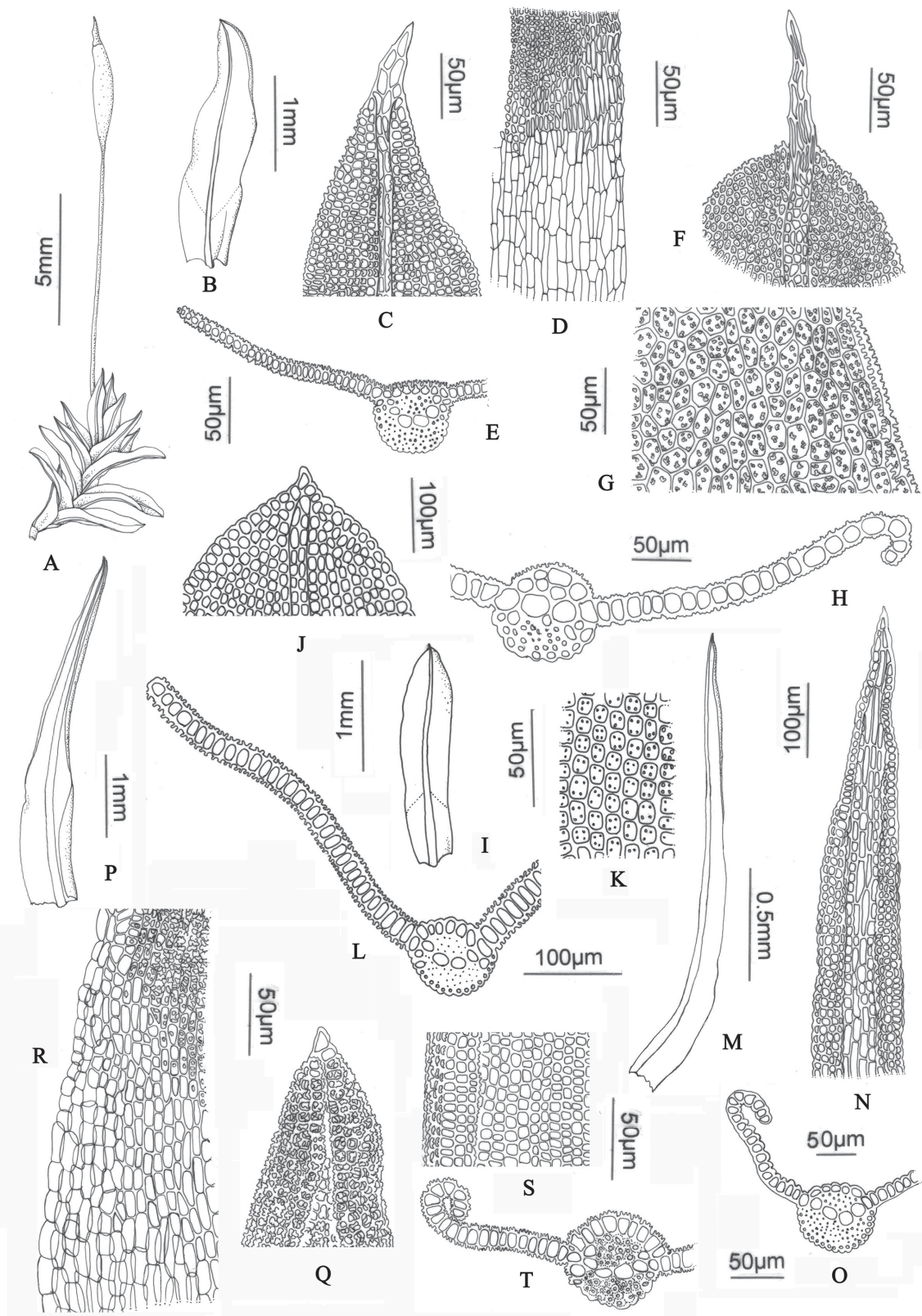


Figure 7. A-E. *Tortella humilis*. A. Habit. B. Leaf. C. Leaf apex. D. Basal cells. E. Leaf section (Costa et al. 2184, RB). F-H. *Tortula muralis*. F. Leaf apex. G. Papillae. H. Leaf section (Schäfer-Verwimp & Verwimp 10566, RB). I-L. *Trichostomum weisioides*. I. Leaf. J. Leaf apex. K. Papillae. L. Leaf section (Ule 1814, holotype R). M-P. *Weissia breutelii*. M. Leaves. N. Leaf apex. O. Leaf section (Schäfer-Verwimp & Verwimp 8711, RB). P-T. *Weissia jamaicensis*. P. Leaf. Q. Leaf apex. R. Marginal cells. S. Basal cells. T. Leaf section (Schäfer-Verwimp & Verwimp 8441, RB).

endemic. According to Rocha *et al.* (2003), although the remaining forests fragments in the state are protected, they still suffer strong anthropogenic pressure due to deforestation (agriculture and pasture), urbanization, the illegal commerce of animals and plants, and the introduction of exotic species.

Habitat fragmentation is a major threat to the bryoflora, especially for species with limited ranges (endemics). The Atlantic Rainforest in southeastern Brazil is under severe pressure (e.g., from agriculture and industrial development) and relentless human interference (population expansion). The protection and conservation of bryophytes represents a new and unfamiliar concept for Brazil, and there are no specific laws protecting these plants. Critical studies have only been undertaken in two states, Pernambuco (Pôrto & Germano 2002) and Rio de Janeiro (Costa *et al.* 2005a; Costa & Faria 2008; Costa & Santos 2009).

DD—Data deficient: Three taxa are considered to have insufficient available data: *Syntrichia amphidiaceae*, *Trichostomum weisioides*, and *Weissia jamaicensis*.

LC—Least Concern: The majority of the species (20 taxa) are included within this category because: they have widespread distributions in the country; they are known from new collections; they occur in different vegetation types; are found inside protected areas (Conservation Areas); or their distributions have expanded since their initial descriptions.

VU—Vulnerable: Five taxa are included in this category because they are restricted to the Atlantic Rainforest in Brazil:

Ganguleea angulosa: VU B2ab (i, ii, iii), area of occupancy 2,000 km², occurring in less than 10 locations. The species occurs in southeastern Brazil and the Himalayas (India and Nepal). In Brazil, it is restricted to the Montane and Upper Montane Atlantic Rainforest of Rio de Janeiro and São Paulo states, with few herbarium records. Some sub-populations are protected in the Itatiaia National Park.

Leptodontium filicola: VU B1ab (i, ii, iii, iv), extent of occurrence 20,000 km², occurring in less than 10 locations. This species occurs in Tropical America, but is only known from the Atlantic Rainforest of southeastern and southern Brazil at high elevations in the following conservation areas: Itatiaia National Park; Serra dos Órgãos National Park; Caparaó State Park; and Serra Geral State Park.

Leptodontium flexifolium: VU B2ab (i, ii, iii), area of occupancy 2,000 km², occurring in less than 10 locations. This species is widespread globally, although it is known from only one collection from the Upper Montane Atlantic Rainforest of Rio de Janeiro State, in the Itatiaia National Park in Brazil (Aguilhas Negras, ca. 2500 m).

Leptodontium luteum: VU B1ab (i, ii, iii, iv), extent of occurrence 20,000 km², occurring in less than 10 locations. This taxon occurs in Tropical America, Tanzania and Brazil, where it is restricted to the Upper Montane Atlantic Rainforest of Serra da Mantiqueira and Serra dos Órgãos, with sub-populations protected in the Itatiaia National Park and Desengano State Park.

Leptodontium wallisii: VU B1ab (i, ii, iii, iv), extent of occurrence 20,000 km², occurring in less than 10 locations. This species occurs in Tropical America, but it is only known from the Atlantic Rainforest of southeastern Brazil (Rio de Janeiro and São Paulo states), with few herbarium records. Some sub-populations are protected in the following conservation areas: Itatiaia National Park; Desengano State Park; and Serra do Mar State Park.

Acknowledgments

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