



The genus *Lejeunea* Lib. (Lejeuneaceae, Marchantiophyta) in Brazil

CID JOSÉ PASSOS BASTOS¹ & S. ROBERT GRADSTEIN²

¹ Universidade Federal da Bahia, Instituto de Biologia, Laboratório de Taxonomia de Briófitas–BrioFLORA, Campus Universitário de Ondina, 40170-280 Salvador, Bahia, Brazil.

² Department of Systematics, Biodiversity and Evolution of Plants, Albrecht von Haller Institute, University of Göttingen, 37073 Göttingen, Germany; Muséum National d'Histoire Naturelle, Institute de Systematique, Évolution, Biodiversité (UMR 7205), 75005 Paris, France.

³ cidbastos@gmail.com; <https://orcid.org/0000-0002-0624-5696>

⁴ sgradst@gwdg.de; <https://orcid.org/0000-0002-3849-6457>

Abstract

Lejeunea is one of the largest genera of liverworts in the Neotropics and probably the largest liverwort genus in Brazil. We present the first treatment of *Lejeunea* for Brazil, and for any major part of the Neotropics. Fifty-eight species and three varieties are recognized. A key to the Brazilian species of *Lejeunea* is provided and each species is briefly described with data on geographical distribution, habitat, differentiating characters and affinities, and reference to published illustrations. Illustrations of a few selected species are also provided. Almost half of the species (24) are widely distributed in tropical America and four of them occur also in Africa; one species, *L. flava*, is pantropical. About 40% of the species (23) have more restricted ranges and are limited to tropical South America. Ten of them (*L. atlantica*, *L. beyrichiana*, *L. combuensis*, *L. flagellifera*, *L. juruana*, *L. longidentata*, *L. oligoclada*, *L. perpapillosa*, *L. pulchra*, *L. subplana*) are only known from Brazil. Within Brazil 19 species are widespread, the remaining ones have restricted distributions in the country. Twenty-three species are newly reduced to synonymy (see list in text), fourteen new lectotypifications are designated, two species are newly described, *L. atlantica* sp. nov. and *L. pulchra* sp. nov., and four new combinations are proposed: *L. acanthogona* var. *crisulata* comb. nov., *L. acanthogona* var. *diversicuspis* comb. nov., *L. acanthogona* var. *grossiretis* comb. nov. and *L. beyrichiana* comb. nov. *Lejeunea cochleata* is reported new to Brazil and *L. rionegrensis* is new to Ecuador.

Keywords: bryophytes, liverworts, Neotropics, taxonomy

Introduction

Lejeunea Libert (1820: 372) is one of the largest genera within liverworts. About four hundred species names are currently accepted in *Lejeunea* worldwide (Söderström *et al.* 2016), but only about a quarter of these are treated in modern taxonomic revisions and monographs (Bastos *et al.* 2018) and we expect that the actual species number in the genus will be much lower. The genus is taxonomically complex due to the different generic definitions employed in the past, the often scanty or heterogeneous type material of the older species names, and the high morphological variability of the gametophytes (Reiner-Drehwald 2010a, Lee 2013, Heinrichs *et al.* 2013, Bastos *et al.* 2017). Recent molecular and morphological studies have shown that several genera accepted in the “Guide to the Bryophytes of Tropical America” (Gradstein *et al.*, 2001), such as *Amblyolejeunea*, *Amphilejeunea*, *Crossotolejeunea*, *Echinocolea*, *Macrolejeunea*, *Neopotamolejeunea*, *Oryzolejeunea*, *Sphaerolejeunea* and *Taxilejeunea*, do not merit generic status and are synonyms of *Lejeunea* (see Heinrichs *et al.*, 2013 for review). The first global phylogeny of *Lejeunea* revealed a split into two major lineages, subg. *Lejeunea* and subg. *Crossotolejeunea* Spruce (1884: 161), and a putative cradle of the genus situated in the Neotropics (Heinrichs *et al.* 2013).

Our understanding of the neotropical species of *Lejeunea* is largely based on the important taxonomic studies of Dr. Elena Reiner-Drehwald (e.g., Reiner-Drehwald 2000a, 2000b, 2003, 2005a, 2005b, 2005c, 2009a, 2009b, 2010a, 2010b, Reiner-Drehwald & Goda 2000, Reiner-Drehwald & Drehwald 2002, Reiner-Drehwald & Pôrto 2007, Reiner-Drehwald & Schäfer-Verwimp 2008a, b, Reiner-Drehwald *et al.* 2018). Nevertheless, many species remained poorly known, especially those in the former genus *Taxilejeunea* (Spruce 1884: 212) Steph. (1889: 262).

Costa & Peralta (2015) reported 40 species in Brazil and recently, two new species were described: *Lejeunea flagellifera* Bastos *et al.* (2017: 71) and *Lejeunea longidentata* Bastos *et al.* (2018: 60).

Morphologically, the genus *Lejeunea* is recognized by the following set of characters: (1) vegetative branches of the *Lejeunea*-type; (2) stem usually with a hyalodermis; (3) leaves with a J-shaped insertion line, leaf segmentation spiralled; (4) underleaves bifid or undivided; (5) leaf lobules well-developed or reduced, when well-developed with an unreduced first tooth; (6) hyaline papilla marginal; (7) ocelli absent; (8) oil bodies small, granular or homogenous; (9) gynoecea with lejeuneoid innovations and unwinged bracts; (10) perianth with 0–5 smooth or toothed wings.

The present paper presents a synthesis of the taxonomy and distribution of *Lejeunea* in Brazil. It is hoped that this treatment may improve our understanding of the diversity and distribution of *Lejeunea* in the country and will be useful for the identification of collections. Since many of the Brazilian species occur also elsewhere in tropical America, the present treatment may be useful for other neotropical regions as well.

Material and methods

This study is based on examination of herbarium specimens from ALCB, F, G, HBG, MANCH, MG, NY, PC, RB, SP, UFP and UB, and fresh material. The preliminary species list of *Lejeunea* in “Brazilian Flora 2020” (Bastos 2018a) served as a basis for the study. For each species accepted in this paper the following information is provided: brief descriptions, selected synonyms (with reference for heterotypic synonymy), reference to recent monographic treatments when available, reference to published illustrations, comments, world distribution (based on literature), vegetation and substrate types of *Lejeunea* species, selected specimens examined (where relevant), and distribution in Brazil based on collections studied. Unverified records are documented by bibliographic references or data from “INCT-Herbário Virtual da Flora e dos Fungos” (<http://inct.splink.org.br>). Distribution in Brazil is by geopolitical regions following IBGE (not by Brazilian states since latitudinally defined areas are considered more significant biogeographically and presence/absence of species in states is usually more strongly biased by collecting intensity), as follows: **Northern** (Acre, Amazonas, Amapá, Pará, Rondônia, Roraima, Tocantins), **Northeastern** (Alagoas, Bahia, Ceará, Paraíba, Pernambuco, Piauí, Maranhão, Rio Grande do Norte, Sergipe), **Middle-Western** (Goiás, Mato Grosso do Sul, Mato Grosso) **Southeastern** (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo), **Southern** (Paraná, Rio Grande do Sul, Santa Catarina). All accepted species and varieties are keyed and described, and selected figures are provided for species lacking published illustrations. For species whose type specimen(s) we have not studied, reference is given to published papers where the type has been examined. Nomenclature follows Söderström *et al.* (2015, 2016).

Taxonomic Treatment

We present the first treatment of the genus *Lejeunea* for Brazil, and the first for a major region of the Neotropics. Fifty-eight species and three new varieties are accepted for Brazil, an increase of 18 species compared to Costa & Peralta (2015). Two new species are described, *L. atlantica* C.J.Bastos & Gradst. sp. nov. and *L. pulchra* C.J.Bastos & Gradst. sp. nov., 23 species are new synonyms (see list at the end of the taxonomic treatment), 14 new lectotypifications are designated, and four new combinations are proposed, *L. acanthogona* var. *crisulata* (Steph.) Gradst. & C.J.Bastos *comb. nov.*, *L. acanthogona* var. *diversicuspis* (Spruce) Gradst. & C.J.Bastos *comb. nov.*, *L. acanthogona* var. *grossiretis* (Steph.) Gradst. & C.J.Bastos *comb. nov.* and *L. beyrichiana* (Steph.) Gradst. & C.J.Bastos *comb. nov.* *Lejeunea cochleata* is reported new to Brazil and *L. rionegrensis* is new to Ecuador.

World distributions of the species

1. **Brazil only:** *L. atlantica*, *L. beyrichiana*, *L. combuensis*, *L. flagellifera*, *L. juruana*, *L. longidentata*, *L. oligoclada*, *L. perpapillosa*, *L. pulchra*, *L. subplana*.
2. **Amazonia:** *L. asthenica*, *L. juruana*, *L. polyantha*.
3. **Tropical South America:** *L. acanthogona*, *L. anomala*, *L. caripensis*, *L. cochleata*, *L. grossitexta*, *L. immersa*, *L. inflexiloba*, *L. ptosimophylla*, *L. rionegrensis*, *L. subsessilis*.
4. **Tropical South America + West Indies:** *L. asperrima*, *L. boryana*, *L. catinulifera*, *L. pulverulenta*, *L. sporadica*.
5. **Tropical South America + Central America:** *L. puiggariana*, *L. raddiana*, *L. reflexistipula*.
6. **Widespread neotropical:** *L. adpressa*, *L. angusta*, *L. bermudiana*, *L. bombonasensis*, *L. cancellata*, *L. cerina*, *L. controversa*, *L.*

deplanata, *L. flaccida*, *L. glaucescens*, *L. herminieri*, *laeta*, *L. laetevirens*, *L. parviloba*, *L. phyllobola*, *L. quinqueumbonata*, *L. ramulosa*, *L. serpillifolioides*, *L. setiloba*, *L. subspathulata*.

7. **Neotropical + Africa:** *L. aphanes*, *L. capensis*, *L. trinitensis*.

8. **Pantropical:** *L. flava*.

9. **Brazil + USA:** *L. calcicola*.

10. **Subtropical South America + Bahia:** *L. terricola*.

Distribution of the species within Brazil

A) Restricted distribution:

Northern (N): *L. combuensis*.

Northeastern (NE): *L. atlantica*, *L. cochleata*, *L. perpapillosa*, *L. pulchra*.

Southeastern (SE): *L. beyrichiana*, *L. catinulifera*, *L. inflexiloba*, *L. longidentata*, *L. ptosimophylla*, *L. subspathulata*.

Southern (S): *L. ramulosa*, *L. topoensis*.

N/NE: *L. asperrima*, *L. immersa*.

N/MW: *L. juruna*, *L. polyantha*.

NE/SE: *L. flagellifera*, *L. pulverulenta*, *L. terricola*.

SE/S: *L. subplana*.

N/SE/S: *L. anomala*, *L. capensis*, *L. cerina*.

NE/SE/S: *L. laeta*.

NE/MW/S: *L. deplanata*.

MW/SE/S: *L. calcicola*.

N/NE/SE: *L. angusta*, *L. asthenica*, *L. boryana*, *L. caripensis*, *L. herminieri*, *L. oligoclada*, *L. parviloba*, *L. rionegrensis*.

N/NE/S: *L. sporadica*.

B) Widespread: *L. acanthogona*, *L. adpressa*, *L. aphanes*, *L. bermudiana*, *L. bombonasensis*, *L. cancellata*, *L. controversa*, *L. flaccida*, *L. flava*, *L. glaucescens*, *L. grossitexta*, *L. laetevirens*, *L. phyllobola*, *L. pterigonia*, *L. puiggariana*, *L. quinqueumbonata*, *L. raddiana*, *L. reflexistipula*, *L. serpillifolioides*, *L. subsessilis*, *L. setiloba*, *L. trinitensis*.

Habitat of the species in Brazil

Most species in Brazil occur in lowland and montane rainforests, few are restricted to montane forests (over 500 m) (*L. beyrichiana*, *L. catinulifera*, *L. flagellifera*, *L. inflexiloba*, *L. longidentata*). Regarding substrate types, 23 species were found only on living trees while 13 occurred on living trees, rotten logs and living leaves, and some of them also on rock and soil. Three species are specialized rheophytes (*L. juruana*, *L. polyantha*, *L. topoensis*).

Generic description of *Lejeunea* Lib.

For explanation and illustration of terminology see Gradstein (1979, 1994), He (1996) and Gradstein & Costa (2003).

Plants pale green, dark green or yellowish green, vegetative branches of the *Lejeunea*-type. Ventral merophyte 2–10 cells wide. Stems usually with hyalodermis, in cross section with usually 7 epidermal cells and 3–20 or more medullary cells. Leaves imbricate to contiguous, suberect to widely spreading, rarely squarrose, insertion line J-shaped; lobe ovate to ovate-oblong, dorsal surface usually smooth (rarely rough due to conically projecting cells: sect. *Echinocolea*), dorsal margin arched to slightly arched, entire to crenulate to crenate to toothed, ventral margin arched to straight, entire to crenulate to crenate, rarely toothed (not in Brazilian species), apex rounded to obtuse to acute to apiculate, rarely acuminate; laminal cells isodiametric to elongate-hexagonal, usually thin-walled, trigones and intermediate thickening present or absent, occasionally the walls uniformly thick-walled; cuticle smooth or finely papillose; oil bodies small, granular or homogenous; ocelli absent; lobule ovate to triangular or rectangular, sometimes reduced, free margin involute to plane, usually with one tooth, the tooth usually short, unicellular, occasionally long and multicellular, hyaline papilla marginal and proximal to the tooth (rarely distal; *L. herminieri*), rarely lobule with two distinct teeth (*L. catinulifera*); keel arched to straight, smooth or crenate. Underleaves small to large, bifid or undivided, sinus acute or U-shaped, lobes usually triangular, acute to rounded, rarely acuminate, bases cuneate, rounded or auriculate, insertion line straight, curved or deeply arched. Autoicous or dioicous. Androecia on short or long branches, bracteoles restricted to the base of the male spike or present throughout. Gynoecia on short or long branches or on the main stem, with 1–2 lejeuneoid innovations, the innovations sterile or fertile, bracts and bracteole with entire or toothed margins, bract keel without wing. Perianths 5-keeled or terete, keels smooth, crenate, dentate or with cilia and/or lacinia, beak present or absent. Sporophyte: foot of only 3 rings of cells, seta articulate, made up of 4 inner and 12 outer rows of cells, capsules with slow dehiscence, capsule wall pale-colored, tetrads decussate, spores

elongate, spore wall without rosettes, elaters attached to valve margins, with reduced spirals. Protonema endosporous. Vegetative reproduction by caducous leaves, caducous leaf lobes, caducous underleaves, caducous branches and/or shoot fragmentation.

Key to the species of *Lejeunea* in Brazil

1. Dorsal leaf surface rough due to conically projecting cells, at least in the upper part of the leaf. Plants very small, less than 1 mm wide (*L. sect. Echinocolea* [Schuster 1963: 125] Gradstein [2018: 7])2
1. Dorsal leaf surface smooth. Plants less than 1 mm wide or more than 1 mm wide3
2. Keel strongly crenate due to conically projecting cells. Dorsal leaf surface entirely roughened*L. asperriima*
2. Keel smooth. Dorsal leaf surface roughened only in the upper half, the lower half smooth*L. subspathulata*
3. Underleaves undivided4
3. Underleaves bifid5
4. Underleaves reniform, more than 6× stem width. Lobules small, 1/5 leaf length (hyaline papilla proximal)*L. reflexistipula*
4. Underleaves (sub)orbicular, 2–3× stem width. Lobules larger, 1/2–2/3 leaf length (hyaline papilla distal)*L. herminieri*
5. Underleaves large, (4–)5–7× stem width on main stems6
5. Underleaves smaller (when in doubt try both leads)12
6. Lobules large, 1/3–1/2× leaf length, with 2 teeth. Underleaves very shallowly bifid (to maximally 1/5). Only known from Serra do Itatiaia*L. catinulifera*
6. Lobules smaller (less than 1/3× leaf length) or reduced, without or with 1 small tooth. Underleaves bifid to (1/6–)1/5–1/3. More widespread7
7. All leaf apices broadly rounded. Cuticle densely papillose*L. pulverulenta*
7. All or some leaf apices pointed (obtuse, acute, apiculate or acuminate). Cuticle papillose or smooth8
8. Leaves asymmetrical, ovate-falcate, ventral margin often upcurved, apex mostly recurved. Lobule tooth elongate, banana-like*L. longidentata*
8. Leaves ± symmetrical, ovate to oblong-ovate, ventral margin and apex often plane. Lobule tooth shorter, not banana-like9
9. Underleaves without auricles, insertion line deeply arched (ca. 200 µm deep)*L. caripensis*
9. Underleaves with auricles, insertion line slightly curved to arched, but not deeply arched (less than 200 µm deep)10
10. Lobules usually well-developed, ca. 1/6 the leaf length. Leaf cells with conspicuous trigones and intermediate thickenings. Underleaf insertion line shallowly curved (to 50 µm deep). Gynoecia with or without a short-sterile innovation, not produced in a row*L. cerina*
10. Lobules ± reduced. Leaf cells with minute trigones or without trigones, intermediate thickenings lacking. Underleaf insertion deeply arched, 100–200 µm deep. Gynoecia with fertile innovation, produced in a row11
11. Underleaves bifid to 1/4–1/3. Cuticle usually finely punctate-papillose (occasionally smooth). Perianth keeled, keels toothed*L. pterigonia*
11. Underleaves shallowly bifid to 1/6–1/5. Cuticle smooth. Perianth without keels, terete*L. serpillifolioides*
12. At least some leaf apices pointed (obtuse, acute, apiculate or acuminate)13
12. All leaf apices rounded32
13. Leaf margins in all or some leaves with a few teeth (near the apex)14
13. Leaf margins without teeth (but sometimes crenate or crenulate)18
14. Lobules mostly well-developed, inflated-swollen, 1/4–1/3 leaf length*L. bermudiana*
14. Lobules mostly reduced15
15. Leaf apex sharply acute to acuminate*L. asthenica*
15. Leaf apex rounded to obtuse to apiculate16
16. Perianth keeled only near apex, in upper 1/4–1/3 of the perianth length. Underleaves 3–5× wider than stem*L. flaccida*
16. Perianth longly keeled, over 1/2–2/3 of perianth length, or terete. Underleaves 2–4× wider than stem17
17. Perianth terete. Leaf margins crenulate*L. combuensis*
17. Perianth longly keeled. Leaf margins entire*L. bombonasensis*
18. Leaves 1.5–4× longer than wide. Cuticle finely papillose. Leaf apex acute to acuminate*L. ramulosa*
18. Leaves 1.0–1.5× longer than wide (when in doubt try both leads). Cuticle finely papillose or smooth. Leaf apex rounded, obtuse, acute or apiculate, but not acuminate19
19. Cuticle strongly and densely papillose. Perianth keels with cilia and lacinia20
19. Cuticle smooth or faintly papillose. Perianth keels with or without cilia and lacinia21
20. Outer margin of underleaves with a tooth. Underleaves deeply bifid to 2/3, lobes acute, ending in a row of 1-2 cells*L. boryana*
20. Outer margin of underleaves without a tooth. Underleaves bifid to 1/2, lobes acuminate, ending in a row of 2–4 cells*L. controversa*
21. Leaves conspicuously bordered by transversely oriented cells22
21. Leaves not conspicuously bordered by transversely oriented cells24
22. Underleaves 2–3× stem width, orbicular. Leaf lobes ovate, not falcate. Plants 1.0–1.4 mm wide*L. immersa*
22. Underleaves smaller, 1–2× stem width, obovate to oblong. Leaf lobes ovate-falcate. Plants 0.4–0.9 mm wide23
23. Leaf apex rounded to obtuse, plane. Plants very small, 0.4–0.7 mm wide*L. sporadica*
23. Leaf apex acute to sharply apiculate, usually broadly recurved. Plants slightly larger, 0.6–0.9 mm wide*L. raddiana*
24. Lobules when well-developed ca. 1/3–1/2 leaf length25

24.	Lobule smaller, 1/6–1/4 leaf length (or reduced)	30
25.	Leaf lobe obliquely spreading, ovate-oblong, narrowed to the apex	<i>L. atlantica</i>
25.	Leaf lobe widely spreading, ovate, not narrowed to the apex	26
26.	Leaf apex acute to sharply apiculate	27
26.	Leaf apex rounded to obtuse to bluntly apiculate.....	28
27.	Autoicous. Perianth keels dentate-laciniate. Underleaves 1.5–2× stem width. Lobule tooth short, to 25 µm long.....	<i>L. grossitexta</i>
27.	Dioicous. Perianth keels smooth. Underleaves 1–1.5× stem width. Lobule tooth longer.....	<i>L. subplana</i>
28.	Underleaves 2.5–4× stem width. Perianth terete, smooth.....	<i>L. capensis</i>
28.	Underleaves smaller, 1.5–2× stem width. Perianth 5-keeled, the keels crenate to ciliate-laciniate.....	(<i>L. acanthogona</i>) 29
29.	Perianth apex with a distinct, 4–6 cell long beak	<i>L. acanthogona</i> var. <i>acanthogona</i>
29.	Perianth without beak.....	<i>L. acanthogona</i> var. <i>diversicuspis</i>
30.	Plants less than 1 mm wide. Leaf apex obtuse to acute to apiculate, recurved or plane. Perianth keels crenate	<i>L. calcicola</i>
30.	Plants larger. Leaf apex rounded to obtuse (not acute to apiculate), plane. Perianth keels not crenate, smooth	31
31.	Leaf margins entire. Leaf cells with distinct trigones and intermediate thickenings. Branches often caducous. Perianth keels without lamella-like projections	<i>L. cancellata</i>
31.	Leaf margins crenate. Leaf cells with minute trigones, without intermediate thickenings. Branches not caducous. Perianth keels with lamella-like projections	<i>L. quinqueumbonata</i>
32.	Stem robust, ventral merophyte 4–10 cells wide. Rare rheophytes	33
32.	Stem thinner, ventral merophyte 2 cells wide. Not rheophytes.....	35
33.	Insertion of leaf lobes as long as the whole width of the leaves	34
33.	Insertion of leaf lobes only about half the width of the leaves.....	<i>L. topoensis</i>
34.	Ventral merophyte ca. 10 cells wide. Underleaf insertion deeply arched	<i>L. polyantha</i>
34.	Ventral merophyte 4 cells wide. Underleaf insertion shallowly curved.....	<i>L. juruana</i>
35.	Ventral margin of the leaf lobe strongly revolute.....	<i>L. inflexiloba</i>
35.	Ventral margin of the leaf lobe not strongly revolute.....	36
36.	Lobule tooth 3–12 cells long	37
36.	Lobule tooth 1–2 cells long.....	39
37.	Leaves and underleaves caducous. Underleaves lobes widely divergent.....	<i>L. ptosimophylla</i>
37.	Leaves and underleaves not caducous. Underleaves lobes not widely divergent	38
38.	Lobule tooth (4–)6–12 cells long. Leaves suborbicular, flat. Perianth obcordate, flattened, keeled along its whole length, keels smooth	<i>L. trinitensis</i>
38.	Lobule tooth shorter, 3–4(–6) cells long. Leaves ovate-oblong, convex. Perianth obpyriform, inflated, keeled only in the upper half, keels crenate	<i>L. setiloba</i>
39.	Leaves or leaf lobes caducous. Leaf margins sometimes with rhizoids (on shoots producing caducous leaf lobes)	40
39.	Leaves or leaf lobes not caducous. Leaf margins without rhizoids.....	45
40.	Lobules large, rectangular, ca. 1/3–1/2 leaf length.....	<i>L. flagellifera</i>
40.	Lobules smaller, ovate, less than 1/2 leaf length.....	41
41.	Underleaves (2.8–)3–5× stem width. Plants usually more than 1 mm wide	42
41.	Underleaves smaller, 1.5–2.5(–3)× stem width. Plants usually less than 1 mm wide.....	44
42.	Leaf cells with intermediate thickenings and radiate trigones	<i>L. parviloba</i>
42.	Leaf cells without intermediate thickenings, trigones indistinct or minute, not radiate.....	43
43.	Cell walls evenly thickened, trigones indistinct. Leaf apex plane or recurved. Bracteoles limited to the base of the male spike	<i>L. deplanata</i>
43.	Cell walls thin, trigones minute. Leaf apex plane. Bracteoles present throughout the male spike	<i>L. rionegrensis</i>
44.	Leaf lobes ovate. Cuticle smooth. Cell walls usually without intermediate thickenings	<i>L. phylloloba</i>
44.	Leaf lobes triangular-ovate. Cuticle finely punctate-papillose. Cell walls with intermediate thickenings in leaves of main shoots ..	<i>L. oligoclada</i>
45.	Underleaves 3–5(–6)× stem width.....	46
45.	Underleaves 1–3× stem width (when in doubt try both leads).....	53
46.	Underleaf bases strongly auriculate. Cuticle densely papillose	<i>L. pulverulenta</i>
46.	Underleaf bases not auriculate. Cuticle smooth or faintly papillose (densely papillose in <i>L. anomala</i>)	47
47.	Perianth terete.....	48
47.	Perianth keeled or perianth absent.....	49
48.	Perianth longly exerted beyond the bracts (to 1/2–2/3 of perianth length), without beak. Margins of leaves and underleaves crenulate. Plants 1.0–1.5 mm wide. Lobules small, maximally 1/4 of leaf length. Only known from Serra dos Orgãos	<i>L. beyrichiana</i>
48.	Perianth scarcely exerted beyond the bracts (to maximally 1/3 of perianth length), with a long beak. Margins of leaves and underleaves entire. Plants maximally 1.0 mm wide. Lobules larger than 1/4 leaf length. Common and widespread species	<i>L. capensis</i>
49.	Underleaves wider than long.....	50
49.	Underleaves not wider than long.....	52
50.	Cuticle smooth. Underleaves with a large cell at either side of the base, where the underleaf margin joins the stem	<i>L. puiggariana</i>
50.	Cuticle papillose. Underleaves without large cell at the base	51
51.	Leaf margins entire. Lobules very small, to 1/6 of leaf length. Underleaves bifid to 1/2. Perianth 5-keeled.....	<i>L. anomala</i>

51.	Leaf margins crenulate. Lobules larger, 1/4–1/3 of leaf length. Underleaves bifid to 1/4–1/3. Perianth terete. Only known from the type from Serra dos Orgãos.....	<i>L. beyrichiana</i>
52.	Underleaf bases rounded-cordate. Trigones conspicuous, intermediate thickenings present. Leaves plane or slightly convex. Perianth 5-keeled.....	<i>L. flava</i>
52.	Underleaf bases cuneate. Trigones inconspicuous, intermediate thickenings ± absent. Leaves distinctly convex. Perianth terete.....	<i>L. capensis</i>
53.	Well-developed lobules 1/3–1/2 of leaf length. Cuticle finely punctate-papillose.....	54
53.	Well-developed lobules smaller, maximally 1/4 of leaf length. Cuticle smooth.....	58
54.	Leaves obliquely spreading, ovate-oblong, with rounded to obtuse apices.....	55
54.	Leaves obliquely to widely spreading, ovate-orbicular, with rounded apices.....	56
55.	Plants dioicous. Shoots fragile, easily fragmenting. Underleaves as long as wide or longer than wide, frequently with a tooth on outer margins.....	<i>L. laetevirens</i>
55.	Plants autoicous. Shoots not fragile. Underleaves wider than long, without tooth on outer margins.....	<i>L. angusta</i>
56.	Leaves fully caducous, lobules not remaining on stems and branches. Leaf cells with uniformly thickened walls, without trigones.....	<i>L. cochleata</i>
56.	Leaves not caducous. Leaf cells with small trigones and intermediate thickenings.....	57
57.	Leaves obliquely spreading, strongly convex, sometimes squarrose. Underleaf lobes broadly triangular, 3–4 cells wide at the base, obtuse (ending in one cell), tip cell never broken.....	<i>L. pulchra</i>
57.	Leaves widely spreading, flat to weakly convex, not squarrose. Underleaf lobes narrowly triangular, 2-3 cells wide at the base, ending in a row of 2 cells, tip cell very thin-walled, often broken.....	<i>L. aphanes</i>
58.	Underleaves deeply bifid, to 2/3 of underleaf length; underleaf lobes narrowly lanceolate.....	<i>L. adpressa</i>
58.	Underleaves less deeply bifid, to maximally 1/2 of underleaf length; underleaf lobes broader, triangular.....	59
59.	Perianth keels with cilia or lacinia (or both).....	(<i>L. acanthogona</i>) 60
59.	Perianth keels smooth or crenate to crenulate, never with cilia or lacinia.....	63
60.	Perianth beak 4–6 cells long.....	61
60.	Perianth beak absent or 1–3 cells long.....	62
61.	Perianth keels with cilia and lacinia. Well-developed lobules usually oblong, rarely ovate.....	<i>L. acanthogona</i> var. <i>acanthogona</i>
61.	Perianth keels with cilia but without lacinia. Well-developed lobules ovate (sometimes subspherical).....	<i>L. acanthogona</i> var. <i>grossiretis</i>
62.	Perianth apex constricted, slightly depressed, without beak.....	<i>L. acanthogona</i> var. <i>diversicuspis</i>
62.	Perianth apex not constricted, with beak (beak 2–3 cells long).....	<i>L. acanthogona</i> var. <i>crustulata</i>
63.	Leaf apex rounded to obtuse, flat or recurved. Leaf margins entire. Gynoecia on elongate branches. Perianth keels entire or slightly toothed.....	<i>L. laeta</i>
63.	Leaf apex rounded, obtuse or pointed, flat. Leaf margins crenulate. Gynoecia on very short or elongate branches. Perianth keels crenulate to crenate by mammillose cells.....	64
64.	Underleaves 1.5–2× wider than stem, longer than wide or as long as wide. Very common in Brazil.....	<i>L. glaucescens</i>
64.	Underleaves larger, 2–4× wider than stem, wider than long. Uncommon in Brazil.....	65
65.	Gynoecia usually in a row on the main stem or on short branches, with fertile innovations. Female branches with vegetative leaves. Perianth keels slightly crenulate.....	<i>L. terricola</i>
65.	Gynoecia on very short branches with a sterile innovation, never in a row. Female branches without vegetative leaves. Perianth keels crenate to crenulate.....	<i>L. subsessilis</i>

1a. *Lejeunea acanthogona* Spruce (1884: 177) var. *acanthogona*

Harpalejeunea acanthogona (Spruce) Steph., Sp. Hepat. 5: 246. 1913. Type:—ECUADOR. Mt. Tunguragua, 3000 m, “supra truncus putrescentis,” *Spruce L528* (holotype, MANCH-000001!).

Crossotolejeunea bogotensis Steph. (syn. fide Reiner-Drehwald & Goda 2000).

Crossotolejeunea cristatella Steph. (syn. fide Reiner-Drehwald & Goda 2000).

Description and illustration: Reiner-Drehwald & Goda (2000).

Plants 0.5–0.9 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, obliquely to widely spreading; lobe ovate to slightly falcate, ± flat 300–450 µm long × 200–370 µm wide, dorsal margin arched, entire or crenulate, ventral margin straight to slightly arched, entire or crenulate, apex rounded to obtuse to bluntly apiculate; leaf cells oblong to hexagonal, 11–23 × 10–33 µm, thin-walled, trigones small to indistinct, intermediate thickenings occasional; cuticle smooth to slightly papillose; oil bodies not seen; lobule well-developed usually oblong, rarely ovate, inflated, 1/3–1/2 of leaf length, free margin slightly involute to plane, tooth short, keel arched. *Underleaves* small, 1.5–2.0× stem width, suborbicular, distant, bifid to 1/2, sinus V-shaped, lobes triangular, bases cuneate, insertion line slightly arched. *Autoicous*. *Androecia* on short branches, with 3–4(–9) pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on main stem or on short branches, with innovation, bract lobe obovate, margins entire, apex rounded, bracteole oblong, shortly bifid. *Perianths* longly exerted, obovoid to cylindrical, 5-keeled, keels strongly crenate or with cilia, lacinia or teeth, beak 4–6 cells long (ca. 90–140 µm) (description based in part on Reiner-Drehwald & Goda 2000).

Comment:—The main characters of *L. acanthogona* var. *acanthogona* are the perianth keels with 1-celled teeth, cilia and lacinia, the rather long perianth beak, ca. 90–140 µm (4–6 cells) long, small, wider than long underleaves and the fully or partially inflated lobules with a involute or flat free margin.

World distribution:—Brazil, Paraguay, northern Argentina and northern Andes (Venezuela, Colombia, Ecuador) (Reiner-Drehwald 2000, Reiner-Drehwald & Goda 2000, Reiner-Drehwald *et al.* 2018, this study).

Distribution in Brazil:—Southern (Yano 2008).

Habitat:—Rainforest, on living trees, leaves and rotten logs.

1b. *Lejeunea acanthogona* var. *crisulata* (Steph.) Gradst. & C.J.Bastos, *comb. nov.*

Crossotolejeunea crisulata Steph., Hedwigia 35: 75. 1896 (*Lejeunea crisulata* [Steph.] M.E.Reiner & Goda); Reiner-Drehwald & Goda (2000).

Lejeunea apiahyana (Steph.) Suhil.K.Singh (syn. fide Bastos 2018b).

Lejeunea cristuliflora (Steph.) M.E.Reiner & Goda, J. Hattori Bot. Lab. 89: 19. 2000 (*Crossotolejeunea cristuliflora* Steph.), *syn. nov.*

Type:—BRAZIL. São Paulo: Apiahy, *Puiggari s.n.* (holotype, G-010095!).

Lejeunea resupinata (Steph.) Steph. (syn. fide Reiner-Drehwald *et al.* 2018).

Trachylejeunea didrichsenii Steph., Hedwigia 35: 138. 1896, *syn. nov.* Type:—BRAZIL. Minas Gerais, Sítio, *Wainio 68* (isosytype, MANCH-000147!).

Description and illustration: Reiner-Drehwald & Goda (2000, as *L. crisulata*).

Plants 0.5–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, obliquely to widely spreading; lobe ovate to slightly falcate, dorsal margin arched, entire or crenulate, ventral margin straight to slightly arched, apex rounded; cuticle smooth; lobule ovate, fully or partially inflated, free margin involute to flat, tooth short, keel arched. *Autoicous*. *Androecia* on main stem, 2–6 pairs of bracts, bracteole restricted to the base of the spike. *Gynoecia* on main stem or on short branches. *Perianths* obovate, apex not constricted, 5-keeled, keels strongly crenate or with cilia, lacinia or teeth, beak short, 2–3 cells long, 45–60(–75) µm long.

Comment:—*Lejeunea acanthogona* var. *crisulata* differs from the typical variety in the shorter perianth beak, being only 2–3 cells long (45–60(–75) µm). In contrast, the beak in var. *acanthogona* is 4–6 cells long (ca. 90–140 µm). *Lejeunea cristuliflora* is just a rather robust phenotype of *L. acanthogona* var. *crisulata*, up to 1.5 mm wide with leaf lobule flattened towards the free margin. *Trachylejeunea didrichsenii* has short-beaked perianths and is a synonym of var. *crisulata*. *Trachylejeunea didrichsenii* was erroneously listed as a synonym of *Cyclolejeunea luteola* (Spruce) Grolle in the “Catalogue of the liverworts of Colombia” (Gradstein & Uribe 2016). The latter synonymy was based on a misidentified specimen from Colombia, not on the type.

World distribution:—Brazil, tropical Andes (Venezuela to Peru), Panama (Reiner-Drehwald & Goda 2000, Reiner-Drehwald *et al.* 2018).

Distribution in Brazil:—Northeastern, Southeastern. Further records: Southern (Yano, 2008, Ristow *et al.* 2015).

Habitat:—Rainforest, on living trees and leaves.

Selected material examined:—BRAZIL. **Bahia**: Boa Nova, PARNA Boa Nova, Trilha Três Cachoeiras, 14°25'45"S, 40°07'18"W, 718 m, 7 November 2018, *S.B. Vilas Bôas-Bastos 3557-A* (ALCB, as *L. crisulata*). **Espírito Santo**: Domingos Martins, Parque Estadual Pedra Azul, 14 May 2009, *L.T. Penha 315* (ALCB, as *L. crisulata*); Ubú, 16 May 1965, *D.M. Vital 355* (SP). **Rio de Janeiro**: Itatiaia, Parque Nacional do Itatiaia, trilha para a bifurcação da Travessia Rui Braga, 22°25'98"S, 44°38'30"W, 1700 m, 9 April 2014, *M.A Rezende & D.P. Costa 172* (RB, as *L. crisulata*). **São Paulo**: Serra do Mar, Paranapiacaba, 1000 m, 20 September 1986, *A. Schäfer-Verwimp & I. Verwimp 7616* (hb. Schäfer-Verwimp, as *L. cristuliflora*).

1c. *Lejeunea acanthogona* var. *diversicuspis* (Spruce) Gradst. & C.J.Bastos, *comb. nov.*

Lejeunea diversicuspis Spruce, Trans. & Proc. Bot. Soc. Edinburgh 15: 176. 1884; Reiner-Drehwald *et al.* (2018).

Crossotolejeunea parva Steph. (syn. fide Reiner-Drehwald *et al.* 2018).

Lejeunea erostrata M.E.Reiner & Goda., J. Hattori Bot. Lab. 89: 25. 2000. Type:—BRAZIL. Amazonas: Rio Negro, São Gabriel, *Spruce s.n.* (lectotype, designated here, G-18429!; isolectotype, JE).

Lejeunea megalantha Spruce (syn. fide Reiner-Drehwald *et al.* 2018).

Description and illustration: Reiner-Drehwald & Goda (2000, as *L. erostrata*).

Plants 0.4–0.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate to contiguous, obliquely to wide spreading; lobe ovate, dorsal margin entire to crenulate, ventral margin straight, entire to crenulate, apex rounded to obtuse; cuticle smooth to finely papillose; lobule ovate, inflated, 1/2–1/3 of leaf length, free margin involute, tooth short, keel arched. *Underleaves* small, 1.4–1.7× stem width, oblong, distant, bifid to 1/2, lobes triangular, bases cuneate, insertion line curved. *Autoicous*. *Androecia* on short branches, 2–3 pairs of bracts, bracteole restricted to the base of the spike. *Gynoecia* on short branch or in main stem, with one innovation. *Perianths* obovate, 5-keeled, keels 2-winged, wing 1(–2) cells long, strongly crenulate by projecting cells, apex constricted, slightly depressed, beak absent.

Comment:—The main character of *Lejeunea acanthogona* var. *diversicuspis* is the perianth apex without beak (Reiner-Drehwald *et al.* 2018). The perianth keels are strongly crenate by projecting cells.

World distribution:—Endemic to the upper Rio Negro region of Brazil and Venezuela (São Gabriel, San Carlos).
Distribution in Brazil—Northern.

Habitat:—Rainforest, on living trees and rotten logs.

1d. *Lejeunea acanthogona* var. *grossiretis* (Steph.) Gradst. & C.J.Bastos, *comb. nov.*

Crossotolejeunea grossiretis Steph., Hedwigia 35: 75. 1896. *Lejeunea grossiretis* (Steph.) M.E.Reiner & Goda.

Description and illustration: Reiner-Drehwald & Goda (2000), Bastos & Yano (2009).

Plants small, 0.8–1.1 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide spreading; lobe ovate, dorsal margin entire to weakly crenate, ventral margin straight to slightly arched, entire, apex rounded to obtuse; cuticle smooth; lobule strongly inflated, ovate, 1/5–1/4 of leaf length, free margin involute, tooth short, keel arched. *Underleaves* small, 1.5–2.0× stem width, distant, suborbicular to ovate, bifid to 1/3–1/2, lobes triangular, bases cuneate. *Autoicous*. *Androecia* on short branches, 2–4 pairs of bracts, bracteole restricted to the base of the spike. *Gynoecia* on short branch or on main stem, with one innovation. *Perianths* obovate, 5-keeled, keels with cilia or teeth, beak long, 5–6 cells long, up to 100 µm long.

Comment:—*Lejeunea acanthogona* var. *grossiretis* differs from the typical variety in perianth keels with cilia only, without lacinia, and the shorter, ovate to subspherical lobules. Reiner-Drehwald & Goda (2000) described the lobules of *L. acanthogona* as oblong and those of *L. grossiretis* as subspherical, but we found ovate lobules in populations of both species (in addition to oblong ones in populations of *L. acanthogona* and subspherical ones in *L. grossiretis*). Moreover, in the illustration of *L. acanthogona* in Reiner-Drehwald & Goda (2000) some lobules are ovate rather than oblong. Regarding the perianth, we consider the presence of cilia and lacinia in *L. acanthogona* and the presence of cilia only (no lacinia) in *L. grossiretis* as insufficiently strong evidence for separation of the two taxa at the species level. We therefore treat *L. grossiretis* as a variety of *L. acanthogona*. The type of *L. grossiretis* is very poor (Reiner-Drehwald & Goda 2000, p. 29) and was therefore not examined. Instead, we studied copious fertile recent specimens of the species identified by Dr. Reiner-Drehwald.

World distribution:—Brazil.

Distribution in Brazil:—Northeastern, Southeastern.

Habitat:—Rainforest, on living trees and rotten logs.

Selected material examined:—BRAZIL. **Bahia**: Eunápolis, Estação Veracel, 16°22'S, 39°10'W, 70–100 m, 9 June 1999, S.B. Vilas Bôas-Bastos & C. Bastos 398, 462, 508, 517 (ALCB, as *L. grossiretis*, det. M.E. Reiner-Drehwald). **Espírito Santo**: Ubú, 16 April 1965, D.M. Vital 355 (SP, as *L. grossiretis*, det. M.E. Reiner-Drehwald). **São Paulo**: Cananéia, junto do Sambaqui, perto do canal do Ararapira, 10 July 1981, O. Yano 3839 (SP).

2. *Lejeunea adpressa* Nees, in Gottsche *et al.* (1845: 380); Reiner-Drehwald (2009b)

Eulejeunea setistipa Steph. (syn. fide Reiner-Drehwald 2009).

Lejeunea caespitosa auct. (non typus; syn. fide Reiner-Drehwald 2009).

Lejeunea carolensis Spruce (syn. fide Reiner-Drehwald 2009).

Lejeunea drymophila Spruce (syn. fide Reiner-Drehwald 2009).

Lejeunea drymophila Spruce var. *macrostachya* Spruce (syn. fide Reiner-Drehwald 2009).

Lejeunea limbata Spruce (syn. fide Reiner-Drehwald 2009).

Lejeunea longifissa Spruce (syn. fide Reiner-Drehwald 2009).

Lejeunea obidensis Spruce, Trans. & Proc. Bot. Soc. Edinburgh 15: 277. 1884, *syn. nov.* Type:—BRAZIL. Pará: Obidos, “in cortice,”

Spruce s.n., autoic., material poorly preserved (holotype, MANCH-000301!).

Lejeunea orbicularis Spruce (syn. fide Reiner-Drehwald 2009b).

Description and illustration: Schuster (1980, as *L. caespitosa*), Reiner-Drehwald (2009b), Gradstein & Ilkiu-Borges (2009, as *L. longifissa*).

Plants 0.8–1.2 mm wide. *Ventral merophyte* two cells wide. *Leaves* obliquely to widely spreading; lobe ovate, flat, 350–470 µm long × 250–340 µm wide, dorsal margin slightly arched, entire, ventral margin straight, apex rounded to obtuse; leaf cells oblong to hexagonal, 22–40 × 12–27 µm, thin-walled, trigones small, intermediate thickenings 0–2 per cell; cuticle smooth; oil bodies finely segmented, ca. 3–12 per cell (Gradstein *in press*); lobule ovate, 1/3–1/4 of leaf length, frequently reduced, free margin involute to plane near the apex, tooth short, keel slightly arched. *Underleaves* distant, 1.0–2.0× stem width, deeply bifid (to 2/3), sinus U-shaped to V-shaped, lobes narrowly triangular to lanceolate, bases cuneate, insertion line slightly arched. *Autoicous*. *Androecia* on short branches, with 3–4 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches or on main stem, with one sterile or fertile innovation, bract lobe ovate, margins entire, bracteole ovate-oblong, bifid to ca. 1/2. *Perianths* emergent to ca. 1/3, obovoid, 5-keeled, keels usually smooth, occasionally crenate, lateral keels sometimes expanded above, beak 2 cells long.

Comment:—*Lejeunea adpressa* is recognized by the delicate plants with flat, ovate leaf lobes with entire margins and rounded to obtuse apex, very thin-walled leaf cells with small trigones, frequently reduced lobules, and, especially, small, deeply bifid (to 2/3) underleaves with lanceolate lobes. The perianths are usually smooth and the lateral keels are sometimes expanded above. *Lejeunea obidensis* Spruce (1884: 277) was accepted as a good species by Moura *et al.* (2013). We have studied the type material of *L. obidensis* in the Spruce herbarium in MANCH. Although the material is poorly preserved, we found that it is morphologically completely identical to *L. adpressa*.

World distribution:—Widely distributed in tropical America, from Mexico and Florida to Brazil and northern Argentina (Reiner-Drehwald 2009b).

Distribution in Brazil:—Northern, Northeaster, MW, Southeastern. Further records: Southern (Yano, 2008).

Habitat:—Rainforest, on living trees, leaves and rotten logs.

Selected material examined:—BRAZIL. **Acre**: Vicinity of Periquito, Rio Juruá-Mirim, 19 May 1971, *P.J.M. Maas et al.* P13146 (INPA). **Amazonas**: Manaus, Av. Floriano Peixoto, 12 August 1974, *D. Griffin III et al.* 831 (INPA). **Bahia**: Jussari, RPPN Serra do Teimoso, 15°12'S, 39°29'W, 350 m, 21 March 2018, *C. Bastos* 6242, 6263, 6265 (ALCB). **Espírito Santo**: Domingos Martins, Parque Estadual Pedra Azul, 5 August 2009, *L.T. Penha* 457 (ALCB). **Goiás**: Chapada dos Veadeiros, estrada do Cruzeiro, 13°57'52"S, 47°29'43"W, 1511 m, 12 February 2011, *Bonomo et al.* 09 (UB). **Mato Grosso**: Aripuanã, Estação Humboldt, 25 April 1977, *Damião* 2413 (INPA); Cuiabá, BR 364 Cuiabá-São Vicente, km 50, 20 May 1984, *N. Saddi & Vital* 6039-B (UB). **Minas Gerais**: Santa Bárbara, Parque Nacional do Caraça, 27 May 1983, *O. Yano & J.R. Pirani* 7334 (SP). **Paraíba**: Areia, Parque Estadual do Pau Ferro, 6°57'55"S, 35°45'02"W, 645 m, 9 September 2011, *E.B. Valente* 1825p.p. (HUEFS). **Rio de Janeiro**: Angra dos Reis, trilha para o Pico do Papagaio, 21 March 1995, *O. Yano et al.* 23548 (SP). **Roraima**: Serra Tepequem, 1200 m, 17 February 1967, *G.T. Prance et al.* 4451 (INPA). **São Paulo**: Ibiúna, Bosque de Ibiúna, 2 December 1982, *O. Yano* 4702 (SP).

3. *Lejeunea angusta* (Lehm. & Lindenb., in Lehmann 1832: 52) Montagne (1842: 469)

Jungermannia angusta Lehm. & Lindenb. Type:—MEXICO. Xalapa, without collector (isotype, PC-Mont. 2118!).

Description and illustration: Ilkiu-Borges & Oliveira-da-Silva (2018).

Plants 0.4–0.9 mm wide. *Ventral merophyte* two cells wide. *Leaves* distant to subimbricate, obliquely spreading to suberect; lobe ovate-oblong, 150–350 µm long × 100–280 µm wide, dorsal margin arched, entire, ventral margin straight, entire, apex rounded; leaf cells isodiametric, trigones small, intermediate thickenings absent; cuticle densely punctate-papillose; oil bodies not seen; lobule ovate, 1/2–2/3 of leaf length, tooth long, falcate, keel slightly arched. *Underleaves* small, 1.5–2.0× stem width, suborbicular, bifid to 1/3, lobes acute to short-acuminate, bases cuneate, insertion line curved. *Androecia* and *gynoecia* not observed.

Comment:—*Lejeunea angusta* is a small (0.4–0.9 mm wide), neotropical plant, characterized by leaves obliquely spreading, leaf lobes ovate-oblong, lobules strongly inflated, ca. 1/3 of leaf length, cuticle densely punctate-papillose, and small (ca. 1.0–2.0× stem width), bifid underleaves. According to Reiner-Drehwald (2007), in the “Preliminary key to the genus *Lejeunea* in Brazil”, the perianth keels are smooth and the leaf cells have trigones; we were unable to observe these characters in the very poorly developed type material. *Lejeunea angusta* is very similar to *L. laetevirens*

Nees & Mont. (1842: 469), but the shoots of *L. angusta* are not fragmenting like *L. laetevirens* and the underleaves are wider than long and never produce a tooth on the outer margins. *Lejeunea angusta* also resembles *L. oligoclada* but the latter species is dioicous and produces caducous leaves.

World distribution:—Tropical America.

Distribution in Brazil:—Northern, Northeastern. Further records: Southeastern (Ilkiu-Borges & Oliveira-da-Silva 2018, Costa 2017).

Habitat:—Montane and lowland forest, on living trees.

Selected material examined:—BRAZIL. **Amazonas**: Barcelos, Serra do Aracá, Serrinha, alto do Rio Aracá, 0°24'53"N, 63°23'08"W, 18 August 2014, *C.E. Zartman 9637* (INPA, ALCB). **Bahia**: Miguel Calmon, Parque Estadual das Sete Passagens, Trilha Geral, 11°39'S, 40°53'W, 1000 m, 18 December 2005, *J. Ballejos 230* (ALCB). **Pará**: Serra dos Carajás, Serra do Tarzan, 6°19'45"S, 50°00'27.4"W, 758 m, 1 September 2015, *A.L. Ilkiu-Borges et al. 3667* (MG).

4. *Lejeunea anomala* Lindenber & Gottsche (1851[1852]: 636); Dauphin (2003). Fig. 1

Ceratolejeunea anomala (Lindenb. & Gottsche) Steph., Sp. Hepat. 5: 396. 1913.

Lejeunea matteola Spruce (syn. fide Reiner-Drehwald 2003).

Taxilejeunea carinata Herzog (syn. fide Dauphin 2005).

Description: Dauphin (2003). Illustration: Bonner (1953, as *Ceratolejeunea anomala*). The species has been illustrated in *Icones Hepaticarum* (Stephani 1985) under the names *Ceratolejeunea anomala* and *Lejeunea matteola*. A modern illustration of the species is lacking.

Plants 1.0–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate to contiguous, wide spreading; lobe ovate-oblong, rather flat, mostly falcate, 510–780 µm long × 330–510 µm wide, dorsal margin slightly arched, entire, ventral margin entire, arched, apex rounded, plane; leaf cells isodiametric to elliptical, 30–65 × 30–35 µm, trigones distinct, intermediate thickenings 1–2 per cell; cuticle papillose; oil bodies granular; lobule ovate, very small, ca. 1/6–1/7 of leaf length, sometimes reduced, free margin plane, tooth short. *Underleaves* 3–5(–6) × stem width, reniform, bifid to 1/2, lobes acute, bases cordate, rounded. *Dioicous*. *Androecia* on short branches, with 2–3 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, usually two in a short row, bract lobe obovate, margins entire, apex rounded to acute. *Perianths* 5-keeled, keels crenate, beak short, 1–2 cells long.

Comment:—*Lejeunea anomala* resembles *L. pulverulenta* in the rounded leaf apex, the densely papillose cuticle, the large underleaves with a cordate base, and two gynoecia in a short row. The latter species differs from *L. anomala* however, in autoicous sexuality, leaves with crenulate margins and a broad border of 5–6 rows of smaller marginal cells perpendicular to the larger inner cells, and underleaves with large auricles. *Lejeunea anomala* may also be confused with *L. cerina* but the latter species differs by somewhat pointed leaves (apex not fully rounded), crenulate leaf margins, cuticle more strongly papillose and single gynoecia, never in a row.

Material of *L. anomala* in herbarium SP (SP-081941) proved to be misidentified and belongs to *Cheilolejeunea*; it is probably a poorly developed specimen of *C. rigidula* (Montagne 1840: 336) Schuster (1971: 102).

World distribution:—Costa Rica, Suriname, Ecuador and Brazil (Stephani 1913, Dauphin 2003, 2005, Gradstein & Costa 2003).

Distribution in Brazil:—Southeastern. Further records: Northern, Southern (Costa *et al.* 2005, Yano 2008).

Habitat:—Lowland and montane rainforest, on living trees.

Selected material examined:—BRAZIL. **Minas Gerais**: Senhora do Carmo, Serra dos Alves, 19°28'52"S, 43°26'05"W, 1100 m, 23 July 2011, P.E.A.S. *Câmara et al. 2477* (UB).

5. *Lejeunea aphanes* Spruce (1881: 36); Schäfer-Verwimp & Reiner-Drehwald (2009)

Lejeunea autoica R.M.Schust. (syn. fide Reiner-Drehwald 2000a)

Lejeunea filipes Spruce (syn. fide Schäfer-Verwimp & Reiner-Drehwald 2009).

Lejeunea humefacta Spruce, Trans. & Proc. Bot. Soc. Edinburgh 15: 15. 275. 1884, *syn. nov.* Type:—BRAZIL. Amazonas: upper Rio Negro, São Gabriel, mixed with *Ceratolejeunea cubensis*, *Spruce L317* (lectotype, designated here, MANCH-0002321!; isolectotypes, MANCH-000231! MANCH-000233!).

Description and illustration: Schuster (1980, as *L. autoica*), Reiner-Drehwald (2000a, as *L. filipes*), Gradstein & Ilkiu-Borges (2009, as *L. filipes*).

Plants 480–900 µm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, obliquely to widely spreading; lobe ovate, 160–300 µm long × 130–250 µm wide, convex, dorsal margin arched, entire to crenulate, ventral margin straight, entire, apex rounded to obtuse; leaf cells oblong to hexagonal, 14–24 × 10–12 µm, thin walled, trigones small, intermediate thickenings absent; cuticle weakly papillose to almost smooth; oil bodies finely granular, few per cell; lobule often reduced, when well-developed ovate, inflated, ca. 1/3 of leaf length, free margin involute, apical tooth short, keel arched. *Underleaves* small, ca. 1.0–2.0× stem width, distant, bifid to 2/5–1/5, lobes narrow, 2–3 cells wide at the base, ending in a row of two cells, tip cell very thin-walled, often broken, sinus U-shaped or V-shaped, bases cuneate, insertion line straight to slightly arched. *Autoicous*. *Androecia* on main stem or on short branches or innovations, with 2–5 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on main stem or on short branches, with 1(–2) sterile or fertile innovations, bract lobe ovate, margins entire, apex acute, bracteole oblong, bifid to ca. 1/3. *Perianths* 5-keeled, keels smooth, beak 2–3 cells long.

Comment:—*Lejeunea aphanes* is a very common species in Brazil. The tip cells of underleaf lobes are very thin-walled and are often broken. *Lejeunea humefacta* is a phenotype with lobules that are often reduced, only occasionally reaching 1/3 of lobe length. In other respects the plants fit *L. aphanes* well.

World distribution:—Widespread in tropical and subtropical America and Africa.

Distribution in Brazil:—Northern, Northeastern. Further records: Middle-Western, Southeastern (Yano 2008).

Habitat:—Lowland and montane rainforest, on living trees, leaves and rotten logs.

Selected material examined:—BRAZIL. **Bahia**: Wenceslau Guimarães, povoado de Nova Esperança, 13°35'43"S, 39°43'13"W, 583 m, 28 September 2017, *C. Bastos* 5972 (ALCB). **Ceará**: Ubajara, Serra da Ibiapaba, Trilha do Mirante, 3°48'15"S, 40°54'23"W, 924 m, 25 August 2010, *C. Bastos* 5402, 5412 (ALCB). **Roraima**: Mucujai, Serra do Apiaú, 2°26'05"N, 61°24'56"W, 961 m, 16 April 2016, *A.M. Sierra* 5565 (INPA. ALCB).

6. *Lejeunea asperrima* Spruce (1884: 160); Ilkiu-Borges (2005)

Prionolejeunea asperrima (Spruce) Steph., Sp. Hepat. 5: 198. 1913.

Echinocolea asperrima (Spruce) R.M.Schust., Beih. Nova Hedwigia 9: 125. 1963.

Description and illustration: Ilkiu-Borges (2005), Gradstein & Ilkiu-Borges (2009).

Plants 200–500 µm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, obliquely to widely spreading; lobe orbicular to ovate from narrow base, shallowly convex, 100–270 µm long × 65–200 µm wide, dorsal margin arched, strongly crenate, ventral margin slightly arched to straight, strongly crenate, apex rounded; dorsal surface of lobe roughened due to conically projected papillose cells; leaf cells oblong to rounded, 20–30 × 15–22 µm, thin-walled, trigones and intermediate thickenings absent; cuticle smooth; oil bodies not seen; lobule ovate, inflated, large, 1/3–1/2 of leaf length, free margin involute, tooth short, keel arched, papillose. *Underleaves* small, ca. 1.0–2.0 × stem width, distant, bifid to 1/2–1/3, sinus V-shaped or U-shaped, lobes triangular, bases cuneate, insertion line arched. *Dioicous*. *Androecia* on main stem or on short branches, 3–6 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on main stem or on short branches, with one sterile innovation, bract lobe obovate, margins strongly crenate, apex rounded, bracteole obovate, bifid, margins crenate. *Perianths* obovoid, exerted to ca. 1/2, 5-keeled in the upper half, keels denticulate, perianth surface roughened by conically papillose cells near the keels, beak 1–2 cells long.

Comment:—*Lejeunea asperrima* is a very tiny species that is readily distinguished by the dorsal leaf surface and margins roughened by conically projecting cells. In Brazil, the species may only be confused with the very rare *L. subspathulata* Spruce (1884: 173), but this latter species differ by smooth lobule keel and having dorsal surface roughened only in the upper half.

World distribution:—Lesser Antilles, northern South America.

Distribution in Brazil:—Northern (Ilkiu-Borges 2005), Northeastern.

Habitat:—Rainforest, on living trees, rotten logs and leaves.

Selected material examined:—BRAZIL. **Bahia**: Wenceslau Guimarães, povoado de Nova Esperança, Estação Ecológica de Wenceslau Guimarães, 29 September 2017, *C. Bastos* 6069 (ALCB).

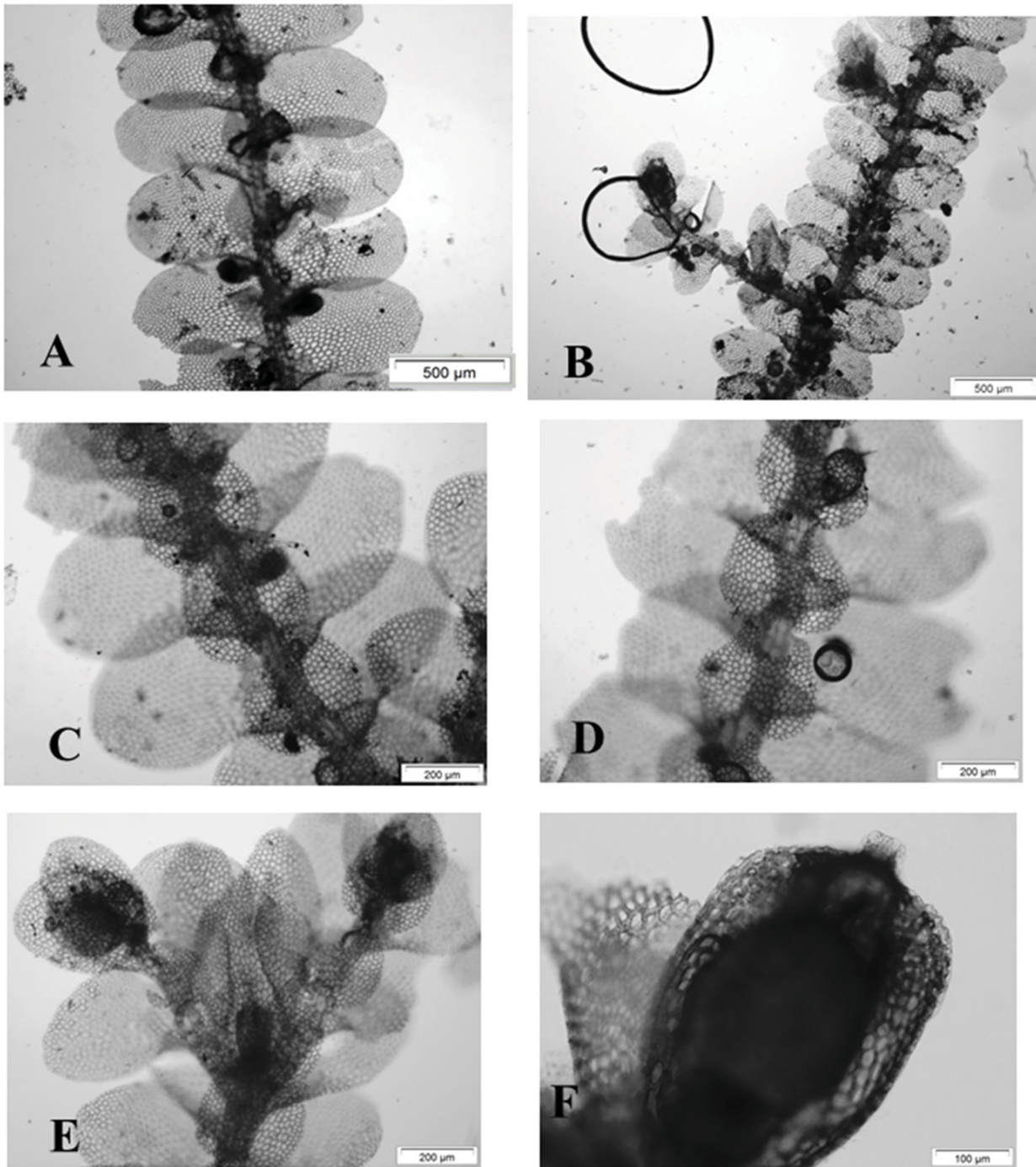


FIGURE 1. *Lejeunea anomala* Lindenb. & Gottsche. A–B: Habit in ventral view. C–D: Contiguous bifid underleaves. E: Gynoecia with two lejeuneoid innovations, ventral view. F: Perianth (all from Câmara *et al.* 2477).

7. *Lejeunea asthenica* Spruce (1884: 222). Fig. 2

Taxilejeunea asthenica (Spruce) Steph., Sp. Hepat. 5: 483. 1914. Type:—VENEZUELA. S. Carlos del Rio Negro, in “caatingas”, ad arborum truncos ramosque, *R. Spruce s.n.* (lectotype, designated here, G-00115808!).

Plants 1.0–1.3 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, obliquely to rather widely spreading; lobe ovate, rather flat, 520–700 µm long × 380–525 µm wide, dorsal margin slightly arched, entire, ventral margin straight to slightly arched, entire or with 1(–3) small teeth near apex, apex sharply acute to acuminate, plane or recurved; leaf cells isodiametric to elongate-hexagonal, 15–53 × 20–28 µm, with distinct, simple-triangular to radiate trigones and 1–2 intermediate thickening on each wall; cuticle smooth or finely punctate-papillose; oil bodies

not seen; lobule frequently reduced, when well-developed rectangular to subquadrate, ca. 1/6–1/7 of leaf length, free margin plane to slightly involute, tooth short, keel straight to slightly arched. *Underleaves* distant, ovate, longer than wide, 2–3.0× stem width on main stems, smaller on branches, bifid to 1/2, sinus V-shaped, lobes triangular-acute, bases cuneate to somewhat rounded, never auriculate, insertion line curved, with a large cell at the angles. *Autoicous*. *Androecia* on short branches, with 3–4 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, with one usually fertile innovation, bract lobe obovate, margins entire or toothed, apex acute, bracteole obovate, bifid. *Perianths* obpyriform, shortly 5-keeled near the apex, keels weakly crenate, beak very short (1–2 cells long) to inconspicuous.

Comment:—*Lejeunea asthenica* is close to *L. flaccida* but differs in the sharply apiculate to cuspidate leaf tips, the conspicuous trigones and numerous intermediate thickenings, the densely papillose cuticle, the smaller underleaves and presence of a large cell in the angles of the underleaf insertion (like in *L. puiggariana* and some other species of *Lejeunea*).

World distribution:—Amazonia (Brazil, Ecuador, Peru, Venezuela).

Distribution in Brazil:—Northeastern. Further records: Southeastern (Schiffner & Arnell 1964).

Habitat:—Rainforest, on living trees.

Selected material examined:—BRAZIL. **Bahia**: Camacan, Serra Bonita, 15°23'S, 39°34'W, 853 m, 26 February 2015, *Costa, I.M.O. 10-A* (ALCB). ECUADOR. **Zamora-Chinchipec**: road Loja – Zamora 35 km, surroundings of Estación Científica San Francisco, 3°58'S, 79°05'W, 1825 m, 19 March 2012, *A. Schäfer-Verwimp & M. Nebel 32985* (hb. Schäfer-Verwimp).

8. *Lejeunea atlantica* C.J.Bastos & Gradst., sp. nov. Fig. 3

Diagnosis: Plants very small, 380–430 µm wide, leaf lobe ovate-oblong, narrowed to the apex, obliquely spreading, margins entire to crenulate, apex acute to short-apiculate, leaf cells thin-walled or uniformly thick-walled, trigones and intermediate thickenings lacking, cuticle smooth, leaf lobule ovate, strongly inflated, ca. 1/2 of leaf length, underleaves small, about as long as wide, ca. 1.5–2.0× stem width, bifid to 1/2–2/3, sinus U-shaped to widely acute, lobes narrowly triangular, bases cuneate, insertion line slightly curved. Dioicous (?). Vegetative reproduction absent.

Type:—BRAZIL. Bahia, Wenceslau Guimarães, Nova Esperança, Estação Ecológica de Wenceslau Guimarães, Trilha Serra Grande, 13°35'43"S, 39°43'13"W, on tree trunk in montane rainforest, 583 m, 28 September 2017, *C. Sena 68A p.p.* (holotype, ALCB).

Plants 380–430 µm wide. *Ventral merophyte* two cells wide. Vegetative branches *Lejeunea*-type. *Stems* ca. 90 µm in diameter, in cross section with 7 epidermal cells and 3 medullary cells, thin-walled. *Leaves* imbricate, obliquely spreading; lobe ovate-oblong and narrowed to the apex, 220–260 µm long × 120–170 µm wide, dorsal margin slightly arched, entire to crenulate, ventral margin straight, entire to crenulate, apex acute to short-apiculate, plane; leaf cells hexagonal to oblong, 18–28 × 15–20 µm, thin-walled to uniformly thick-walled, trigones and intermediate thickenings indistinct; cuticle smooth; oil bodies not seen; ocelli absent; lobule ovate, strongly inflated, 100–120 µm long × 90–110 µm wide, ca. 1/2 of leaf length, free margin involute, tooth oblong, curved to falcate, keel arched, smooth to crenulate by projecting cells wall. *Underleaves* distant, small, about as long as wide, 75–90 µm long × 70–90 µm wide, ca. 1.5–2.0× stem width, suborbicular, bifid to 1/2–2/3, sinus U-shaped to V-shaped, lobes narrowly triangular, outer margins sometimes with a blunt tooth, bases cuneate, insertion line slightly curved. *Dioicous*. *Androecia* not seen. *Gynoecia* on main stem, with one lejeuneoid innovation, bract lobe ovate, 420 µm long × 220 µm wide, margins entire to crenulate, apex acute, lobule oblong, 180 µm long × 90 µm wide, apex rounded, bracteole ovate, 380 µm long × 220 µm wide, bifid to 1/2, sinus acute. *Perianths* not seen. Vegetative reproduction not observed.

Comment:—*Lejeunea atlantica* is characterized by the very small plants (380–430 µm wide), with obliquely spreading, ovate-oblong leaves with a narrow, acute to short-apiculate apex, thin-walled to uniformly thick-walled cells without trigones, a smooth cuticle and small, distant underleaves (ca. 1.5–2.0× stem width), which are bifid to 1/2–2/3 and with a U-shaped to V-shaped sinus. The new species resembles *L. laetevirens* but the latter species has a rounded to obtuse leaf apex, a papillose cuticle and leaf cells with trigones. With small underleaves and uniformly thick-walled cells *L. atlantica* also resembles *L. perpapillosa*, but the latter species has widely spreading leaves, a rounded leaf apex and a strongly papillose cuticle; moreover, the leaves in *L. perpapillosa* are caducous.

Lejeunea atlantica is so far known only from one collection from Bahia State, Northeastern Brazil. The type specimen was collected in tropical rainforest, growing on a living tree trunk, mixed with *L. grossitexta* and *L. aphanes*.

World distribution:—Brazil.

Distribution in Brazil:—Northeastern (Bahia State).

Habitat:—Rainforest, on living tree.

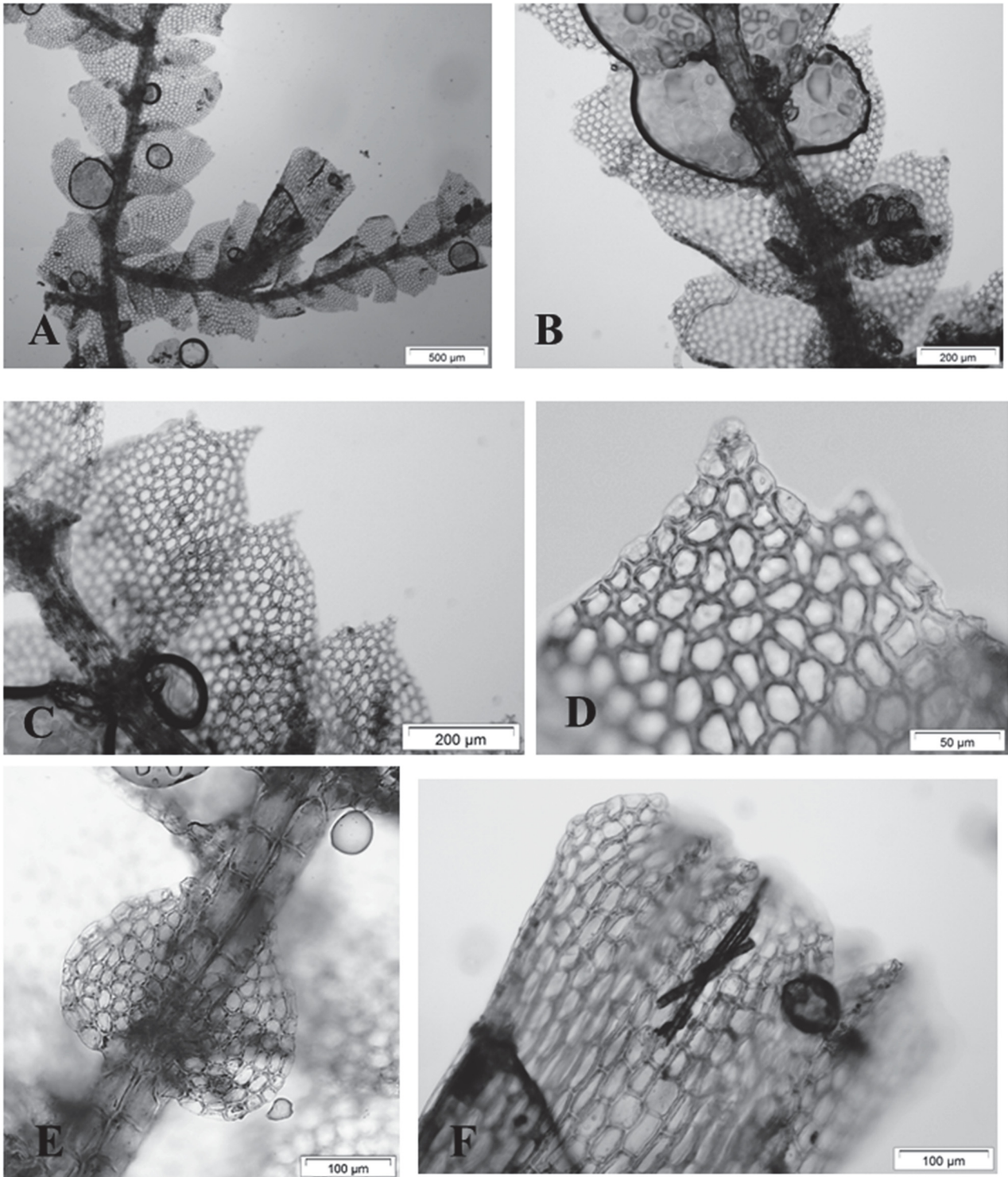


FIGURE 2. *Lejeunea asthenica* Spruce. A: Habit in ventral view, showing perianth in lateral branch. B: Androecial branch, ventral view. C–D: Leaf lobes apices with teeth. E: Suborbicular, bifid underleaf. F: Apical part of perianth (all from type).

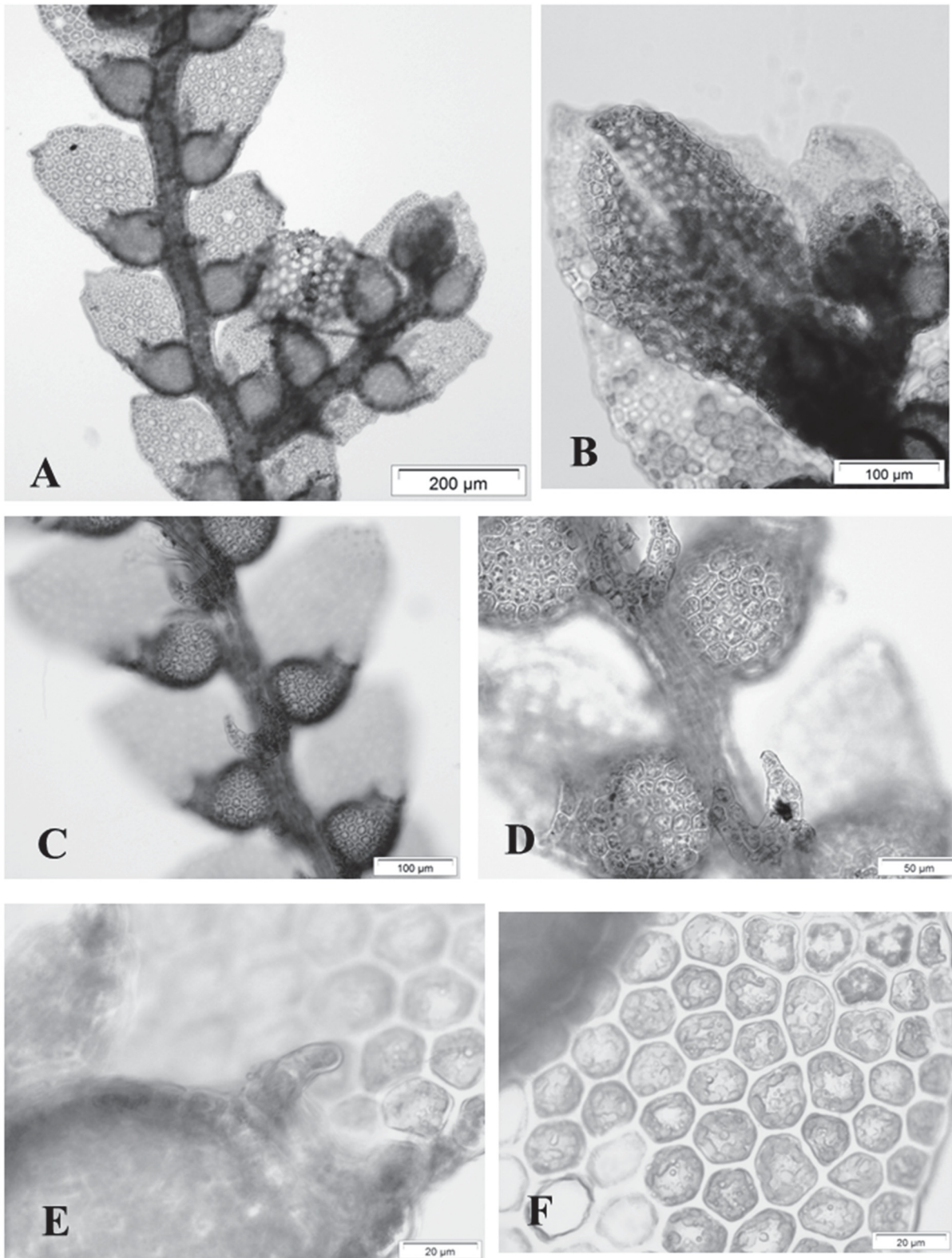


FIGURE 3. *Lejeunea atlantica* C.J.Bastos & Gradst. A: Habit in ventral view. B: Gynoecium showing bifid bracteole. C–D: Small, distant underleaves. E: Lobule apex with apical tooth. F: Leaf lobe cells (all from holotype).

9. *Lejeunea bermudiana* (Evans 1906: 132) Schuster (1980: 1105); Reiner-Drehwald & Goda (2000)

Crossotolejeunea bermudiana A. Evans.

Description and illustration: Schuster (1980, as *Taxilejeunea bermudiana*), Reiner-Drehwald & Goda (2000).

Plants 0.7–1.0 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide-spreading; lobe ovate, rather flat, 330–480 µm long × 250–400 µm wide, dorsal margin arched, entire or with a few small teeth near the apex, ventral margin straight to slightly arched, entire, apex obtuse to acute to apiculate, plane; leaf cells oblong to hexagonal, 20–43 × 10–25 µm, thin-walled, trigones small, intermediate thickenings occasional; cuticle smooth; oil bodies not seen; lobule ovate, inflated-swollen, 1/4–1/3 of leaf length, free margin involute, tooth usually short, keel arched. *Underleaves* distant, ca. 1.0–2.0× stem width, bifid to 1/2, lobe tips subacute, sinus V-shaped to U-shaped, margins entire or with one tooth, bases cuneate, insertion line arched. *Autoicous*. *Androecia* on short branches, with 2–4 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, with one sterile innovation, bract lobe ovate-oblong, margins toothed, apex acute, bracteole ovate, bifid to 2/5, margins mostly toothed. *Perianths* obovoid, exerted to ca. 1/2, 5-keeled, keels crenate or with teeth and cilia, beak 1–2 cells long.

Comment:—The distinctive features of *L. bermudiana* are the leaf apex obtuse to acute to apiculate and frequently with a few subapical teeth, and the crenate perianth keels with a few cilia. The species is close to *L. raddiana* but the latter species differs in having falcate leaves with a broadly recurved apex and crenate margins, underleaves with rounded to obtuse tips and perianth keels with a border of transversely arranged mammillose cells.

World distribution:—Rather widespread in tropical and subtropical America.

Distribution in Brazil:—Northern, Northeastern, Southeastern. Further records: Middle-Western (Goías: Serra Dourada, D.M. Vital 126685 [SP]) Southern (Yano 2008, Ristow *et al.* 2015).

Habitat:—Rainforest, on living trees, soil and rock.

Selected material examined:—BRAZIL. **Amazonas**: direção à Morro dos Seis Lagos, da BR-307, 18 August 1979, O. Yano 2037 (INPA, SP). **Bahia**: Abaíra, Catolés, Serra do Barbado, Mata da Forquilha, 13°17'27"S, 41°54'015"W, 1594 m, 5 September 2008, C. Bastos 5212 (ALCB). **Minas Gerais**: Santa Bárbara, Parque Natural do Caraça, 28 May 1983, O. Yano & J.R. Pirani 7392 (SP). **São Paulo**: Eldorado Paulista, Caverna do Diabo, ca. 200 m, ca. 24°42'S, 48°20'W, 29 September 1984, D.M. Vital & W.R. Buck 12536a (SP).

10. *Lejeunea beyrichiana* (Steph.) Gradst. & C.J.Bastos, *comb. nov.*

Taxilejeunea beyrichiana Steph., Sp. Hepat. 5: 460. 1914. Type:—BRAZIL. Rio de Janeiro: Serra dos Órgãos, “ad radices arborum”, *Beyrich s.n.*, autoic., c. per. (lectotype, designated here, G-00112009!).

Plants 1.0–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* (sub)imbricate, wide spreading; lobe ovate to ovate-falcate, convex, 600–700 µm long × 500–550 µm wide, dorsal margin arched, crenulate, ventral margin straight, crenulate, apex rounded; leaf cells elongate-hexagonal, 25–35 × 20–25 µm, trigones conspicuous, simple-triangular to radiate, intermediate thickenings well-developed, 1–2 per cell; cuticle finely papillose; oil bodies not seen; lobule small, ovate, fully inflated, ca. 1/4 of leaf length on stems (ca. 1/3 on branches), free margin involute, crenulate, tooth short, obtuse, invisible in optical view, keel curved, making a rather sharp angle with ventral margin of the lobe. *Underleaves* wider than long, size variable, when well-developed subimbricate, 4–4.5× stem width (on some shoots smaller, distant, ca. 2–3× stem wide), bifid to 1/4–1/3, sinus wide, V-shaped, lobes tips obtuse, margins crenate, ± bordered by somewhat smaller, quadrate to subrectangular cells, bases rounded-cordate, insertion line curved. *Dioicous*. *Androecia* unknown. *Gynoecia* on main stem or on short branches and with one often fertile innovation, resulting in 2–3 gynoecia in a row, bracts slightly smaller than vegetative leaves, suberect, lobe ovate, apex narrowly rounded, lobule ca. 1/2 lobe-length, obtuse, bracteole ovate-oblong, shortly bifid. *Perianths* terete, fully smooth, cylindrical, ca. 1.1 mm long, 0.5 wide, ca. 2× longer than wide, slightly expanded in the upper part, sometimes shortly stipitate, exerted to 1/2–2/3 of length, beak absent.

Comment:—*Taxilejeunea beyrichiana* resembles *L. capensis* in the terete perianth but differs from the latter species in the larger plants (1.0–1.5 mm wide) with crenulate leaf and underleaf margins, smaller lobules (maximally 1/4 of leaf length on stems), less deeply bifid underleaves (to 1/4–1/3) with cordate bases, and the cylindrical, longly exerted perianth (exserted to maximally 1/2–2/3) without beak. In the cylindrical, beakless perianth and the crenulate margins of leaves and underleaves, *L. beyrichiana* is similar to *L. combuensis*, a rare species recently described from várzea forest in Lower Amazonia, near Belém (Moura *et al.* 2012). However, *L. combuensis* differs from *L. beyrichiana* in

having plane leaves with an obtuse to acute apex, lobules with a plane to slightly incurved margin (tooth visible in optical view) and an almost straight keel, forming an almost straight line with the ventral margin of the leaf lobe, and smaller and more deeply bifid underleaves. Moreover, *L. combuensis* is autoicous.

World distribution:—Only known from Brazil.

Distribution in Brazil:—Southeastern.

Habitat:—Montane rainforest, on roots of trees.

11. *Lejeunea bombonasensis* Spruce (1884: 222)

Taxilejeunea bombonasensis (Spruce) Steph., Sp. Hepat. 5: 484. 1914. Type:—ECUADOR: Río Bombanasa, *Spruce L213* (lectotype, designated here, MANCH-CC18215! isoelectotypes, MANCH-CC18214! MANCH-CC18216!).

Lejeunea lusoria auct. (non typus) (*Taxilejeunea lusoria* auct.).

Taxilejeunea crebriflora (Spruce) Steph. (syn. fide Gradstein & Costa 2003).

Taxilejeunea implexa (Spruce) Steph. (syn. fide Gradstein & Costa 2003).

Taxilejeunea tenax (Spruce) Steph. (syn. fide Gradstein & Costa 2003).

Illustration: Gradstein & Costa (2003, as *Taxilejeunea lusoria*).

Plants 1.2–1.8 µm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, obliquely to widely spreading; lobe asymmetrically ovate-triangular, rather flat, 680–920 µm long × 840 µm wide, dorsal margin arched, entire or with few teeth near apex, ventral margin straight, entire, apex rounded to acute to short-apiculate; leaf cells oblong to hexagonal, 27–52 × 15–30 µm, trigones minute, intermediated thickenings absent; cuticle smooth; oil bodies finely segmented, 4–10 per cell; lobule usually reduced, when well-developed ovate to ovate-rectangular, 1/5–1/4 of lobe length, inflated to flattened, free margin involute, tooth short, keel slightly arched. *Underleaves* distant, 2–4× stem width, orbicular, bifid to 1/3–1/2, lobes triangular, bases cuneate to rounded, insertion line slightly curved. *Autoicous*. *Androecia* on short branches, with 2–3 pairs of bracts, bracteoles restricted to the base of the spik. *Gynoeceia* on the main stem or up to 6 in a row on innovating branches, bracts entire or slightly toothed. *Perianths* sharply and longly 5-keeled over (1/3–)1/2–2/3 of perianth length, keels smooth or crenulate, often widened in the upper third, beak 1–2 cells long.

Comment:—This species has generally been called *Taxilejeunea lusoria* (basonym: *Lejeunea lusoria*) but the type of *L. lusoria* belongs to *L. flaccida*. The latter species is readily separated from *L. bombonasensis* by the very short perianth keels.

World distribution:—Tropical America.

Distribution in Brazil:—Northern, Northeastern, Middle-Western. Further records: Southeastern, Southern (Yano 2008).

Habitat:—Rainforest, on living trees and rotten logs.

Selected material examined:—BRAZIL. **Amazonas**: São Gabriel, R. *Spruce L71* (MANCH-000235, as *L. implexa*). **Bahia**: Eunápolis, Estação Veracel, 16°22'S, 39°10'W, 70–100 m, 9 September 1999, C. Bastos & S.B. Vilas Boas-Bastos 1715 (ALCB). **Goiás**: Serra Geral do Paraná, ca. 3 km S of São João da Aliança, 850 m, H.S. Irwin et al. 31760 (UB).

12. *Lejeunea boryana* Montagne (1838: 47); Reiner-Drehwald & Goda (2000)

Crossotolejeunea boryana (Mont.) Schiffn., in Engler & Prantl, Nat. Pflanzenfam. 1, 3: 127. 1893.

Lejeunea boryana var. *concinna* Spruce (syn. fide Reiner-Drehwald & Goda 2000).

Description and illustration: Reiner-Drehwald & Goda (2000). Illustration: Gradstein & Ilkiu-Borges (2009).

Plants 0.5–0.8 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, widely spreading; lobe ovate, often falcate, slightly convex, 250–350 µm long × 260–290 µm wide, dorsal margin arched, entire to crenate, ventral margin arched, entire, apex acute to apiculate, plane; leaf cells oblong to hexagonal, 15–25 × 12–38 µm, thin-walled, trigones small, intermediate thickenings occasional, cuticle densely papillose; oil bodies not seen; lobule ovate, inflated, ca. 1/3–1/2 of leaf length, free margin involute, tooth elongate, falcate, keel arched. *Underleaves* small, distant, 1.3–2.5× stem width, deeply bifid to 2/3, sinus V-shaped to U-shaped, lobes narrowly triangular terminating in a row of 1–2 cells at apex, outer margins usually with a distinct tooth (sometimes entire), bases cuneate, insertion line straight to slightly arched. *Autoicous*. *Androecia* on short or long branches, with 2–5 pairs of bracts, bracteoles restricted to the base of the

spike. *Gynoecea* on short branches or on the main stem, with one sterile or fertile innovation, bract lobe ovate, margin entire, apex rounded to obtuse to apiculate, bracteole oblong to lanceolate, bifid to 1/2. *Perianths* obcordate, 5-keeled, keels with teeth, cilia and lacinia, beak 1–2 cells long (Reiner-Drehwald & Goda 2000).

Comment:—*Lejeunea boryana* is recognized by the very densely papillose cuticle, the apiculate leaves with crenate margins and the deeply bifid, small underleaves (bifid to 2/3) with a tooth on the outer margins.

World distribution:—Tropical South America, West Indies.

Distribution in Brazil:—Northern, Northeastern. Further records: Southeastern (Yano 2008).

Habitat:—Rainforest, on living trees.

Selected material examined:—BRAZIL. **Amazonas**: São Sebastião do Uatumã, Reserva do Desenvolvimento Sustentável, 19 May 2017, *A.M. Sierra 4454* (INPA). **Bahia**: Igrapiúna, Reserva Ecológica da Michelin, 13°48'S, 39°10'W, 90–383 m, 16 February 2006, *C. Bastos 4365* (ALCB). **Pará**: Belém, Reserva Mocambo, *R. Lisboa et al. 751*, det. M.E. Reiner-Drehwald (MG, U). **Roraima**: Caracarái, Parque Nacional da Serra da Mocidade, Acampamento Rio Águas Boas, 7 April 2017, *C. Zartman 9839* (INPA).

13. *Lejeunea calcicola* Schuster (1957: 404); Schuster (1957)

Description and illustration: Breil (1970), Schuster (1980).

Plants 1.1–1.3 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to slightly imbricate, wide-spreading; lobe asymmetrically ovate, 510–640 µm long × 430–500 µm wide, dorsal margin arched, crenulate, ventral margin straight, crenulate, apex obtuse to acute to short-apiculate, plane; leaf cells hexagonal, 35–50 × 23–25 µm, thin-walled, trigones minute to indistinct, intermediate thickenings absent; cuticle smooth; oil bodies few per cell, finely segmented; lobule mostly reduced, when well-developed ovate, 1/6–1/5 of leaf length, tooth short, unicellular, keel straight, smooth. *Underleaves* small, 1.5–2.0× stem wide, distant, wider than long, suborbicular to subcordate, bifid to 1/2, sinus acute, lobes broadly triangular, bases cuneate, insertion line curved. *Autoicous*. *Androecia* on a short branch, with 3–4 pairs of bracts, bracteoles restricted to the base of the branch. *Gynoecea* on short or long-branches, with one sterile innovation, bract lobe obovate, margins crenulate, apex acute, bracteole obovate, bifid to 1/3. *Perianths* oblong, 5-keeled, keels crenate, beak 1–2 cells long.

Comment:—*Lejeunea calcicola* resembles *L. glaucescens* and *L. subsessilis*, but the latter species differ in having ± symmetrically ovate leaves with rounded tips. Moreover, *L. glaucescens* has underleaves longer than wide or as long as wide (not wider than long) and *L. subsessilis* has larger underleaves (usually more than 2× stem width). *L. calcicola* is a rare species in Brazil, having been reported only for the states of Mato Grosso (Middle-Western), Paraná (Southern) and São Paulo (Southeastern). The records from Paraná and São Paulo could not be verified.

World distribution:—Brazil and USA.

Distribution in Brazil:—Middle-Western. Further records: Southeastern (Yano 2008), Southern (Ristow *et al.* 2015). The record from Bahia (Bastos, 2004; Yano, 2008) proved to be erroneous; the material belongs to *Lejeunea glaucescens*.

Habitat:—seasonal forest, on living trees.

Selected material examined:—BRAZIL. **Mato Grosso**: Guarantá do Norte, 9°50'S, 54°55'W, 19 July 1995, *A.P.N. Soares 28* (SP).

14. *Lejeunea cancellata* Nees & Montagne (1842: 472); Reiner-Drehwald (2000a)

Lejeunea cladiophora (R.M.Schust.) R.M.Schust. (fide Grolle 1985).

Lejeunea leptophylla Ångstr., Öfvers. Förh. Kongl. Svenska Vetensk.-Akad. 33: 86. 1876, *syn. nov.* Type:—BRAZIL. Minas Gerais: Caldas, *Widgren s.n.*, “cum *Macromitrium regnelli* Hampe retulit” (isotype, S!).

Description and illustration: Schuster (1980, as *L. cladiophora*), Reiner-Drehwald (2000a).

Plants 1.1–1.2 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, obliquely spreading; lobe ovate, ± convex, 400–700 µm long × 300–500 µm wide, dorsal margin arched, entire, ventral margin straight, entire, apex rounded to obtuse; leaf cells oblong to hexagonal, 18–40 × 16–24 µm, thin walled, trigones distinct, intermediate thickenings 1–2 per cell; cuticle smooth; oil bodies homogeneous, numerous per cell; lobule ovate to triangular, small, to 1/5 of leaf length, free margin involute, tooth short, keel arched. *Underleaves* distant, 2.3–4× stem width, suborbicular to reniform, wider than long, bifid to 1/2, sinus V-shaped, lobes triangular, bases cuneate, insertion line

arched. *Dioicous* or *autoicous*. *Androecia* on short or long branches, with 3–12 pairs of bracts, bracteoles present throughout the male spike. *Gynoecea* on short branches or on main stem, with sterile innovation, bract lobe obovate, margins entire, apex acute to rounded, bracteole ovate, bifid to 1/3. *Perianths* obovoid, 5-keeled, keels smooth, beak 2–3 cells long. Vegetative reproduction by caducous branches.

Comment:—*Lejeunea cancellata* is recognized by plants often profusely branched and with numerous microphyllous branches, leaf cells with distinct trigones and intermediate thickenings, underleaves distant, suborbicular to reniform, wider than long, bifid to 1/2, and bracteoles present throughout the male spike. Caducous branches are the principal character of this species.

World distribution:—Scattered throughout tropical and subtropical America.

Distribution in Brazil:—Northeastern, Southeastern, Southern. Further records: Middle-Western (Yano 2008).

Habitat:—Rainforest and seasonal forest, on living trees.

Selected material examined:—BRAZIL. **Bahia**: Wenceslau Guimarães, Povoado de Nova Esperança, 13°35'43"S, 39°43'13"W, 583 m, 28 September 2017, *Cintia Sena 73-A* (ALCB). **Espírito Santo**: Domingos Martins, Parque Estadual Pedra Azul, 15 May 2009, *L.T. Penha 300, 355* (ALCB). **Minas Gerais**: Serra de Itatiaia zwischen Itamonte und Abrigo Rebouças, 2120 m, 7 July 1991, *A. Schäfer-Verwimp & I. Verwimp 14645* (hb. Schäfer-Verwimp). **Paraná**: Bergland südlich Ponta Grossa, road Palmeira – Porto Amazonas, 880 m, 25°29'S, 49°55'W, 17 December 1991, *A. Schäfer-Verwimp & I. Verwimp 15180* (hb. Schäfer-Verwimp). **Pernambuco**: Altinho, Fazenda Taboca, 29 August 1980, *O. Yano & Andrade Lima 2786* (SP).

15. *Lejeunea capensis* Gottsche *et al.* (1845: 374); Reiner-Drehwald & Schäfer-Verwimp (2008b)

Lejeunea caespitosa Lindenb. (syn. fide Reiner-Drehwald & Schäfer-Verwimp 2008b).

Lejeunea clavitiflora (J.B.Jack & Steph.) Steph. (syn. fide Reiner-Drehwald & Schäfer-Verwimp 2008b).

Taxilejeunea lindbergiana Steph., Sp. Hepat. 5: 491. 1914, *syn. nov.* Type:—BRAZIL. Minas Gerais: Caldas, *Lindberg s.n.*, autoic., c. per. (holotype, G-00283286!).

Description and illustration: Reiner-Drehwald & Schäfer-Verwimp (2008b).

Plants 0.6–1.0 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide spreading; lobe ovate, convex, 280–450 µm long × 180–300 µm wide, dorsal margin slightly arched, entire, ventral margin straight, entire, apex rounded to narrowly obtuse; leaf cells oblong to hexagonal, 15–45 × 13–20 µm, thin-walled, trigones small or indistinct, intermediate thickenings absent; cuticle faintly papillose; oil bodies not seen; lobule ovate, inflated, when well-developed 1/3–2/5 of leaf length, free margin involute to plane, tooth short, keel arched. *Underleaves* contiguous to imbricate, 2.5–4.0× stem width, ± as long as wide, bifid to 1/3–1/2, lobes narrowly rounded to acute, sinus V-shaped to U-shaped, bases cuneate, insertion line arched. *Autoicous*. *Androecia* on main stem or on short branches, with 2–3 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecea* on main stem or on short branches, with 1–2 innovations, innovations often fertile, bract lobe obovate, margins entire, apex rounded, bracteole ovate, bifid to 1/3–1/2. *Perianths* terete, obovoid, slightly emergent to 1/4–1/3, beak long, 2–4 cells long, cylindrical to trumpet-shaped.

Comment:—*Lejeunea capensis* is recognized by the convex leaves with rounded to narrowly obtuse apex, cell walls with very small trigones and usually without intermediate thickenings, underleaves 2.5–4.0× stem width and with cuneate bases, and terete obovoid perianths, scarcely exerted beyond the bracts (to maximally 1/3 of perianth length) and furnished with a long, cylindrical to trumpet-shaped beak (Reiner-Drehwald & Schäfer-Verwimp 2008). In its eplicate perianth *L. capensis* approaches *L. corynantha* Spruce (1895: 344), a species known from the West Indies and the northern Andes, but the latter species is a more delicate plant with a much more longly exerted, beakless perianth, larger lobules (ca. 1/2× leaf length) and smaller underleaves.

World distribution:—Widespread in tropical America and Africa.

Distribution in Brazil:—Southeastern. Further records: Northern (Costa *et al.* 2017), Southern (Reiner-Drehwald & Schäfer-Verwimp 2008).

Habitat:—Rainforest, on living trees.

Selected material examined:—BRAZIL. **Minas Gerais**: Serra da Mantiqueira, Camanducaia, Monte Verde, Weg zum Chapéu do Bispo, 22°49'S, 45°58'W, 1700 m, 9 August 1986, *A. Schäfer-Verwimp & I. Verwimp 7463* (hb. Schäfer-Verwimp).

16. *Lejeunea caripensis* Lindenb. & Gottsche, in Gottsche *et al.* (1847: 758)

Taxilejeunea caripensis (Lindenb. & Gottsche) Steph., Bot. Jahrb. Syst. 23: 582. 1897. Type:—VENEZUELA (“Colombia”): Prov. Monagas, Caripe, *Moritz s.n.*, ster. (lectotype, designated here, W-Lindenb.-6385!).

Description and illustration: Alvarenga *et al.* (2007, as *Lejeunea cerina*), Gradstein & Ilkiu-Borges (2009, as *Taxilejeunea* sp.).

Plants 1.0–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, obliquely spreading; lobe flat, asymmetrically ovate-triangular, 560–680 µm long × 360–500 µm wide, tapering to a obtuse to apiculate apex ending in a row of 1–3 cells, dorsal and ventral margins crenulate, sometimes with a small teeth near apex; leaf cells hexagonal to oblong, 35–50 × 25–30 µm, thin-walled, trigones minute, intermediate thickenings 1–2 per cell; cuticle finely papillose; oil bodies not seen; lobule ovate, inflated, 1/5–1/7 of leaf length, free margin involute, tooth short, keel arched. *Underleaves* very large, 5–7× stem width, subimbricate, ovate, bifid to maximally 1/5, sinus very narrow, bases rounded, not auriculate, insertion line deeply arched, ca. 160–200 µm deep. *Dioicous*. *Androecia* not seen. *Gynoecia* in a short row on short branches, with one fertile innovation, bract lobe ovate, apex acute to apiculate, bracteole narrowly ovate, bifid to 1/3. *Perianths* oblong, exerted to 1/2, 5-keeled, keels slightly crenulate, beak very short, 1–2 cells long.

Comment:—*Lejeunea caripensis* has been confused with *L. cerina*, but differs from the latter by underleaves with a very deeply arched insertion, a shallowly bifid apex and no auricles, the leaves gradually tapering to the apex and the gynoecia in a short row on branches. In *L. cerina* the leaves are more symmetrical, with a broad apex ending suddenly in a short apiculus (not tapering), the underleaves are much more deeply bifid (to 1/3–1/2) with a broader incision, a shallowly curved insertion line (to 40 µm deep; not deeply arched) and more or less auriculate bases, and the gynoecia are not produced in a row. The specimens cited (and illustrated) in Alvarenga *et al.* (2007), Bastos & Valente (2008), Bastos & Yano (2009), Yano & Peralta (2011), Valente *et al.* (2013a, 2013b) and Reis *et al.* (2015) as *L. cerina*, and Gradstein & Ilkiu-Borges (2009) as *Taxilejeunea* sp., belong to *L. caripensis*.

World distribution:—Brazil, French Guiana and Colombia.

Distribution in Brazil:—Northern, Northeastern, Southeastern.

Habitat:—Rainforest and cloud forest, on living trees and leaves.

Selected material examined:—BRAZIL. **Bahia**: Abaíra, Catolés, Serra do Barbado, Mata da Forquilha, 13°17'27"S, 41°54'0.15"W, 1594 m, 5 September 2008, *C. Bastos 5114* (ALCB). **Espirito Santo**: Domingos Martins, Parque Estadual Pedra Azul, 14 May 2009, *L.T. Penha 421* (ALCB). **Minas Gerais**: Serra do Cipó, Rodovia MG 010, rumo Conceição do Mato Dentro, 19°13'02"S, 43°30'25"W, 1309 m, 27 July 2011, *P.E.A.S. Câmara & D.P. Costa 2713* (UB). **Pernambuco**: Jaqueira, RPPN Frei Caneca, Mata da Serra do Quengo, 30 October 2003, *L.D.P. Alvarenga s.n.* (UFP 50927, 50983). **Roraima**: Mucujai, Serra do Apiaú, Sendero hacia la cima da Serra, 02°26'25"N, 61°25'16"W, 1276 m, 17 April 2019, *A.M. Sierra 5591* (INPA; ALCB).

17. *Lejeunea catinulifera* Spruce (1884: 233); Reiner-Drehwald (2005a)

Amphilejeunea catinulifera (Spruce) R.M. Schust., Nova Hedwigia 44: 8. 1987.

Taxilejeunea obtusifolia Steph., Sp. Hepat. 5: 474. 1913, *syn. nov.* Type:—BRAZIL. Rio de Janeiro: Serra do Itatiaia, Agulhas Negras, “in truncis arboreum”, ca. 2300 m, 17 April 1902, *P. Dusén 559*, dioic. c. gyn. juv. (holotype, G-00047594!).

Description and illustration: Reiner-Drehwald (2005a).

Plants 1.2–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, obliquely to widely spreading; lobe convex, ovate to orbicular, symmetrical, 400–800 µm long × 350–750 µm wide, dorsal margin slightly arched, slightly crenulate, ventral margin straight to slightly arched, weakly crenulate, apex rounded, plane or somewhat recurved; leaf cells isodiametrical to slightly elongate, 25–30 × 35–40 µm, trigones small, intermediate thickenings 0–2 on longer cell walls; cuticle smooth; oil bodies homogeneous, numerous per cell (but not seen in the material from Brazil); lobule large, 1/3–1/2 of leaf length, ovate, free margin involute, with (1–)2 teeth, first tooth 1–2 celled, second tooth 1-celled or reduced, the two teeth separated by a broad, shallow sinus, keel arched. *Underleaves* large, imbricate, orbicular, 5–6× stem width, shallowly bifid to 1/5, sinus V-shaped, lobes obtuse, margins slightly crenulate, bases rounded to subauriculate, insertion line arched, ca. 50–70 µm deep. *Dioicous*. *Androecia* not seen. *Gynoecia* on elongate branches, with 1–2 again fertile innovations, bracts and bracteoles with entire margins, bract apex rounded, bracteole apex short-bifid. *Perianths* (only juvenile seen) 5-keeled, keels smooth, beak 3–4 cells long (leaf lobe measurements from Reiner-Drehwald 2005a).

Comment:—*Lejeunea catinulifera* is a characteristic high-montane neotropical species that is new to Brazil. The species is recognized by dioicous plants with somewhat convex, ovate leaves with rounded apex, thin-walled leaf cells with homogeneous oil bodies, large lobules with two teeth, and large, undivided to shortly bifid underleaves. The plants from Serra do Itatiaia are a phenotype with shortly bifid underleaves. The record from SE Brazil adds another example to the list of species disjunct in the Andes and the mountains of the Atlantic coast of Brazil (Gradstein & Costa 2003, p. 34).

World distribution:—Mexico to Bolivia, Dominican Republic and southeastern Brazil (new).

Distribution in Brazil:—Southeastern.

Habitat:—Montane forest and alpine scrub, usually on bark.

18. *Lejeunea cerina* (Lehmann & Lindenberg 1833: 16) Lehm. & Lindenb., in Gottsche *et al.* (1845: 391)

Jungermannia cerina Lehm. & Lindenb. (*Hygrolejeunea cerina* [Lehm. & Lindenb.] Schiffn.).

Description and illustration: Gradstein & Ilkiu-Borges (2009; note that the characteristic leaf apiculus is not well developed in the material illustrated).

Plants 0.9–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, obliquely to widely spreading; lobe rather flat, ovate, 500–630 µm long × 400–450 µm wide, dorsal margin slightly arched, entire to crenulate, occasionally with two teeth near apex, ventral margin straight to slightly arched, apex rounded to obtuse to apiculate; leaf cells oblong, 25–40 × 20–23 µm, trigones medium-sized, 0–2 intermediate thickenings; cuticle papillose; oil bodies small, finely segmented; lobule mostly reduced, when well-developed ca. 1/6 of leaf length, inflated, free margin slightly involute, tooth short, keel straight to slightly arched. *Underleaves* imbricate to contiguous to distant, suborbicular to reniform, wider than long, 4–6× stem width, bifid to 1/3, lobes triangular-acute, sinus V-shaped to U-shaped, lobes acute, margins entire, bases rounded to conspicuously auriculate, insertion line shallowly curved, to 50 µm deep. *Dioicous*. *Androecia* on short branches or on main stem, with 3–4 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, without or with one short, sterile innovation, bract lobe obovate, margins entire, apex acute, bracteole obovate, bifid to 1/5–1/3. *Perianths* pyriform, exerted to 1/2, 5-keeled, keels smooth, beak 1–2 cells long.

Comment:—*Lejeunea cerina* is recognized by the wide-spreading ovate leaves with a broadly rounded apex that is suddenly narrowed to a short apiculus, the densely papillose cuticle, the rather large underleaves with a shallowly curved insertion line and rounded to auriculate bases, and the gynoecia on short branches with or without a short sterile innovation. The species has been confused with *L. caripensis* (see under the latter).

World distribution:—Widespread in the Neotropics.

Distribution in Brazil:—Northern. Further records: Southeastern, Southern (Grolle 1988, Ristow *et al.* 2015). Records from Northeastern (Yano 2008) probably refer to *L. caripensis*. The specimen illustrated in Alvarenga *et al.* (2007) belongs to *L. caripensis*.

Habitat:—Rainforest and cloud forest, on living trees.

Selected material examined:—BRAZIL. **Amazonas**: São Sebastião do Uatumã, Reserva do Desenvolvimento Sustentável do Uatumã, 18 May 2017, *A.M. Sierra 4355* (INPA). **Pará**: Município de Oriximiná, Rio do Paru do Oeste, cachoeira Pancada, 4 September 1980, *C.A. Cid et al. 2065* (INPA). **Roraima**: Mucajá, Serra do Apiaú, Sendero hacia la cima da Serra, 02°26'25"N, 61°25'16"W, 1276 m, 17 April 2019, *A.M. Sierra 5593* (INPA; ALCB).

19. *Lejeunea cochleata* Spruce (1884: 273). Fig. 4

Type:—ECUADOR: Mt. Tungurahua, *Spruce L480* (lectotype, designated by Gradstein *et al.* 2018, MANCH-000119!; isolectotype, MANCH-0000118!).

Plants 400–700 µm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide-spreading, convex, apex obtuse to rounded; lobe ovate to suborbicular, 160–300 µm long × 120–260 µm wide, dorsal margin arched, entire to crenulate, ventral margin straight, entire to crenulate, apex rounded to obtuse; cells hexagonal, 16–26 × 10–18 µm, uniformly thickened, without trigones and intermediate thickenings; cuticle finely papillose; oil bodies not seen; lobule ovate, inflated, ca. 1/3 of leaf length, free margin involute, tooth oblong, curved, keel slightly arched. *Underleaves* small, 85–135 µm wide, ca. 1.5–2.0× stem wide, ovate to suborbicular, bifid to 1/2, lobes triangular, sinus V-shaped, bases cuneate, insertion line curved. *Dioicous*. *Androecia* not seen in Brazilian material. *Gynoecia* on short branches, with one lejeuneoid innovation, bract lobes obovate, margins crenulate, apex rounded, bracteole widely ovate, bifid to 1/3. *Perianths* 5-keeled, keels crenulate, beak short, 1–2 cells long.

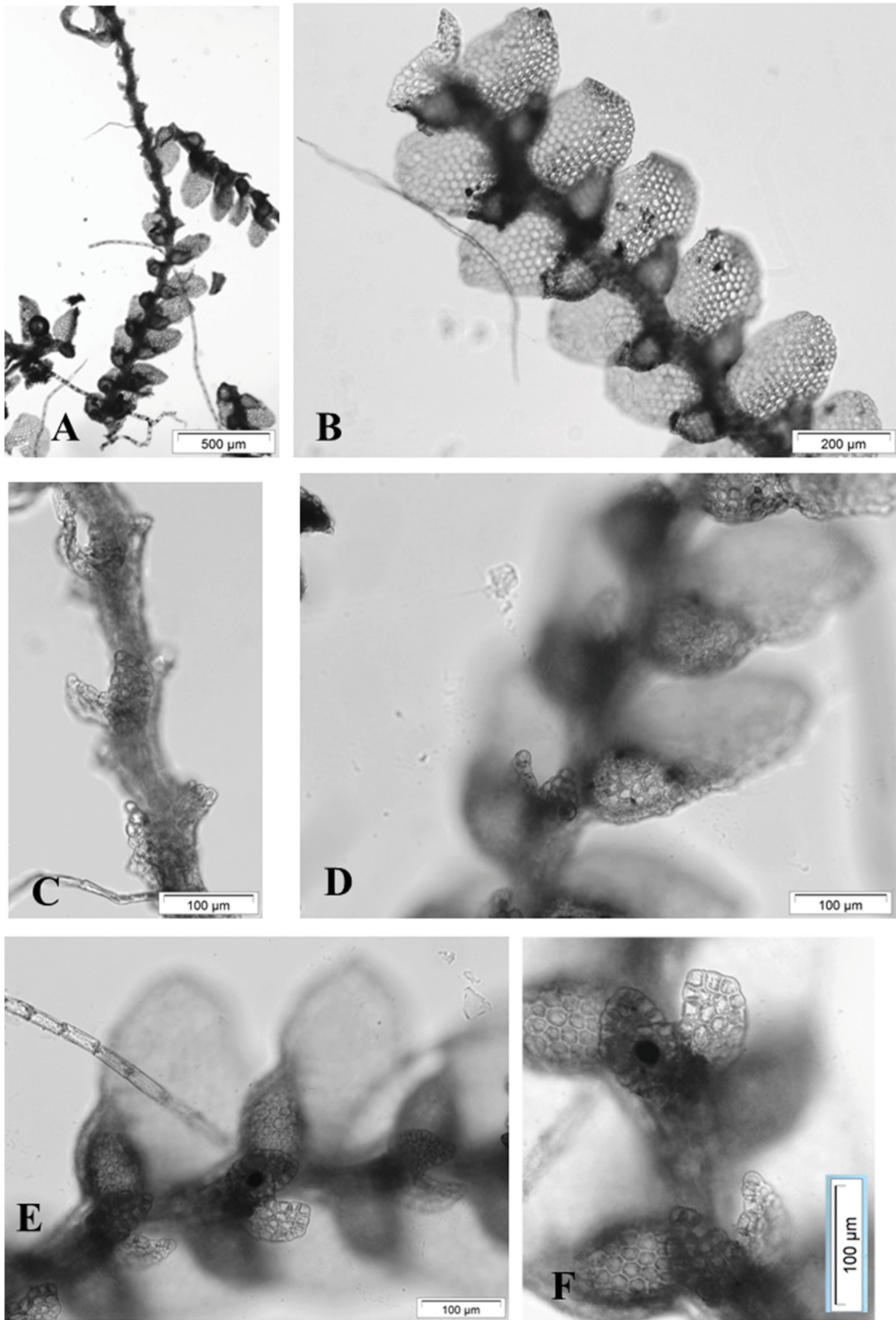


FIGURE 4. *Lejeunea cochleata* Spruce. A: Habit, showing denuded flagelliform branch, ventral view. B: Habit, ventral view. C: Denuded flagelliform branch, ventral view. D–E: Small, distant, underleaves and lobules. F: Small and distant underleaves (all from *C. Bastos & S.B. Vilas Bóas-Bastos 3582p.p.*).

Comment:—Caducous whole leaves (including lobule), strongly convex and wide-spreading leaf lobes, large swollen lobules, finely punctate-papillose cuticle, very small underleaves with obtuse apices, and denuded branches without any trace of the lateral leaves (only with underleaves) are the main characters of *L. cochleata*. The species resembles *L. aphanes* but in the latter species the apical cells of underleaves are very thin-walled and often broken, and the leaves are less strongly convex and not caducous. By its caducous leaves and \pm uniformly thickened cell walls, *L. cochleata* is similar to *L. oligoclada* and *L. deplanata*, but the latter two species are dioicous and have flat leaves. Moreover, *L. deplanata* is a larger plant (to 1.5 mm wide) with broader underleaves (2.5–5 \times stem width), a smooth cuticle and only leaf lobes caducous (lobules persistent). *Lejeunea cochleata*, finally, also resembles *L. pulchra* but the leaves in the latter species are obliquely spreading and not caducous, and the leaf cells have trigones and intermediate thickenings. Gradstein *et al.* (2018c) erroneously treated *L. cochleata* as a synonym of *L. angusta*.

World distribution:—Northern Andes (Colombia, Ecuador) and Brazil.

Distribution in Brazil:—Northeastern (Bahia).

Habitat:—Montane rainforest, on living tree.

Selected material examined:—BRAZIL. **Bahia**: Miguel Calmon, Parque Estadual das Sete Passagens, 11°39'S, 40°53'W, 1000 m, 22 April 2003, C. Bastos & S.B. Vilas Bôas-Bastos 3582p.p., 3943 (ALCB).

20. *Lejeunea combuensis* Moura *et al.* (2012: 198); Moura *et al.* (2012)

Description and illustration: Moura *et al.* (2012).

Plants 0.8–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide-spreading; lobe plane, ovate, 470–800 μm long \times 300–600 μm wide, dorsal margin arched, crenulate, occasionally with 1–2 teeth near the apex, ventral margin arched, crenate, apex obtuse to acute to apiculate; leaf cells oblong to hexagonal, 30–50 \times 25–30 μm , thin-walled, trigones small, intermediate thickenings absent; cuticle smooth; oil bodies not seen; lobule ovate, 1/4–1/5 of leaf length, frequently reduced, free margin plane to slightly involute, tooth short, keel straight to slightly arched. *Underleaves* ovate, distant, 2.0–3.0 \times stem width, wider than long, bifid to 1/2, lobes triangular-acute, sinus V-shaped, bases cuneate, insertion line arched. *Autoicous*. *Androecia* on short branches, with 3–8 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short or long branches, with 1(–2) sterile innovations, (rarely fertile), bract lobe oblong to ovate, margins crenate, apex acute to apiculate, bracteole short-bifid. *Perianths* terete, cylindrical, emergent to 1/3, apex truncate and smoothly 5-lobed, without beak (Moura *et al.* 2012).

Comment:—*Lejeunea combuensis* is only known from the type location on Combu Island, Belém, State (Pará, Brazil). The species resembles *L. bermudiana* and *L. capensis*, but *L. bermudiana* differs in the 5-keeled perianth with crenate to toothed keels and *L. capensis* in the convex leaves with a usually rounded apex and entire margins, and a beaked perianth (Moura *et al.* 2012).

World distribution:—Only known from Brazil.

Distribution in Brazil:—Northern.

Habitat:—Várzea forest, on living trees and rotten logs.

21. *Lejeunea controversa* Gottsche, in Gottsche & Rabenhorst (1873: 556); Reiner-Drehwald & Goda (2000)

Crossotolejeunea controversa (Gottsche) Steph., Sp. Hepat. 5: 230. 1913.

Lejeunea paucispina Spruce (syn. fide Reiner-Drehwald & Goda 2000).

Taxilejeunea fissistipula Steph., Sp. Hepat. 5: 488. 1914, **syn. nov.** Type:—BRAZIL. Amazonas: Rio Juruá, Menim de Deus, “an trockenem Zweigen”, October 1901, *Ule* 544, autoic., c. per. (holotype, G-00124011!).

Taxilejeunea fusciorufa Steph., Hedwigia 35: 133. 1896, **syn. nov.** Type:—BRAZIL. St. Catarina: “in rupibus”, *Ule* 52, autoic., c. per. (lectotype, designated here, G-00124004! isolectotype, G-001240051!).

Description and illustration: Reiner-Drehwald & Goda (2000), Bastos & Yano (2009), Gradstein & Ilkiu-Borges (2009).

Plants 0.7–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide-spreading; lobe flat, ovate-oblong, 500–580 μm long \times 340–500 μm wide, dorsal margin arched, entire to crenate, ventral margin straight, entire to crenate, apex acute to apiculate to acuminate (mostly ending in a row of 2–4 cells), or obtuse; leaf cells hexagonal to oblong, 31–44 \times 26–22 μm , thin-walled, trigones distinct, intermediate thickenings 1–2 per cell; cuticle strongly papillose; oil bodies not seen; lobule ovate, inflated, ca. 1/6–1/5 of leaf length, frequently reduced, free margin slightly involute, tooth short, keel slightly arched. *Underleaves* distant to contiguous, ovate, 2.5–3.0 \times stem width, bifid to 1/2,

sinus V-shaped to U-shaped, lobes narrowly triangular to lanceolate and with acuminate tips, bases cordate, insertion line arched. *Autoicous*. *Androecia* on short branches, with 2–4 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, with one often fertile innovation, bract lobe obovate, margins entire to crenate, apex rounded to acute, bracteole ovate, bifid to 1/2. *Perianths* obovoid to obcordate, exserted to 1/2, 5-keeled, keels with teeth, cilia and lacinia, beak 2–3 cells long.

Comment:—The main characters of *L. controversa* are the strongly papillose cuticle, the underleaves (2.5–4× stem width) with acuminate tips, and the perianth keels with teeth, cilia and lacinia. Some variation is seen in these characters and sometimes the uniseriate underleaf tips are only 1–2 cells long and the perianth keels only weakly toothed. *Taxilejeunea fusciorufa* is a phenotype with subentire perianth keels.

World distribution:—Widespread in the Neotropics.

Distribution in Brazil:—Northern, Northeastern, Southeastern, Southern. Further records: Middle-Western (Yano 2008).

Habitat:—Rainforest, on living trees, rotten logs and soil.

Selected material examined:—BRAZIL. **Amazonas**: São Sebastião do Uatumã, Reserva do Desenvolvimento Sustentável do Uatumã, 20 May 2017, *A.M. Sierra 4487* (INPA; ALCB); **Bahia**: Wenceslau Guimarães, povoado de Nova Esperança, 13°34'42"S, 39°42'28"W, 443 m, 3 December 2017, *C. Bastos 6120* (ALCB). **São Paulo**: Ubatuba, Núcleo Picinguaba, 9 November 1993, *S.R. Visnadi & D.M. Vital 1348* (SP).

22. *Lejeunea deplanata* Nees, in Gottsche *et al.* (1845: 368); Reiner-Drehwald (2010a)

Lejeunea hebetata Spruce (syn. Reiner-Drehwald 2010a).

Lejeunea leucophylla Lindenb. (syn. Reiner-Drehwald 2010a).

Lejeunea montana Gottsche (syn. Reiner-Drehwald 2010a).

Lejeunea maxonii A.Evans (syn. Reiner-Drehwald 2010a).

Description and illustration: Reiner-Drehwald (2010a).

Plants 0.8–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate to contiguous, obliquely to widely spreading; lobe plane to convex, ovate to suborbicular, 0.5–1.0 mm long × 0.4–0.8 mm wide, dorsal margin slightly arched, entire, ventral margin straight to slightly arched, entire, apex rounded, plane or recurved; leaf cells hexagonal to isodiametric, 17–30 × 17–32 μm, walls uniformly thickened, without trigones and without intermediate thickenings; cuticle smooth to slightly papillose; oil bodies granular, 2–4 per cell; lobule when well-developed ovate, inflated, small, up to 1/5 of leaf length, free margin involute, tooth short, keel slightly arched. *Underleaves* distant to contiguous to slightly imbricate, suborbicular to reniform, 3–5× stem width, wider than long, bifid to 1/2, lobes triangular-acute, sinus V-shaped, bases cuneate to rounded, insertion line slightly arched. *Dioicous*. *Androecia* on main shoot or on short or long branches, with 4–13 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on main stem or on short branches, with 1–2 innovations, bract lobe ovate, margins entire, apex rounded, bracteole ovate to obovate, bifid to 1/4–1/3. *Perianths* obovoid, exserted to 1/3–1/2, 5-keeled, keels smooth, beak short, 2 cells long. Vegetative reproduction by caducous leaves and microphyllous branches (description based in part on Reiner-Drehwald 2010).

Comment:—*Lejeunea deplanata* is morphologically close to *L. phyllobola* and *L. parviloba*, all three species are dioicous and produce caducous leaf lobes. The latter two species differ from *L. deplanata* by leaf cells with trigones (cell walls uniformly thick-walled in *L. deplanata*), male bracteoles present throughout the male spike and absence of caducous microphyllous branches.

World distribution:—Widespread in the Neotropics (Reiner-Drehwald 2010a).

Distribution in Brazil:—Northeastern, Middle-Western, Southern.

Habitat:—Rainforest and cerrado, on living trees.

Selected material examined:—BRAZIL. **Bahia**: Eunápolis, Estação Veracruz, 16°22'S, 39°10'W, 100 m, 9 September 1999, *S.B. Vilas Bôas-Bastos & C. Bastos 1239* (ALCB). **Mato Grosso**: Várzea Grande, Loteamento Santa Cecília, 15°40'48"W, 56°08'17"W, 165 m, 14 August 2009, *T.E.C. Meneguzzo et al. 253* (UB). **Santa Catarina**: Pinhal, Anita Garibaldi, 700 m, 12 July 1963, *Reitz & Kein 15475a* (NY).

23. *Lejeunea flaccida* Lindenb. & Gottsche, in Gottsche *et al.* (1847: 758)

Type:—MEXICO: Veracruz, Río Nautla, finca Cabrestras, April 1841, *Lehmann 476*, c. gyn. (lectotype, designated here, W-Lindenb. 6389!, islectotype, C-M9200!).

Lejeunea lusoria Lindenb. & Gottsche (*Taxilejeunea lusoria* [Lindenb. & Gottsche] Steph.), Hedwigia 29: XVI. 1890, **syn. nov.** Type:—COLOMBIA: “K. Müller in hb. Gottsche” (lectotype, designated here, W-Lindenb. 6087! isolectotype, G-00113346!).

Lejeunea obtusangula Spruce (*Taxilejeunea obtusangula* [Spruce] A. Evans), Trans. & Proc. Bot. Soc. Edinburgh 15: 221. 1884, **syn. nov.** Type: see Reiner-Drehwald (2000).

Taxilejeunea foliicola Steph., Sp. Hepat. 5: 466. 1913, **syn. nov.** Type:—BRAZIL. São Paulo: Apiahy, *Puiggari 785*, autoic., c. per. (lectotype, designated here, G-000283463! isolectotype, G-00283464!).

Taxilejeunea jeringii Steph., Hedwigia 35: 134. 1896, **syn. nov.** Type:—BRAZIL. Rio Grande do Sul: *Ihering s.n.*, ex herb. Brotherus, autoic., c. per. (lectotype, designated here, G-00043996! isolectotype, G-00043997! mixture).

Taxilejeunea macroloba Steph. (syn. fide Gradstein & Costa 2003).

Taxilejeunea multiflora Steph., Hedwigia 35: 135. 1896, **syn. nov.** Type:—BRAZIL. Without loc., *Glaziou 18706 p.p.*, autoic., c. per. (holotype, G-00047595!).

Taxilejeunea puiggarii Steph. (syn. fide Gradstein & Costa 2003).

Description and illustration: Schuster (1980, as *Taxilejeunea obtusangula*), Reiner-Drehwald (2000a, as *Taxilejeunea obtusangula*), Gradstein & Ilkiu-Borges (2009 as *Taxilejeunea obtusangula*).

Plants 1.2–1.8 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, obliquely to widely spreading; lobe flat, ovate-triangular, somewhat asymmetrical, 500–950 µm long × 400–840 µm wide, dorsal margin arched, entire to slightly crenulate, or with few teeth near apex, ventral margin straight, entire, apex narrowly rounded to obtuse to apiculate; leaf cells oblong to hexagonal, 26–51 × 15–30 µm, trigones small, intermediate thickenings scarce, cuticle smooth; oil bodies not seen; lobule frequently reduced, when well-developed ovate to ovate-rectangular, ca. 1/4 × leaf length, free margin involute, tooth short, keel straight to slightly arched. *Underleaves* distant to imbricate, rounded or wider than long, 3–5 × stem width, bifid to 1/2 with a wide incision, lobes triangular, bases cordate, rounded or with low auricles. *Autoicous*. *Androecia* on main stem or on short branches, with 2–4 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on the main stem or in a row on short innovating branches (row of up to 5 gynoecia), bracts entire or denticulate. *Perianths* oblong, keeled near apex, over maximally 1/4(–1/3) of perianth length, keels smooth or crenulate, occasionally with a few small teeth, somewhat inflated above, beak 2–3 cells long (Schuster 1980 as *Taxilejeunea obtusangula*; Reiner-Drehwald 2000a, as *T. obtusangula*).

Comment:—*Lejeunea flaccida* was usually called *Taxilejeunea obtusangula*, which is a synonym. *Taxilejeunea lusoria* is a further synonym; the latter name has been misapplied and the correct name for *T. lusoria* is *Lejeunea bombonasensis*. The main character of *L. flaccida* is the perianth with five short keels in the upper 1/4–1/3 of the perianth. The synonymy of *T. jeringii* was already suggested by Gradstein & Costa (2003).

World distribution:—Widespread in tropical and subtropical America.

Distribution in Brazil:—Northern, Northeastern, Southeastern, Southern.

Habitat:—Rainforest, on living trees and rotten logs; also on rock.

Selected material examined:—BRAZIL. **Bahia**: Igrapiúna, Reserva Ecológica da Michelin, 13°48'S, 39°10'W, Mata da Vila Cinco, 14 February 2006, *C. Bastos 4050* (ALCB). **Espírito Santo**: Domingos Martins, Parque Estadual Pedra Azul, 13 January 2010, *L.T. Penha 856* (ALCB). **Pará**: *R. Spruce s.n.* (MANCH 000460); Rio Maicuru, small islet between Lageira and Macau airstrip, 0°55'S, 54°26'W, 800 ft., 27 July 1981, *J.J. Strudwick et al. 3621* (INPA). **Rio de Janeiro**: Petrópolis, Av. Koeller, 22°30'25"S, 43°10'50"W, 845 m, *F. Juliani 91* (RB, as *Lejeunea minutiloba*).

24. *Lejeunea flagellifera* Bastos *et al.* (2017: 71)

Type:—BRAZIL. Bahia: Miguel Calmon, Parque Estadual das Sete Passagens, 11°39'S, 40°53'W, 1000–1200 m, Capão da Trilha da Cachoeira da Garganta, 13 October 2007, *J. Ballejos 2203* (holotype, ALCB!).

Description and illustration: Bastos *et al.* (2017).

Plants 1.2–2.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide spreading; lobe flat, ovate-oblong, 0.5–1.0 mm long × 0.4–0.7 mm wide, dorsal margin slightly arched, entire, ventral margin straight, entire, apex rounded; leaf cells oblong to hexagonal, 28–35 × 20–28 µm, thin-walled, trigones small, walls with 0–1 intermediate thickenings; cuticle smooth; oil bodies not seen; lobule large, inflated rectangular, 1/3–1/2 of leaf length, free margin slightly involute, plane at the apex, tooth small, ovate to oval, keel straight to weakly arched. *Underleaves* contiguous to distant, bifid to 1/2 its length, ovate to suborbicular, 3–4 × stem width, sinus acute, lobes triangular-acute, bases cuneate, insertion line arched. *Dioicous*. *Androecia* not seen. *Gynoecia* on short branches, with one innovation, bract

lobe obovate, margin entire, apex rounded to obtuse; bract lobule obovate, apex acute; bracteole obovate, bifid to 1/2–1/3. *Perianths* not seen. Vegetative reproduction by modified caducous leaves born on flagelliform shoots.

Comment:—*Lejeunea flagellifera* is characterized by its large size (to 2.5 mm wide), the large, inflated and rectangular leaf lobule with an inconspicuous apical tooth and a 6–8 cells long apical margin, and, especially, by the upright flagelliform shoots without leaves but with strongly reduced, squarrose underleaves. The flagellae resemble those of *Acrolejeunea* (Spruce) Steph., *Rectolejeunea* A. Evans and *Cheilolejeunea schiavoneana*, and are not known in any other species of *Lejeunea*.

World distribution:—Only known from Brazil.

Distribution in Brazil:—Northeastern, Southeastern.

Habitat:—Rain forests, 800–1200 m, on bark and living leaves.

Selected material examined:—BRAZIL. **Bahia**: Miguel Calmon, Parque Estadual das Sete Passagens, 11°39'S, 40°53'W, 1000–1200 m, 9 September 2007, *J. Ballejos 1938* (ALCB). **Espírito Santo**: Domingos Martins, SE Venda Nova, 1060 m, 20°27'S, 41°02'W, 10 October 1988, *A. Schäfer-Verwimp & I. Verwimp 10180* (JE). **São Paulo**: Serra da Paranapiacaba, Fazenda Intervalos s of Capão Bonito, 800 m, 21 April 1990, *A. Schäfer-Verwimp & I. Verwimp 12610* (ALCB, GOET, JE, SP).

25. *Lejeunea flava* (Swartz 1788: 144) Nees (1838: 277); Reiner-Drehwald (2000a)

Jungermannia flava Sw.

Lejeunea flava subsp. *albida* Spruce (syn. fide Schuster 1980).

Lejeunea consimilis Gottsche ex Steph. (syn. fide Pócs *et al.* 2015).

Lejeunea cordiflora Spruce, Trans. & Proc. Bot. Soc. Edinburgh 15: 283. 1884, *syn. nov.* Type:—BRAZIL. Amazonas: Rio Uaupés, *Spruce L334* (lectotype, designated here, MANCH-000144! isolectotypes, MANCH-000145!, MANCH-000146!).

Lejeunea symphoreta Spruce (syn. fide Reiner-Drehwald 2000).

Lejeunea subsymphoreta Steph. (syn. fide Pócs *et al.* 2015).

Illustration: Schuster (1980), Reiner-Drehwald (2000a), Gradstein & Ilkiu-Borges (2009).

Plants 0.8–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, sometimes contiguous, wide-spreading; lobe plane or slightly convex, ovate-oblong, 160–500 µm long × 120–340 µm wide, dorsal margin arched, entire, ventral margin straight to slightly arched, entire, apex rounded; leaf cells hexagonal, 16–30 × 10–18 µm, thin-walled, trigones and intermediate thickenings distinct, cuticle faintly papillose due to the presence of wax crystals; oil bodies segmented, ca. 2–10 per cell; lobule ovate, inflated, 1/4–1/3 of leaf length, free margin slightly involute, tooth short, keel arched. *Underleaves* rather large, ovate, 3–4× stem width, longer than wide or as long as wide, distant, sinus V-shaped, lobes triangular-acute, bases rounded to subauriculate, cordate, insertion line arched. *Autoicous*. *Androecia* on main stem or on short branches, with 2–4 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* terminal on stem or on short branches, with 1–2 innovations, innovation on branches frequently fertile resulting in a short row of two gynoecia, bract lobe ovate, margins entire, apex rounded, bracteole ovate, bifid to 1/3. *Perianths* oblong-obovoid, exerted to 1/3–1/2, 5-keeled, keels smooth, beak 2–3 cells long.

Comment:—*Lejeunea flava* is a very common species and is usually copiously fertile. Ovate-oblong leaf lobes with rounded tips, leaf cells with conspicuous trigones and intermediate thickenings, rather large and frequently longer than wide underleaves with a cordate base, gynoecia singly or two in a row on short branches, and perianths with five smooth keels are the main characters. *Lejeunea cordiflora* is a phenotype of *L. flava* with lateral perianth keels slightly expanded above, the perianth apex thus becoming somewhat emarginate (hence the name “cordiflora”). In other respects, these plants are typical *L. flava*, as already noted by Spruce (1884, p. 283).

World distribution:—Very widespread pantropical species, extending northwards into western Europe and southeastern U.S.A.

Distribution in Brazil:—Northern, Northeastern, Middle-Western, Southeastern, Southern.

Habitat:—Rainforest, restinga, cerrado and urban environments, on living trees, leaves, rotten logs, rock and soil.

Selected material examined:—BRAZIL. **Amazonas**: Amajani, Serra do Tepequem, Cachoeira do Paiva, 578 m, 7 September 2017, *A.M. Sierra 4529* (INPA). **Bahia**: Wenceslau Guimarães, povoado de Nova Esperança, 13°35'43"S, 39°43'13"W, 583 m, 28 September 2017, *C. Bastos 5998* (ALCB). **Ceará**: Ubajara, Serra da Ibiapaba, Sítio São Luís, 3°48'15"S, 40°54'23"W, 924 m, 24 August 2010, *C. Bastos 5363* (ALCB). **Espírito Santo**: Domingos Martins, Parque Estadual Pedra Azul, 14 May 2009, *L.T. Penha 381* (ALCB). **Goiás**: Distrito Federal, Brasília, Espaço Experimental

de Biologia –UNB, 13 May 2003, *R.N. Leite & R.M. Rocha* 47 (UB). **Minas Gerais**: Lima Duarte, Parque Estadual do Ibitipoca, entrada da Gruta do Pião, 30 September 2009, *H.C.S. Gomes et al.* 276 (CESJ); **Rio Grande do Sul**: Caxias do Sul, Travessão Gablonntz, ca. 8 km da cidade, 6 October 2006, *O. Yano & J. Bordin* 29275 (UCS). **Rondônia**: Santa Bárbara, 120 km SW of Porto Velho via BR 364, 9°10'S, 63°07'W, 24 May 1982, *A.J. Fife et al.* 4230 (INPA). **Roraima**: Caracará, Parque Nacional da Serra da Mocidade, Serrinha Rios Águas Boas, 8 April 2017, *C. Zartman* 9892 (INPA). **Santa Catarina**: Blumenau. Parque Municipal São Francisco de Assis, 27°55'15"S, 49°04'30"W, 74 m, s.d., *M.S. Dias s.n.* (RB 453225). **São Paulo**: Litoral Norte, Serra do Mar, near Ubatuba, 23°24'S, 45°04'W, 40 m, 24 March 1989, *A. Schäfer-Verwimp & I. Verwimp* 10959/A (hb. Schäfer-Verwimp).

26. *Lejeunea glaucescens* Gottsche, in Gottsche et al. (1845: 378)

Type:—BRAZIL: *Lehmann* 370 (isotype, G 00232878!).

Crossotolejeunea caulicalyx Steph., Sp. Hepat. 5: 237. 1913 (*Lejeunea caulicalyx* [Steph.] M.E.Reiner & Goda), *syn. nov.* Type:—CUBA. *Wright s.n.* (holotype, G-18398!).

Lejeunea muscicola Spruce, Trans. & Proc. Bot. Soc. Edinburgh 15: 281. 1884, *syn. nov.* Type:—BRAZIL. Pará: Santarém, *Spruce s.n.* (lectotype, designated here, G-00152213; isolectotype, MANCH-000298!).

Taxilejeunea brasiliensis Steph., Hedwigia 35: 132. 1896, *syn. nov.* Type:—BRAZIL. St. Catarina: Tubarão, *Ule* 262 (G-000069512!).

Taxilejeunea uleana Steph., Hedwigia 35: 136. 1896, *syn. nov.* Type:—BRAZIL. St. Catarina: Blumenau, *Ule* 73 (holotype, G-000069513!).

Description and illustration: Schuster (1980), Reiner-Drehwald & Goda (2000, as *L. caulicalyx*), Gradstein & Ilkiu-Borges (2009, as *L. caulicalyx*).

Plants 0.4–0.8 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, wide spreading; lobe flat, ovate to ovate-orbicular, 390–420 µm long × 330–360 µm wide, dorsal margin arched, ± crenate, ventral margin straight to slightly arched, ± crenate, apex rounded to obtuse; leaf cells hexagonal, 28–38 × 18–26 µm, thin-walled, trigones and intermediate thickenings indistinct; cuticle finely papillose; oil bodies not seen; lobule mostly reduced, when well-developed ovate, inflated, 1/4–1/3 of leaf length, free margin involute, tooth short, keel slightly arched. *Underleaves* small, 1.5–2.0× stem width, distant, ovate to oblong-ovate, longer than wide or as long as wide, lobes erect, triangular, sinus V-shaped, bases cuneate, insertion line slightly curved. *Autoicous*. *Androecia* on short branches, with 3–4 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on very short branches, without vegetative leaves, mostly with one sterile innovation, bracts with lobe obovate, apex rounded to acute, bracteole ovate, bifid to ca. 1/3, sinus V-shaped. *Perianths* oblong to obovate, 5-keeled, keels crenate, beak short, 1–2 cells long.

Comment:—*Lejeunea glaucescens* is a common lowland species on rotten or dead wood. Very characteristic are the leaves with crenulate to crenate margins, very small underleaves (ca. 1.5–2× stem width), gynoecia on very short branches without vegetative leaves (with bracts only) and perianths with conspicuously crenate keels. The species is very similar to *L. subsessilis* but the underleaves in the latter species are broader, 2–3× stem width, and ± wider than long. Moreover, *L. subsessilis* usually grows on living trees or leaves, not on rotten or dead wood.

World distribution:—Widespread in tropical America.

Distribution in Brazil:—Northern, Northeastern, Middle-Western, Southeastern, Southern.

Habitat:—Rainforest and urban environments, usually on rotten or dead wood, also on living leaves, bark, rock or soil.

Selected material examined:—BRAZIL. **Acre**: Rio Branco, FUFAC, 9°58'29"S, 67°48'36"W, *D.M. Vital* 14852 (SP). **Amazonas**: São Gabriel da Cachoeira, Ilha Cariuari, 17 February 2017, *A.M. Sierra* 4732 (INPA). **Bahia**: Igrapiúna, Reserva Ecológica da Michelin, 13°48'S, 39°10'W, 90–383 m, Mata da Vila Cinco, 16 February 2006, *C. Bastos* 4344 (ALCB). **Espírito Santo**: Linhares, Reserva Florestal da Co. Vale do Rio Doce, 15 October 1992, *O. Yano & P.G. Windisch* 17326 (SP). **Goiás**: Brasília, Distrito Federal, Área de Proteção Ambiental de Cafuringa, 15°30'21"S, 48°06'18"W, 28 January 2009, *A.F.R. Soares & J.R.P.M. Oliveira* 104 (UB). **Mato Grosso**: Santo Antônio de Leverger, BR 364 para São Vicente, km 51, 20 May 1984, *N. Saddi & D.M. Vital* 6041 (UB). **Paraná**: Foz do Iguaçu, Parque Nacional do Iguaçu, 100–200 m, 25°40'S, 54°25'W, 22 September 1984, *D.M. Vital & W.R. Buck* 12099 (SP). **Pernambuco**: Cabo de Santo Agostinho, Reserva Ecológica do Gurjaú, 3 November 2000, *S.R. Germano s.n.* (UFP 32843). **Rio de Janeiro**: Angra dos Reis, Ilha Grande, 50–110 m, 21 March 1995, *O. Yano et al.* 23560 (SP). **Roraima**: Jaru, 9 October 1986, *D.M. Vital* 14272 (SP). **São Paulo**: Cananéia, Ilha do Cardoso, 13 January 1984, *O. Yano & M.G.L. Wanderley* 8990 (SP).

27. *Lejeunea grossitexta* (Stephani 1913: 240) Reiner-Drehwald & Goda (2000: 29); Reiner-Drehwald & Goda (2000)

Crossotolejeunea grossitexta Steph.

Crossotolejeunea apiahyana Steph. (syn. fide Reiner-Drehwald & Goda).

Harpalejeunea mohrii Steph. (syn. fide Reiner-Drehwald & Goda).

Lejeunea lignicola Spruce (*Harpalejeunea lignicola* [Spruce] Steph.) (syn. fide Reiner-Drehwald & Goda 2000).

Description and illustration: Reiner-Drehwald (2000a), Reiner-Drehwald & Goda (2000).

Plants 0.4–0.9 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, wide spreading; lobe ± convex, triangular-ovate, 300–450 µm long × 250–340 µm wide, dorsal margin slightly arched, entire to crenate, ventral margin slightly arched, entire, apex acute to sharply apiculate, plane or recurved; leaf cells 16–27 × 16–30 µm, thin-walled, trigones small to indistinct, intermediate thickenings absent; cuticle smooth to finely papillose; oil bodies not seen; lobule ovate, inflated, 1/3–1/2 of leaf length, free margin involute, tooth short, keel arched. *Underleaves* small, 1.5–2× stem width, distant, bifid to 1/2, sinus V-shaped, lobes obtuse, bases cuneate, insertion line slightly arched. *Autoicous*. *Androecia* on long or short branches, with 3–6 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on the stem or on short branches, with one sterile innovation, bract lobe ovate-lanceolate, apex acute to apiculate, bracteole oblong, bifid to 1/5. *Perianths* obovoid, 5-keeled, keels with teeth and lacinia, beak 2 cells long.

Comment:—*Lejeunea grossitexta* is a mainly subtropical South American species. The species is somewhat similar to *L. raddiana* but the leaf lobes and perianth keels in *L. raddiana* are usually bordered by a row of subrectangular, mammillose cells, oriented transversely to the margin, and the perianth keels in the latter species lack lacinia.

World distribution:—Brazil, Paraguay and northern Argentina (Reiner-Drehwald & Goda 2000).

Distribution in Brazil:—Northeastern, Middle-Western, Southeastern. Further records: Northern and Southern (Yano 2008, Costa 2017).

Habitat:—Rainforest, on living trees.

Selected material examined:—BRAZIL. **Bahia**: Abaíra, Catolés, Serra do Barbado, Mata da Forquilha, 13°17'27"S, 41°54'015"W, 1594 m, 5 September 2008, S.B. Vilas Bóas-Bastos 2376 (ALCB). **Goiás**: Formoso, 13°37'S, 48°45'W, 25 July 1984, D.M. Vital 12685 (SP). **Pernambuco**: Altinho, Fazenda Taboca, mixed with *Lejeunea cancellata* and *Lejeunea aphanes*, 29 August 1980, O. Yano & D. Andrade Lima 2786 (SP). **São Paulo**: Ilha do Cardoso, mixed with *Lejeunea aphanes*, *Lejeunea bermudiana* and *Lejeunea controversa*, 1 June 1982, D.M. Vital 10428 (SP).

28. *Lejeunea herminieri* (Stephani 1911: 714) R.L.Zhu, in Pócs *et al.* (2015: 99); Pócs *et al.* (2015)

Archilejeunea herminieri Steph.

Lejeunea saccatiloba (Steph.) Ye *et al.* (*Oryzolejeunea saccatiloba* [Steph.] Gradst.) (syn. fide Pócs *et al.* 2015).

Description and illustration: Schuster (1970, as *Cyrtolejeunea antillana* R.M. Schust.).

Plants 0.9–1.2 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide spreading; lobe convex, ovate, often somewhat falcate, 530–560 µm long × 400–450 µm wide, dorsal margin arched, entire or crenulate, ventral margin arched, entire or crenulate, apex rounded; leaf cells hexagonal to oblong, 28–45 × 20–28 µm, thin-walled, trigones and intermediate thickenings small; cuticle finely papillose (occasionally smooth); oil bodies homogeneous, numerous per cell; lobule ovate, inflated, 1/2–2/3 of leaf length, free margin plane near the apex, tooth (= second tooth) short, unicellular, hyaline papilla distal-marginal, keel arched, crenate. *Underleaves* undivided, distant, orbicular to suboblong, 2–3× stem width, margin entire, bases cuneate, insertion line straight. *Dioicous*. *Androecia* not seen. *Gynoecia* on short branches, with 1–2 innovations, bracts suberect, lobe obovate, margin entire, apex acute, bracteole obovate, undivided or emarginate. *Perianths* 5-keeled, keels smooth, beak very short, 1–2 cells long.

Comment:—The main characters of *Lejeunea herminieri* are the undivided underleaves and the distal hyaline papilla (Ye *et al.* 2013, as *L. saccatiloba*). In the latter respect the species is similar to members of *Cheilolejeunea*, especially *C. holostipa* which also has undivided underleaves. However, *C. holostipa* is a much smaller plant (ca. 0.5 mm wide) with suberect leaf lobes, lobules with a long and sharp tooth, and leaf cells with a smooth cuticle.

World distribution:—Widespread in the Neotropics.

Distribution in Brazil:—Northeastern. Further records: Northern, Southeastern (Yano 2008).

Habitat:—Rainforest, on living trees and rotten logs.

Selected material examined:—BRAZIL. **Bahia**: Miguel Calmon, Parque Estadual das Sete Passagens, 11°39'S, 40°53'W, 1000–1200 m, 17 December 2005, S.B. Vilas Bôas-Bastos 1757 (ALCB).

29. *Lejeunea immersa* Spruce (1884: 186). Fig. 5

Trachylejeunea immersa (Spruce) Steph., Sp. Hepat. 5: 308. 1913. Type:—PERU: Yurimaguas, fl. Huallaga, *Spruce L489* (lectotype, designated here, MANCH-000007! isotype, MANCH-000008!).

Plants 1.0–1.4 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, wide spreading; lobe ± flat, ovate, 500–800 µm long × 300–600 µm wide, dorsal margin slightly arched, crenulate to strongly crenate by projecting ovate, transversely oriented cells, ventral margin straight, strongly crenate, apex rounded, obtuse, acute, to apiculate, plane; leaf cells hexagonal, 30–60 × 18–30 µm, thin-walled, trigones minute, intermediate thickenings absent; cuticle smooth; oil bodies not seen; lobule frequently reduced, when well-developed small, 120–150 µm × 90–120 µm wide, 1/5–1/4 of leaf length, ovoid, free margin strongly involute, tooth short, keel straight to slightly arched; reduced lobules plane, rectangular. *Underleaves* orbicular, 2–3× stem width, distant, bifid to 1/2, sinus V-shaped, lobes acute, margin crenate, bases cuneate, insertion line curved. *Autoicous*. *Androecia* on short branches, with 2–5 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, with one sterile innovation, bract lobe ovate-oblong, margin crenate, apex acute to obtuse, bracteole ovate-oblong, bifid to 1/4–1/5. *Perianths* oblong to obovoid, 5-keeled, keels strongly crenate, beak 2–3 cells long.

Comment:—*Lejeunea immersa* is characterized by the leaf margin strongly crenate by projecting ovate, transversely oriented cells and by the perianth with strongly crenate keels. The species is morphologically quite similar to *L. quinqueumbonata*, but differs from the latter in the strongly crenate perianth keels without lamella-like projections. *Lejeunea immersa* is also similar to *L. raddiana* in the strongly crenate leaf margins and perianth keels, but the latter species has smaller underleaves with rounded to obtuse tips, falcate leaves with a reflexed apex and larger lobules. The specimen reported to Bahia by Bastos & Yano (2009) as *L. immersa* belongs to *L. quinqueumbonata*.

World distribution:—Brazil and Peru; possibly more widespread.

Distribution in Brazil:—Northern, Northeastern.

Habitat:—Rainforest, on living trees and rotten logs.

Selected material examined:—BRAZIL. **Amazonas**: São Gabriel da Cachoeira, Rio Uaupés, Sítio São Paulo, 21 December 2017, A.M. Sierra 5029 (INPA). **Bahia**: Eunápolis, Estação Veracruz, 16°22'S, 39°10'W, 70–100 m, 9 September 1999, S.B. Vilas Bôas-Bastos 1248 (ALCB).

30. *Lejeunea inflexiloba* Jack & Stephani (1892: 16); Reiner-Drehwald & Goda (2000)

Description and illustration: Reiner-Drehwald & Goda (2000).

Plants 1.3–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* wide spreading, imbricate; lobe ovate, convex, 700 µm long × 600 µm wide, dorsal margin arched, entire, ventral margin arched, entire, strongly revolute, apex rounded; leaf cells oblong, 35–38 × 22–28 µm, thin-walled, trigones and intermediate thickenings distinct; cuticle smooth to slightly papillose; oil bodies not seen; lobule inflated, rectangular-ovate, 1/3–1/2 of leaf length, free margin involute, tooth short, keel arched. *Underleaves* small, 2–3× stem width, distant to contiguous, bifid to 1/3, sinus V-shaped, lobes triangular-acute, bases cuneate, insertion line arched. *Dioicous*. *Androecia* on long or short branches, with 2–5 pairs, bracteoles restricted to the base of the spike. *Gynoecia* on stem or short branches, with 1(–2) innovations, bract lobe ovate, margin entire, apex rounded, bracteole obovate, bifid to 1/5–1/4. *Perianths* 5-keeled, keels crenate, beak 2–3 cells long.

Comment:—*Lejeunea inflexiloba* is a rare northern Andean páramo species. With a strongly revolute ventral margin of the leaf lobe this species cannot be confused with other neotropical *Lejeunea* species.

World distribution:—Brazil, northern Andes (Colombia, Ecuador) (Parolly *et al.* 2004).

Distribution in Brazil:—Southeastern.

Habitat:—Montane forest, on living trees.

Selected material examined:—BRAZIL. **Rio de Janeiro**: Teresópolis, Serra dos Órgãos, Pedra do Sino, 22°27'46"S, 43°12'70"W, 21 March 2007, D.P. Costa 4720 (GOET, RB).

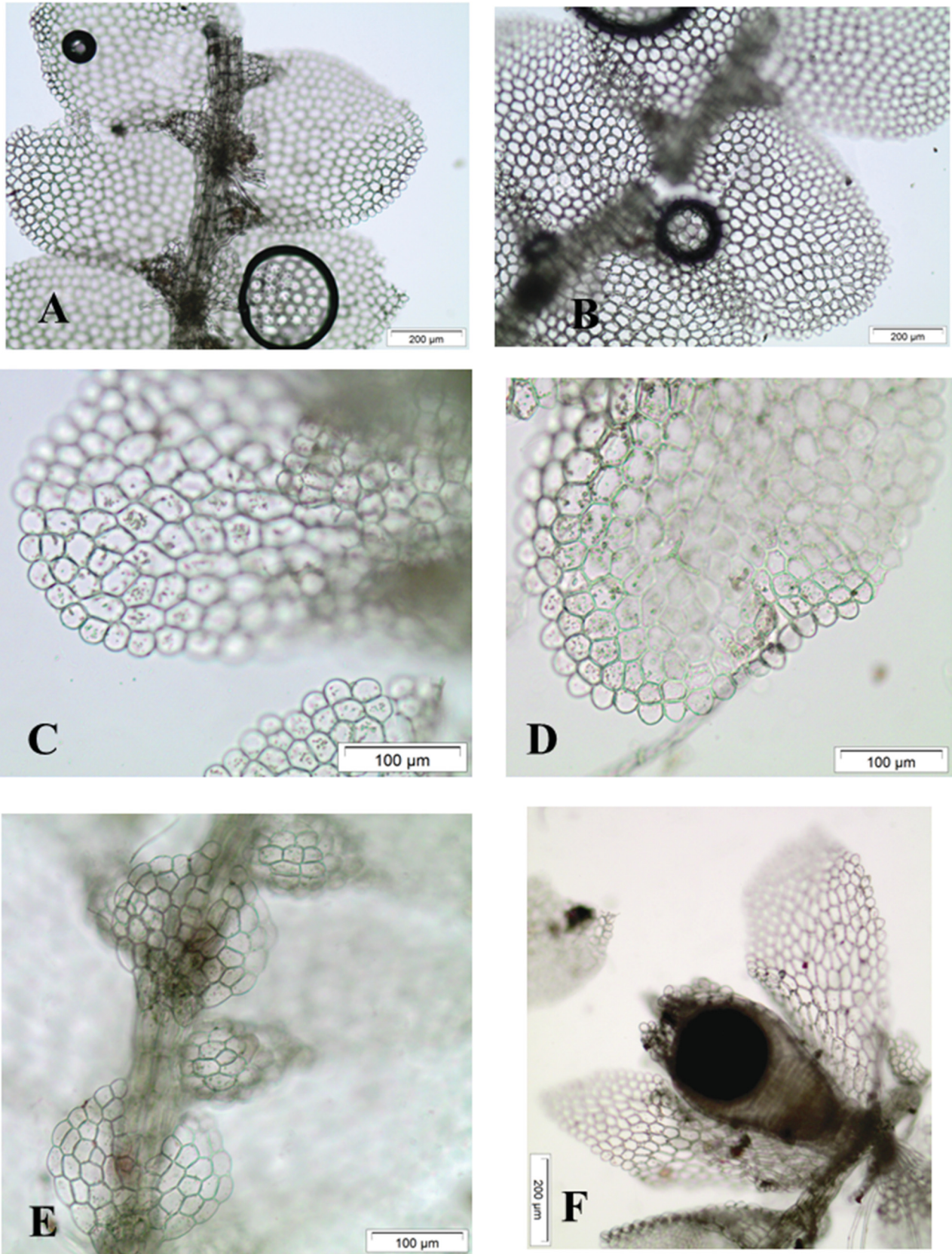


FIGURE 5. *Lejeunea immersa* Spruce. A–B: Habit in ventral view. C–D: Leaf lobes with strongly crenate margins, showing transversely oriented cells. E: Distant, subsorbicular underleaves. F: Perianth (all from *A.M. Sierra 5029*).

31. *Lejeunea juruana* Gradstein & Reiner-Drehwald (2007: 488); Reiner-Drehwald (2000b)

Potamolejeunea uleana Steph., Sp. Hepat. 5: 641. 1914. (*Neopotamolejeunea uleana* [Steph.] M.E. Reiner).

Illustration: Reiner-Drehwald (2000b, as *Potamolejeunea uleana*).

Plants 2.0–2.8 mm wide. *Ventral merophyte* four cells wide. *Leaves* wide spreading, contiguous to imbricate, insertion of leaf lobes very long, as long as the whole width of the leaves; lobe obovate, 1–2 mm long × 0.8–1.7 mm wide, dorsal margin slightly arched, entire, ventral margin straight, entire, apex rounded; leaf cells 11–23 × 15–35 µm wide, thin-walled, trigones small and intermediate thickenings indistinct; cuticle smooth; oil bodies not seen; lobule frequently reduced, when well-developed with a 2–4 cells long tooth, keel straight. *Underleaves* small, longer than wide, 1.5–2× stem width, distant, bifid to 1/2, lobes triangular-acute, bases cuneate, insertion line shallowly curved. *Autoicous*. *Androecia* on long or short branches, with 2–4 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, with one short, sterile or fertile innovation, bract lobe obovate to ovate, margins entire, apex acute, bracteole short-bifid, oblong. *Perianths* obovoid, 5-keeled, keels smooth, beak 1–3 cells long.

Comment:—*Lejeunea juruana* is a rare rheophytic species characterized by stems with 4 cells wide ventral merophyte and leaves longly attached to the stem, across the whole leaf width. The species is very close to *L. polyantha* but the ventral merophyte in the latter species is broader (ca. 10 cells wide) and the underleaf insertion deeply arched.

World distribution:—Only known from Brazil.

Distribution in Brazil:—Northern (Gradstein & Reiner-Drehwald 2007), Middle-Western.

Habitat:—Rainforest, on leaves of trees or shrubs in rivers, growing periodically submerged.

Selected material examined:—BRAZIL. **Mato Grosso**: Cáceres, ao longo do Rio Paraguai, rochedo da Serra Pelada, 6 June 1984, N. Saggi & D.M. Vital 6158 (UB).

32. *Lejeunea laeta* (Lehmann & Lindenbergh 1834: 380) Lehm. & Lindenb., in Gottsche *et al.* (1845: 380); Reiner-Drehwald *et al.* (2018)

Jungermannia laeta Lehm. & Lindenb.

Lejeunea diversistipa Lindenb. & Gottsche (syn. fide Reiner-Drehwald *et al.* 2018).

Lejeunea geophila Spruce (syn. fide Reiner-Drehwald 2003).

Description and illustration: Reiner-Drehwald (2000a, as *L. geophila*).

Plants 0.9–1.0 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide spreading; lobe ovate, 344–552 µm long × 296–432 µm wide, dorsal margin slightly arched, entire, ventral margin straight, entire, apex rounded or obtuse, frequently recurved; leaf cells hexagonal, 22–44 × 14–24 µm, thin-walled, trigones small to indistinct, intermediate thickenings absent; cuticle smooth; oil bodies not seen; lobule occasionally reduced, when well-developed ovate, 1/4–1/3 of leaf length, free margin involute to plane, tooth short, keel straight to slightly arched. *Underleaves* small, distant, orbicular to suborbicular, 1.5–2× stem width, bifid to 1/2, lobes triangular, sinus V-shaped, bases cuneate, insertion line curved. *Autoicous*. *Androecia* on short branches, with 2–3 pairs of bracts, bracteoles restricted to the base of the spike or present throughout (variable!). *Gynoecia* on elongate branches, with one innovation, bract lobe obovate, margins entire, apex acute to obtuse, bracteole oblong, bifid to 1/5–1/3. *Perianths* obovoid, 5-keeled, keels smooth or with teeth or cilia, beak 2 cells long.

Comment:—*Lejeunea laeta* approaches *L. glaucescens* but in the latter species the leaf apex is always rounded and flat (not obtuse nor recurved), the underleaves are usually slightly longer than wide (not wider than long), the gynoecia are on very short branches without vegetative leaves, and the perianth keels in *L. glaucescens* are strongly crenate by mammillose cells.

World distribution:—Widespread in the Neotropics (Reiner-Drehwald *et al.* 2018).

Distribution in Brazil:—Northeastern, Southeastern. Further records: Southern (Ristow *et al.* 2015).

Habitat:—Rainforest, mostly on soil and rock, occasionally on living trees.

Selected material examined:—BRAZIL. **Bahia**: Eunápolis, Estação Veracel, 16°22'S, 39°10'W, 9 June 1999, S.B. Vilas Bôas-Bastos & C. Bastos 403 (ALCB). **São Paulo**: Ubatuba, Fazenda Mar Virado, 13 February 1908, D.M. Vital 8811 (SP).

33. *Lejeunea laetevirens* Nees & Mont., in Montagne (1842: 469); Reiner-Drehwald (2010)

Microlejeunea laetevirens (Nees & Mont.) A. Evans, Bryologist 11: 68. 1908.

Lejeunea cladobola Spruce (syn. fide Reiner-Drehwald 2010).

Lejeunea lepida Lindenb. & Gottsche (syn. fide Reiner-Drehwald 210).

Lejeunea regnellii Ångstr. (syn. fide Reiner-Drehwald 2010).

Description and illustration: Schuster (1980), Reiner-Drehwald (2000a), Gradstein & Ilkiu-Borges (2009).

Plants 300–400 µm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to slightly imbricate, obliquely spreading; lobe flat, ovate-oblong, 110–208 µm long × 100–144 µm wide, dorsal margin slightly arched, entire, ventral margin straight, entire, apex rounded to obtuse; leaf cells hexagonal, 16–24 × 12–16 µm, thin-walled, trigones and intermediate thickenings distinct; cuticle finely punctate-papillose; oil bodies segmented, few per cell; lobules frequently reduced, when-developed ovate, strongly inflated, 1/3–1/2 of leaf length, free margin involute, tooth short, keel arched. *Underleaves* distant, 1.5–2× stem width, bifid to 1/2, lobes acute, 3–4 cells at the base, ending by 1–2 cells never broken, outer margins often with a blunt tooth, sinus V-shaped or U-shaped, bases cuneate, insertion line straight. *Dioicous*. *Androecia* on short or long branches, with 3–12 pairs of bracts, bracteoles present throughout the spike. *Gynoecia* on short or long branches, with one innovation, bract lobe obovate, margins entire, apex rounded, bracteole ovate-oblong, bifid to ca. 1/2. *Perianths* oblong, 5-keeled, keels variously ornamented with teeth or cilia, or smooth, beak 2 cells long. Vegetative reproduction by shoot fragmentation.

Comment:—*Lejeunea laetevirens* is a very common and widespread neotropical species, and one of the most xerotolerant neotropical leafy liverworts. The small plants with highly fragile stems and branches, obliquely spreading, ovate-oblong leaves with a well-developed, inflated lobule, a finely punctate-papillose cuticle, and small, bifid underleaves frequently with a blunt tooth on the outer margins, are the main features of *L. laetevirens*. The species lacks caducous leaves.

World distribution:—Widespread in the Neotropics.

Distribution in Brazil:—Northern, Northeastern, Middle-Western, Southeastern. Further records: Southern (Yano 2008).

Habitat:—Rainforest and deciduous forest, restinga, cerrado and urban environments, on living trees and rotten logs, also on living leaves and rock.

Selected material examined:—BRAZIL. **Bahia**: Miguel Calmon, Parque Estadual das Sete Passagens, 600–900 m, 21 April 2003, C. Bastos & S.B. Vilas Boas-Bastos 3286 (ALCB). **Espírito Santo**: Domingos Martins, Parque Estadual Pedra Azul, 14 May 2009, L.T. Penha 350 (ALCB). **Goiás**: Brasília, Lago Sul, Reserva Ecológica Chácara das Pedras, I.R.P. Faria s.n. (UB). **São Paulo**: Litoral Norte, Serra do Mar near Ubatuba, 23°24'S, 45°04'W, 40 m, 24 March 1989, A. Schäfer-Verwimp & I. Verwimp 10959-A (hb. Schäfer-Verwimp). **Roraima**: Mucujai, Serra de Apiaú, 2°26'05"N, 61°24'56"W, 950 m, 16 April 2016, A.M. Sierra 5565 (INPA, ALCB).

34. *Lejeunea longidentata* Bastos et al. (2018: 60)

Type:—BRAZIL. Minas Gerais: Serra da Mantiqueira, Camanducaia, Monte Verde, “Araukarienwald am Caminho do Grande Pinheiro, epiphytisch,” 1550 m alt., 10 August 1986, Schäfer-Verwimp & Verwimp 7532 (holotype, JE!; isotype, ALCB!). In the original publication the holotype was erroneously cited as being in ALCB.

Description and illustration: Bastos et al. (2018).

Plants 850–975 µm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide spreading; lobe asymmetrically ovate-falcate, 400–510 µm long × 280–400 µm wide, dorsal margin strongly arched, ventral margin straight, often upcurved, apex obtuse to subacute, plane or recurved; leaf cells with small, 23–30 × 13–15 µm, simple-triangular trigones, intermediated thickenings scarce, cuticle smooth; oil bodies not seen; lobule well-developed ovate, 1/4–1/3 of leaf length, inflated, free margin incurved, tooth long, slightly falcate, banana-shaped tip rounded, keel arched, crenulate. *Underleaves* subimbricate, ovate, wider than long, 3–4× stem width, bifid to 1/3, lobes broadly triangular, sinus V-shaped to U-shaped, bases rounded, insertion line curved. *Dioicous*. *Androecia* not seen. *Gynoecia* with 1–2 innovations, bract lobe ovate-triangular, apex rounded, bracteole ovate, bifid to 1/2. *Perianths* obovate, 5-keeled, keels smooth, beak 2 cells long.

Comment:—*Lejeunea longidentata* is so far known only from two collections from elevations between 1450 and 1550 m in southeastern Brazil (Bastos et al. 2018). The species is recognized by the asymmetrically ovate-falcate

leaf lobes with a recurved apex and the narrowly elongate, curved, banana-shaped lobule tooth. The wider than long underleaves (3–4× stem width) with a large cell at the base, at either end of the insertion line, resemble those of *L. puiggariana* but the latter species has plane leaves and a much shorter lobule tooth.

World distribution:—Only known from Brazil.

Distribution in Brazil:—Southeastern.

Habitat:—*Araucaria* forest and montane forest, on living trees.

Selected material examined:—BRAZIL. **Espírito Santo**: Domingos Martins, Parque Estadual Pedra Azul, Trilha Pedra das Flores, 5 August 2009, *L.T. Penha 540* (ALCB). **Minas Gerais**: Serra da Mantiqueira, Piranguçu near Campos do Jordão, Centro Vale Verde, 1450 m, 19 April 1986, *A. Schäfer-Verwimp & I. Verwimp 6893/A* (ALCB, GOET, JE).

35. *Lejeunea oligoclada* Spruce (1889: 199)

Type:—BRAZIL. Rio de Janeiro: *Glaziou 742* (holotype, MANCH-000492!).

Description and illustration: Reiner-Drehwald & Schäfer-Verwimp (2008a), Bastos & Yano (2009).

Plants small, 460–625 µm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous, obliquely to wide spreading; lobe triangular-ovate, 240–300 µm long × 200–210 µm wide, plane or slightly convex, dorsal margin slightly arched, entire to crenulate, ventral margin straight, entire to slightly crenulate, apex rounded to acute; leaf cells hexagonal, 20–25 × 15–17 µm, thin-walled, trigones distinct, intermediate thickenings occasionally present in leaves of main shoots, otherwise lacking; cuticle finely punctate-papillose; oil bodies small, finely segmented; lobule ovate, inflated, 1/4–1/2 of leaf length, free margin involute, tooth short, keel slightly arched. *Underleaves* small, distant, ovate, suborbicular to oblong, ca. 2× stem width, bifid to 1/2, sinus V-shaped, lobes narrowly triangular, bases cuneate, insertion line arched. *Dioicous*. *Androecia* on short branches or intercalary, with 2–4 pairs of bracts, bracteoles present throughout the spike. *Gynoeceia* on main shoot or on branches, with 1–2 sterile or fertile innovations, bract lobe ovate, margin entire, apex acute, bracteole ovate, bifid to 1/2. *Perianths* 5-keeled, keels smooth to crenate, beak 2 cells long. Vegetative reproduction by caducous whole leaves (including lobules).

Comment:—*Lejeunea oligoclada* is readily recognized by the very small plants (460–625 µm wide) with ± plane, ovate-triangular leaves with a rounded to acute apex and a punctate-papillose cuticle, small distant, bifid underleaves, androecia with bracteoles present throughout the male spike, and vegetative reproduction by caducous whole leaves (including lobules).

World distribution:—Only known from Brazil.

Distribution in Brazil:—Northern, Northeastern, Southeastern.

Habitat:—Rainforest, on living trees and rotten logs.

Selected material examined:—BRAZIL. **Bahia**: Abaíra, Catolés, Serra do Barbado, 13°17'27"S, 41°54'015"W, 1594 m, 5 September 2008, *C. Bastos 5155 p.p.* (ALCB). **Ceará**: Ubajara, Serra da Ibiapaba, Sítio São Luís, 3°48'15"S, 40°54'23"W, 924 m, 24 August 2010, *C. Bastos 5354* (ALCB). **Espírito Santo**: Domingos Martins, 20°26'S, 41°03'W, 1000 m, 10 October 1988, *A. Schäfer-Verwimp & I. Verwimp 10153* (GOET). **Minas Gerais**: Delfim Moreira, Morro do Cruzeiro, 22°27'S, 45°15'W, 1800 m, 8 September 1991, *A. Schäfer-Verwimp & I. Verwimp 14932* (GOET). **Pará**: Serra dos Carajás, Serra Norte, 6°03'19.4"S, 50°15'17.7"W, 685 m, 31 August 2015, *A.L. Ilkiu-Borges et al. A-3612* (MG). **Pernambuco**: Inajá, Serra Negra, 6 September 1980, O. Yano & D. Andrade Lima 2963 (SP). **São Paulo**: Parelheiros, 630 m, 24 February 1990, *A. Schäfer-Verwimp & I. Verwimp 12514* (hb. Schäfer-Verwimp).

36. *Lejeunea parviloba* Ångström (1876: 87)

Rectolejeunea parviloba (Ångstr.) Stephani (1914: 694). Type:—BRAZIL. Minas Gerais: Caldas, *S. Henschen s.n.* (isotype, G-00115527!).

Lejeunea tapajosensis Spruce, Trans. & Proc. Soc. Bot. Edinburgh 15: 223. 1884 (*Taxilejeunea tapajosensis* [Spruce] Steph.; *Rectolejeunea tapajosensis* [Spruce] R.M.Schust.), *syn. nov.* Type:—BRAZIL. Pará: Santarem, *Spruce L251* (MANCH 18328!).

Description and illustration: Reiner-Drehwald (2000a, as *L. tapajosensis*), Gradstein & Ilkiu-Borges (2009, as *L. tapajosensis*).

Plants 1–1.6 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide spreading; lobe ovate to ovate-oblong, 600–800 µm long × 450–700 µm wide, plane or slightly convex, dorsal margin slightly arched, entire, ventral

margin straight, entire, apex rounded, usually plane; leaf cells hexagonal, 26–44 × 17–30 µm, thin-walled, trigones and intermediate thickenings distinct, the trigones radiate; cuticle smooth; oil bodies segmented, ellipsoid; lobule ovate-triangular, small, 1/7–1/5 of leaf length, frequently reduced, free margin slightly involute to plane, tooth short, keel straight. *Underleaves* rather large, 3–4.5× stem width, ± wider than long, distant to contiguous, ovate to suborbicular, bifid to 1/2, sinus V-shaped, lobes triangular-acute, bases cuneate. *Dioicous*. *Androecia* (seen in the type of *L. parviloba*) terminal on short or long branches, with 2–4 pairs of bracts, bracteoles present throughout the male spike. *Gynoecia* on short or long branches, with innovation, bract lobe obovate, margins entire, apex rounded to obtuse, bracteole broadly ovate, bifid to ca. 1/3. *Perianths* obovoid to obpyriform and somewhat flattened with expanded lateral keels, exerted to ca. 1/3–2/3, 4–5-keeled, keels smooth, beak 2–3 cells long, perianth base sometimes prolonged. Vegetative reproduction by caducous leaf lobes.

Comment:—*Lejeunea parviloba* is a rather common neotropical species that was previously known as *L. tapajosensis* Spruce, which is a synonym. The species is close to *L. phyllobola*, both have androecia with bracteoles throughout the male spike and produce caducous leaf lobes, but *L. phyllobola* differs from *L. parviloba* in smaller plant size (0.6–1.0 mm wide), smaller underleaves (1.5–3× stem width) and leaf cells without intermediate thickenings and with simple-triangular (not radiate) trigones. *Lejeunea parviloba* also resembles *L. rionegrensis*, but the latter species has very thin-walled leaf cells with minute trigones and without intermediate thickenings, and caducous whole leaves.

World distribution:—Tropical South America, West Indies and Panama.

Distribution in Brazil:—Northern, Northeastern, Southeastern.

Habitat:—Rainforest, on living trees and rotten logs.

Selected material examined:—BRAZIL. **Amazonas**: Rio Solimões, Igapó Curuçá, 8 August 1974, *D. Griffin III et al.* 808, 813 (INPA). **Bahia**: Jussari, RPPN Serra do Teimoso, 15°12'S, 39°29'W, 300–600 m, 21 March 2018, *C. Bastos* 6295 (ALCB). **Espírito Santo**: Domingos Martins, Venda Nova, 20°27'S, 41°02'W, 1060 m, 10 October 1988, *A. Schäfer-Verwimp & I. Verwimp* 10182 (hb. Schäfer-Verwimp). **São Paulo**: Barra do Turvo, Fazenda Sanharão, 6 December 1973, *D.M. Vital* 27979b, det. M.E. Reiner-Drehwald (SP, U).

37. *Lejeunea perpapillosa* Reiner-Drehwald & Pôrto (2007: 542); Reiner-Drehwald & Pôrto (2007). TYPE:—BRAZIL: Pernambuco, Caruaru, Brejo dos Cavalos, Mata do Podocarpus, 11 August 1987, *K. Cavalcanti Pôrto* 1812 (holotype, GOET)

Description and illustration: Reiner-Drehwald & Pôrto (2007).

Plants 0.5–0.8 mm wide. *Ventral merophyte* two cells wide. *Leaves* wide spreading, contiguous to imbricate; lobe ovate, plane, 350–450 µm long × 250–330 µm wide, dorsal margin slightly arched, crenulate, ventral margin straight to slightly arched, crenulate, apex rounded; leaf cells hexagonal, 10–20 × 10–35 µm, thin-walled, trigones small, intermediate thickenings absent; cuticle strongly papillose; oil bodies not seen; lobule frequently reduced, when well-developed ovate, inflated, 1/2–1/3 of leaf length, free margin involute, tooth short, keel straight to slightly arched. *Underleaves* small, distant, wider than long, 1–2× stem width, bifid to 1/2–2/3, lobes triangular, sinus V-shaped or U-shaped, bases cuneate, insertion line curved. *Dioicous*. *Androecia* on short branches, with 2–3 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on main stem or on short branches, with one sterile innovation, bract lobe obovate, margin crenulate, apex rounded, bracteole ovate, bifid to 1/3–1/2. *Perianths* obovate, 5-keeled, keels crenate, beak short, 1 cell long. Vegetative reproduction by caducous or fragmenting leaves and underleaves, and by regenerants.

Comment:—*Lejeunea perpapillosa* is recognized by the small plants, less than 1 mm wide, with strongly papillose, flat leaves with a rounded apex, large lobules (but frequently reduced), small distant underleaves (1–2× stem width), and vegetative reproduction by caducous or fragmenting leaves and underleaves. The species seems to be endemic to northeastern Brazil (Pernambuco and Bahia states) and is quite common in Bahia.

World distribution:—Only known from Brazil.

Distribution in Brazil:—Northeastern. Widespread in Bahia State.

Habitat:—Lowland and montane rainforest, on living trees, leaves and rotten logs.

Selected material examined:—BRAZIL. **Bahia**: Igrapiúna, Reserva Ecológica da Michelin, 13°48'S, 39°10'W, 90–383 m, 11 August 2006, *C. Bastos* 4690 (ALCB).

38. *Lejeunea phyllobola* Nees & Montagne (1842: 471)

Type:—CUBA: *Ramón de la Sagra s.n.* (isolecotype, designated by Reiner-Drehwald 2000, MANCH-000340!).

Rectolejeunea phyllobola (Nees & Mont.) A. Evans, Bull. Torrey Bot. Club 33: 15. 1906.

Lejeunea brittoniae (A. Evans) Grolle (*Rectolejeunea brittoniae* A. Evans) (syn. fide Reiner-Drehwald 2000a).

Lejeunea cephalandra Spruce (syn. fide Reiner-Drehwald 2000a).

Lejeunea polycephala Spruce (syn. fide Reiner-Drehwald 2000a).

Description and illustration: Reiner-Drehwald (2000a).

Plants 0.6–1 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, obliquely to widely spreading; lobe ovate, 230–500 µm long × 200–280 µm wide, dorsal margin arched, entire to slightly crenulate, ventral margin straight to slightly arched, entire, apex rounded; leaf cells oblong to hexagonal, 16–24 × 12–22 µm, trigones small, simple-triangular (not radiate), intermediate thickenings absent; cuticle smooth; oil bodies finely segmented, 2–4 per cell; lobule frequently reduced, when well-developed ovate, inflated, 1/4–1/3 of leaf length, free margin involute, plane near apex, tooth short, oblong to obtuse, keel slightly arched. *Underleaves* ovate to suborbicular, distant, 1.5–3× stem width, bifid to 1/2–1/3, sinus V-shaped, lobes triangular, bases cuneate, insertion line curved to straight. *Dioicous*. *Androecia* on main stem or on short branches, with 2–3 pairs of bracts, bracteoles present throughout to the male spike. *Gynoecia* on short branches, with 1–2 sterile or fertile innovations, bract lobe ovate, margin entire, apex rounded, bracteole broadly ovate, bifid to 1/3–1/2. *Perianths* obovoid and somewhat flattened with expanded lateral keels, exerted to 1/3–1/2, 4–5-keeled, keels smooth, dorsal keels weakly developed and sometimes reduced, beak 2–3 cells long. Vegetative reproduction by caducous leaf lobes.

Comment:—*Lejeunea phyllobola* is a very common species that is readily recognized by the small, dioicous plants with caducous leaf lobes, small underleaves (1.5–3× stem width), thin-walled leaf cells with small, simple-triangular trigones and usually no intermediate thickenings, androecia with bracteoles present throughout the spike, and the small, obovoid and somewhat flattened perianth with expanded lateral keels. A stylus is sometimes seen at the ventral base of the lobule (Reiner-Drehwald 2000). According to Reiner-Drehwald (2000) *L. phyllobola* is dioicous, not autoicous as suggested by Evans (1902) and Schuster (1980), and very variable in plant size and lobule and underleaf shape.

World distribution:—Widespread in the Neotropics, also in Africa and India.

Distribution in Brazil:—Northeastern, Middle-Western, Southeastern, Southern. Further records: Northern (Yano 2008).

Habitat:—Lowland and montane rainforest, deciduous forest and restinga, on living trees and rotten logs.

Selected material examined:—BRAZIL. **Bahia**: Itaberaba, Serra do Orobó, Fazenda Gameleira, 12°24'30"S, 40°32'09"W, 752 m, 18 January 2015, *C. Bastos* 5598 (ALCB). **Espírito Santo**: Domingos Martins, Parque Estadual Pedra Azul, 15 May 2009, *L.T. Penha* 283 (ALCB). **Mato Grosso**: Várzea Grande, Loteamento Santa Cecília, 15°40'48"S, 56°08'17"W, 165 m, T.E.C. *Meneguzzo et al.* 243 (UB). **Rio Grande do Sul**: Caxias do Sul, Mata SanVitto, Reserva Municipal, 29°16'81"S, 51°17'94"W, 817 m, 12 April 2010, *J.R.P.M. Oliveira & R.A. Vasum* 132 (UFP). **Santa Catarina**: Ilha de São Francisco, 26°14'S, 48°36'W, 5 m, 2 January 1991, *A. Schäfer-Verwimp & I. Verwimp* 13600/A (hb. Schäfer-Verwimp). **São Paulo**: Campos do Jordão, Horto Florestal, 1550–1600 m, 11 May 1991, *A. Schäfer-Verwimp & I. Verwimp* 14473/B (hb. Schäfer-Verwimp).

39. *Lejeunea polyantha* Montagne (1856: 350); Reiner-Drehwald (1999); Gradstein & Reiner-Drehwald (2007)

Crossotolejeunea polyantha (Mont.) Steph., Sp. Hepat. 5: 243. 1913 (*Potamolejeunea polyantha* [Mont.] M.E. Reiner & Goda;

Neopotamolejeunea polyantha [Mont.] M.E. Reiner).

Description and illustration: Reiner-Drehwald (1999, as *Potamolejeunea polyantha*).

Plants 2.5–3.2 mm wide. *Ventral merophyte* 10 cells wide. *Leaves* contiguous to distant, widely spreading, insertion of leaf lobes very long, as long as the whole width of the leaves; lobe obovate, asymmetrical, 1.3–2.6 mm long × 1.3–1.5 mm wide, dorsal margin slightly arched, entire, mostly with a border of hyaline cells, ventral margin straight, entire, apex rounded; leaf cells oblong to hexagonal, 14–23 × 33–45 µm, trigones and intermediate thickenings indistinct; cuticle smooth; oil bodies not seen; lobule reduced, tooth short, 1-celled, or lacking, keel straight. *Underleaves* distant, oblong, 3–4× stem width, sinus V-shaped, lobes triangular-acute, bases cuneate, insertion line deeply arched. *Autoicous*. *Androecia* on short branches, with 2–3 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, innovation not seen, bract lobe obovate, apex acute, bracteole narrowly oblong, bifid to 1/3–1/2. *Perianths* obovate, not emergent beyond the bracts, 5-keeled, beak 1–2 cells long (Reiner-Drehwald 1999).

Comment:—*Lejeunea polyantha* is a robust rheophytic species characterized by stems with a ca. ten cells wide ventral merophyte and leaf lobes longly attached to the stem, across the whole leaf width. The species is close to *L. juruana* but the latter species has a longer lobule tooth (more than one cell long) and underleaves with a shallowly curved insertion.

World distribution:—Brazil and Venezuela (Reiner-Drehwald 2000b, as *Neopotamolejeunea*; Gradstein & Reiner-Drehwald 2007).

Distribution in Brazil:—Northern (AM). Further record: Middle-Western (Yano 2008).

Habitat:—Lowland rainforest areas, growing periodically submerged on rock and pendent on branches of shrubs in rivers (Reiner-Drehwald 2000).

Selected material examined:—BRAZIL. **Amazonas**: Rio Parauari, between Água Mineral and Calcário, 4°56'S, 58°01'W, 14 July 1983, *B. Nelson et al. 1331* (INPA).

40. *Lejeunea pterigonia* (Lehmann & Lindenb. 1834: 44) Montagne (1840: 337); Evans (1921); Reiner-Drehwald (2000a)

Jungermannia pterigonia Lehm. & Lindenb.

Taxilejeunea pterigonia (Lehm. & Lindenb.) Schiffn., *Hedwigia* 31: 13. 1892.

Description and illustration: Reiner-Drehwald (2000a, as *T. pterigonia*). Illustration: Gradstein & Costa (2003, as *T. pterigonia*).

Plants 1.1–1.6 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, suberect; lobe ovate-triangular, 0.8–1.2 mm long × 0.5–1.0 mm wide, dorsal slightly arched, entire to crenulate and usually with 1–3 small teeth near the apex, ventral margin straight, entire, apex acute to apiculate; leaf cells hexagonal, 16–43 × 16–27 μm, thin-walled, trigones minute, intermediate thickenings absent; cuticle finely punctate-papillose, occasionally smooth; oil bodies segmented, variable in number, 4–6 or about 10–16 per cell; lobule reduced. *Underleaves* large, 4–7× stem width, imbricate to contiguous, shallowly bifid to 1/4–1/3 with a narrow V-shaped incision, lobes frequently overlapping, tips acute-apiculate, margins crenulate, bases with large auricles. *Autoicous*. *Androecia* on main stem or on short or long branches, with 4–7 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecea* on branches, usually with one repeatedly fertile innovation, resulting in a long row of gynoecea, bract lobe acute to apiculate, margins entire or toothed, bracteole bifid to 1/5–1/3, margins slightly toothed. *Perianths* pyriform, longly exserted, 5-keeled in upper half, keels with teeth-like projections near the apex, beak 1–2 cells long.

Comment:—*Lejeunea pterigonia* is recognized by the long and slender, whitish-green, frequently pendent plants, leaf lobe ovate-triangular, margins entire to crenate and frequently with 1–3 teeth near the apex, apex apiculate to acute, cuticle finely papillose, leaf lobule reduced, underleaves 4–7× stem width, bifid to 1/3 and with large auricles, gynoecea in long rows on branches and perianth 5-keeled in upper half, the keels irregularly toothed near the apex.

World distribution:—Widespread in tropical America.

Distribution in Brazil:—Northeastern, Southeastern. Further records: Northern, Middle-Western and Southern (Yano 2008).

Habitat:—Rainforest, on bark, rock and leaves.

Selected material examined:—BRAZIL. **Bahia**: Igrapiúna, Reserva Ecológica da Michelin, 13°48'S, 39°10'W, 11 August 2006, *C. Bastos 4740* (ALCB). **Minas Gerais**: Campos Jordão, Piranguçu, 1500 m, 19 April 1986, *A. Schäfer-Verwimp & I. Verwimp 6897*, det R. Grolle (GOET). **Rio de Janeiro**: Parque Nacional de Itatiaia, Tres Picos, 1200–1400 m, 10 Mai 2000, *S.R. Gradstein & D.P. Costa 3867* (GOET).

41. *Lejeunea ptosimophylla* Massalongo (1881: 123); Reiner-Drehwald (2000a)

Description and illustration: Reiner-Drehwald (2000a).

Plants 0.8–0.9 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to subimbricate, wide spreading; lobe ovate, 335–465 μm long × 310–400 μm wide, dorsal margin arched, entire, ventral margin straight to slightly arched, entire, apex rounded; leaf cells hexagonal, 16–24 × 12–20 μm, thin-walled, trigones minute, intermediate thickenings absent; cuticle smooth; oil bodies not seen; lobule mainly reduced, rectangular to subrectangular, plane, when well-developed 1/7–1/6 of leaf length, free margin plane to slightly involute, tooth 1–6 cells long, 1–4 cells wide, keel straight. *Underleaves* ovate to ovate-oblong, 3–4× stem width, distant, deeply bifid to (1/2–)3/4, sinus widely V-shaped, lobes narrowly triangular, widely divergent, bases cuneate, insertion line straight to slightly curved. *Dioicous*.

Androecia on short or long branches, with 2–12 pairs of bracts, bracteoles present throughout the spike. *Gynoecia* on stem or on short branches, with 1–2 sterile or fertile innovations, bract lobe obovate, margins entire, apex rounded, bracteole ovate-oblong, bifid to 1/2. *Perianths* obovoid, long exserted, 5-keeled, keels smooth, beak 1–2 cells long. Vegetative reproduction by caducous leaves, leaf lobes and underleaves.

Comment:—*Lejeunea ptosimophylla* is characterized mainly by the long lobule tooth (1–6 cells long, 1–4 cells wide), distant, deeply bifid underleaves with divergent lobes and a widely V-shaped sinus, and vegetative reproduction by caducous leaves and underleaves.

World distribution:—Northern Argentina, Brazil, Paraguay and Bolivia (Reiner-Drehwald 2000, unpubl.).

Distribution in Brazil:—Southeastern.

Habitat:—Rainforest, on living trees.

Selected material examined:—BRAZIL. **Espírito Santo**: BR 262 km 134, 1050 m, 1 July 1990, A. Schäfer-Verwimp & I. Verwimp 12853/A (hb. Schäfer-Verwimp).

42. *Lejeunea puiggariana* Stephani (1915: 754); Reiner-Drehwald (2000a)

Illustration: Reiner-Drehwald (2000a).

Plants 1.6–2.2 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide spreading; lobe ovate to ovate-oblong, 0.8–1.2 mm long \times 0.7–0.9 mm wide, dorsal margin slightly arched, entire, ventral margin straight, entire, apex rounded; leaf cells oblong, 30–48 \times 23–30 μm , thin-walled, trigones small, intermediate thickenings 1–2 per cell; cuticle smooth; oil bodies homogeneous, numerous per cell; lobule ovate, inflated, 1/4–1/3 of leaf length, free margin involute, tooth short, keel straight to slightly arched. *Underleaves* ovate, distant, 2.5–4 \times stem width, bifid to 1/2, sinus V-shaped, lobes broadly triangular, bases rounded, with a large cell at either side of the underleaf base, insertion line arched. *Autoicous*. *Androecia* on short branches, with 2–3 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, with 1(–2) sterile or fertile innovations resulting in 1–2 gynoecia in a row, bract lobe obovate, apex rounded, bracteole ovate-oblong, bifid to 1/2. *Perianths* obovoid, exserted to 1/3–1/2, 5-keeled, keels smooth, beak 3 cells long.

Comment:—*Lejeunea puiggariana* resembles *L. flava* in the ovate to ovate-oblong leaves, small lobules, contiguous underleaves (2.5–4.0 \times stem width) and 1–2 gynoecia in a row on branches, but differs from *L. flava* in underleaves wider than long (longer than wide to as long as wide in *L. flava*), presence of a large cell at either side of the underleaf base, and homogeneous oil bodies.

World distribution:—Northern Argentina, Brazil, Ecuador and Central America.

Distribution in Brazil:—Northeastern. Further records: Middle-Western, Southeastern, and Southern (Yano 2008, Ristow *et al.* 2015).

Habitat:—Cerrado and rainforest, on living trees and leaves.

Selected material examined:—BRAZIL. **Bahia**: Correntina, 1 February 1967, D.M. Vital 1139 (SP); Santa Teresinha, povoado de Pedra Branca, Serra da Jiboia, Morro da Pioneira, 12°51'20"S, 39°28'32"W, 800 m, 17 September 2015, C. Bastos 5689-C (ALCB).

43. *Lejeunea pulchra* C.J.Bastos & Gradst., **sp. nov.** Fig. 6–7

Diagnosis: Plants autoicous, very small, 0.4–0.5 mm wide, leaves strongly convex, obliquely spreading to squarrose, margins entire to crenulate, apex rounded, leaf cells thin-walled, trigones very small, walls with 0–1 intermediate thickenings, cuticle finely punctate-papillose, lobule ovate, strongly inflated, ca. 1/3 of leaf length, keel strongly arched, underleaves small, 1.5–2.0 \times stem width, distant, ovate to suborbicular, bifid to 1/2, lobules triangular with a 3–4 cell wide base, apices obtuse, tip cells never broken, sinus V-shaped, bases cuneate, insertion line arched. *Perianth* 5-keeled, keels smooth, beak short, 3–4 cells long. Vegetative reproduction absent.

Type:—BRAZIL. Bahia, Wenceslau Guimarães, Nova Esperança, Estação Ecológica de Wenceslau Guimarães, Trilha Serra Grande, on bark mixed with *Lejeunea aphanes*, *L. flava*, and *L. grossitexta*, 13°35'43"S, 39°43'13"W, 583 m C. Bastos 5975 (holotype, ALCB).

Plants very small, 0.4–0.5 mm wide. *Ventral merophyte* two cells wide. *Stems* ca. 80 μm wide, in cross section with 7 epidermal cells and 10–11 medullary cells, thin-walled. *Leaves* contiguous to imbricate, strongly convex, obliquely spreading to squarrose; lobe ovate-orbicular, 210–290 μm long \times 150–220 μm wide, dorsal margin slightly arched, entire to crenulate, ventral margin arched, entire, apex rounded; leaf cells isodiametric-hexagonal, 20–40 \times 10–18 μm ,

thin-walled, trigones very small, walls with 0–2 intermediate thickenings; cuticle finely punctate-papillose; oil bodies not seen; lobule ovoid, strongly inflated, 110–140 μm long \times 80–100 μm wide, ca. 1/3 of leaf length, free margin involute, tooth small, mostly curved, hyaline papilla proximal (at the base of the first tooth), keel strongly arched, smooth to crenulate by projecting cell walls; reduced lobules occasional. *Underleaves* distant, small, 90–100 μm long \times 100–110 μm wide, slightly wider than long, 1.5–2.0 \times stem width, ovate to suborbicular, bifid to 1/2, lobes triangular with a 3–4 cell wide base, obtuse, tip cells never broken, sinus V-shaped, bases cuneate, insertion line arched. *Autoicous*. *Androecia* on short branches or intercalary on long shoots, with 2–4 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on main stem or on short branches, with one lejeuneoid innovation, bract lobe obovate, ca. 380 μm long \times 230 μm wide, margin entire to crenulate, apex rounded to acute, lobule obovate to oblong, ca. 290 μm long \times 90 μm wide, apex rounded to acute. *Perianths* obovoid, 630 μm long \times 340 μm wide, 5-keeled, keels smooth, beak short, 3–4 cells long. Vegetative reproduction not seen.

Comment:—*Lejeunea pulchra* is so far known only from Bahia, Northeastern Brazil, where it grows on tree trunks in humid, submontane forest together with other bryophytes, especially Lejeuneaceae. *Lejeunea pulchra* is perhaps most similar to *L. aphanes*, but differs from the latter species in the leaves obliquely spreading and strongly convex (widely spreading and flat to weakly convex in *L. aphanes*) and underleaves not appressed to the stem (usually appressed to the stem and inconspicuous in *L. aphanes*) and with 3–4 cells wide lobes, ending in one short cell with firm walls (underleaf lobes narrower in *L. aphanes*, with a 2–3 cells wide base and usually ending in a row of 2 cells, the tip cell being elongate and with fragile walls, frequently broken). In its small size and papillose cuticle *L. pulchra* also resembles *L. angusta*, but the leaves in the latter species are more elongate, ovate-oblong and flat or weakly convex, never strongly convex.

Due to its obliquely spreading leaves and the small size *Lejeunea pulchra* also resembles *Cheilolejeunea decursiva* (Sande Lacoste 1855: 522) Schuster (1963: 112), but the latter species has a long and sharp lobule tooth and the hyaline papilla is distal to this tooth (the long tooth being the second lobule tooth).

World distribution:—Brazil (Bahia).

Distribution in Brazil:—Northeastern (Bahia).

Habitat:—Rainforest, on bark of living trees.

Additional specimen examined:—BRAZIL. **Bahia**: Abaíra, Catolés, Serra do Barbado, Mata da Forquilha, 13°17'27"S, 41°54'015"W, 1594 m, mixed with *Macromitrium frustratum* B.H.Allen, *Lejeunea grossitexta* and *Radula schaefer-verwimpitii* K.Yamada 5 September 2008, *C. Bastos 5135* (ALCB) Wenceslau Guimarães, povoado de Nova Esperança, Estação Ecológica de Wenceslau Guimarães, Trilha Água Vermelha, 13°34'42"S, 39°42'28"W, 443 m, 29 September 2017, *C. Sena 142* (ALCB).

44. *Lejeunea pulverulenta* (Stephani 1913: 447) Reiner-Drehwald (2005b: 60); Reiner-Drehwald (2005b)

Taxilejeunea pulverulenta Steph.

Description and illustration: Reiner-Drehwald (2005b), Bastos *et al.* (2019).

Plants 1.2–1.4 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide spreading; lobe oblong, 650–750 μm long \times 475–575 μm wide, dorsal margin slightly arched, entire, ventral margin slightly arched, entire, apex rounded to acute; median cells oblong, 38–55 μm long \times 23–30 μm wide, thin-walled, trigones large, intermediate thickenings nodulose, cells toward the leaf margin oblong to hexagonal, 20–25 \times 15–20 μm , forming a broad, 5–6 cells rows wide border of smaller cells perpendicular to the large, central cells; cuticle strongly papillose, oil bodies not seen; lobule small, ovate, up to 1/4 of leaf length, free margin involute, tooth oblong, slightly curved, keel straight to slightly arched. *Underleaves* large, ovate to suborbicular, imbricate, 4–6 \times stem width, bifid to 1/2, lobes acute to cuspidate, sinus acute, bases auriculate, insertion line arched. *Autoicous*. *Androecia* terminal on the main shoot or on short lateral branches, with 2–5 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, with 1(–2) sterile or fertile innovations resulting in 1–3 or more gynoecia in a row, bract lobe ovate to obovate, margin entire, apex rounded to acute, bracteole ovate-oblong, short-bifid. *Perianths* obovoid, emergent to 1/2, 5-keeled, lateral keels expanded above, irregularly ornamented with teeth and small cilia, beak 2 cells long.

Comment:—*Lejeunea pulverulenta* is readily distinguished by the leaf lobe with a rounded apex and a broad border of 5–6 rows of smaller marginal cells arranged perpendicular to the large, central cells. The leaf cells have trigones and a strongly papillose cuticle, the underleaves are large (4–6 \times stem width), imbricate, with acute lobes and auriculate bases, and the perianth keels are irregularly ornamented with teeth and small cilia. *Lejeunea pulverulenta* somewhat resembles *L. anomala*; for differences see under the latter species.

World distribution:—Brazil, Colombia, Ecuador, Guyana and Guadeloupe.

Distribution in Brazil:—Northeastern. Further records: Southeastern (Yano 2008).

Habitat:—Rainforest, on living trees.

Selected material examined:—BRAZIL. **Bahia**: Camacan, Serra Bonita, 15°23'S, 39°34'W, 853 m, 24 February 2015, M.P.P. Silva 977 (ALCB).

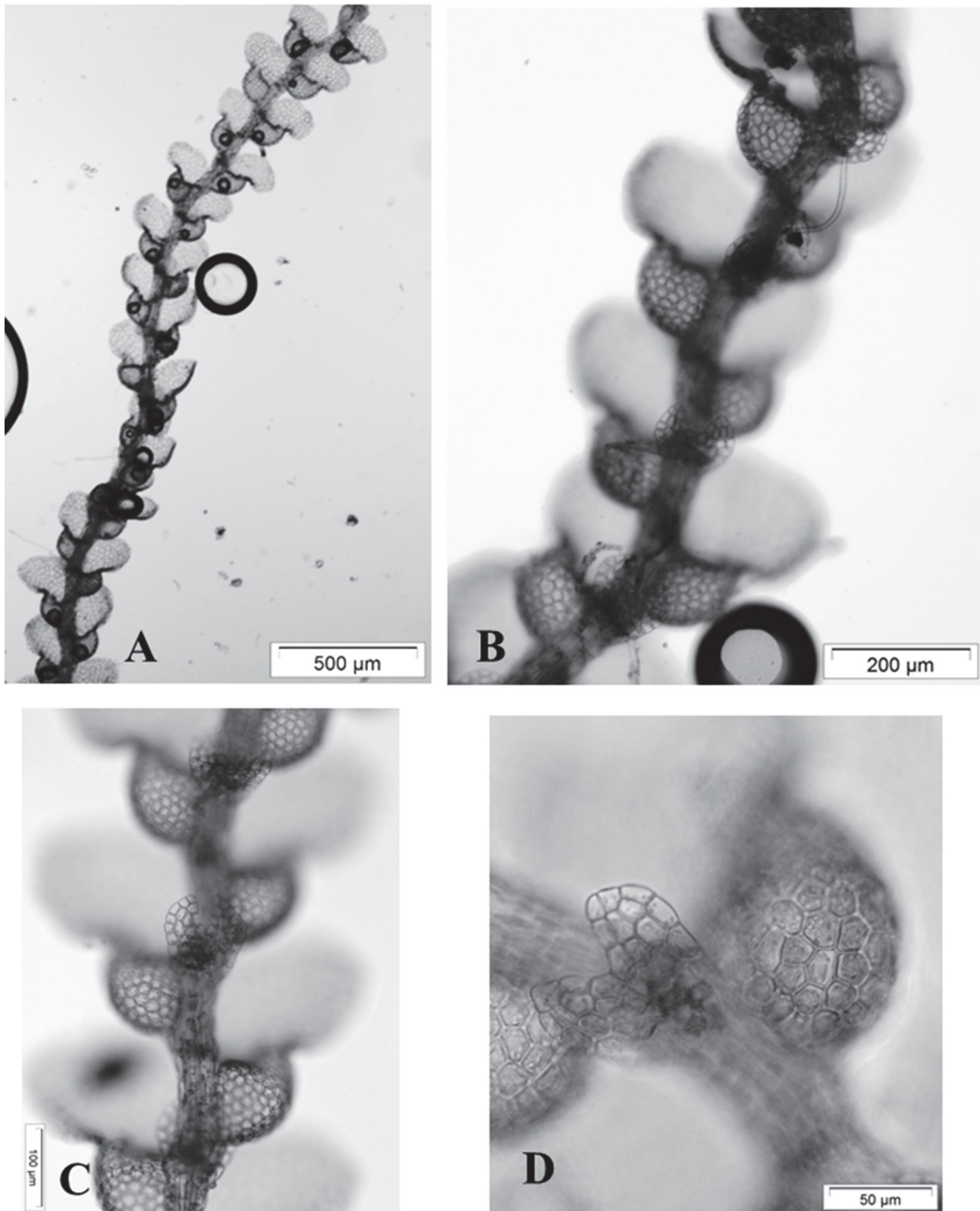


FIGURE 6. *Lejeunea pulchra* C.J.Bastos & Gradst. A–B: Habit in ventral view. C: Part of gametophyte showing the distant, small underleaves. D: detail of underleaf (all from holotype).

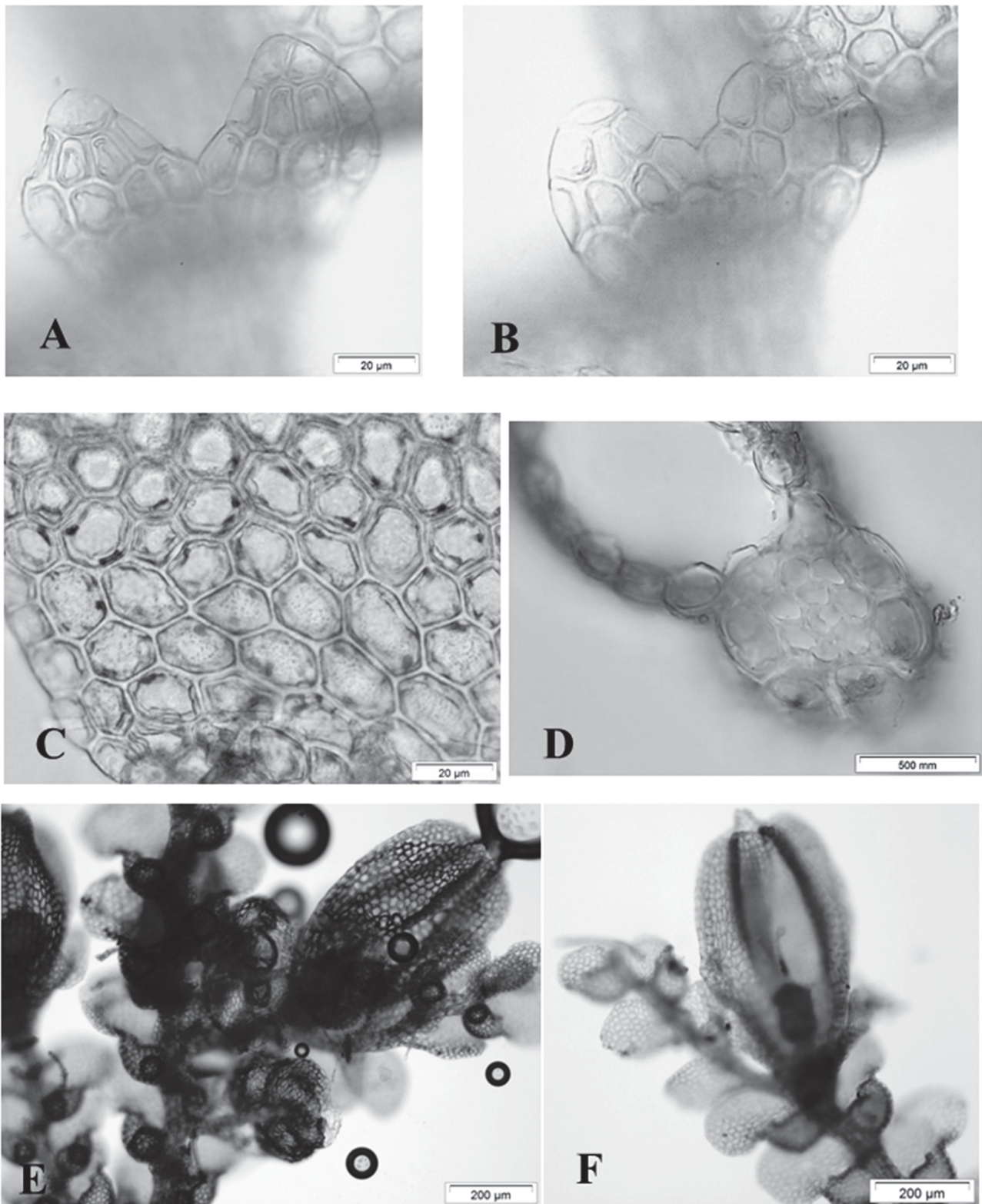


FIGURE 7. *Lejeunea pulchra* C.J.Bastos & Gradst. A–B: Small underleaf. C: Leaf lobe cells. D: Cross section of stem. E: Gynoecial and androecial branches (autoicous conditions) ventral view. F: Perianth with lejeuneoid innovation (all from holotype).

45. *Lejeunea quinqueumbonata* Spruce (1884: 230); Reiner-Drehwald (2000a)

Lejeunea cyrtotis Spruce, Trans. & Proc. Bot. Soc. Edinburgh 15: 229. 1884 (*Otigoniolejeunea cyrtotis* [Spruce] Schiffn.), **syn. nov.**

Type:—VENEZUELA. Río Negro, San Carlos: *Spruce s.n.*, Hepaticae Spruceana: Amazonicae et Andinae (lectotype, designated by M.E. Reiner-Drehwald in sched., MANCH-000139!). Syntype: *ibid.*, “in truncis putridis”, *Spruce L401* (MANCH-000458!).

Description and illustration: Reiner-Drehwald (2000a).

Plants 1–2 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, obliquely to widely spreading; lobe ovate-triangular to ovate-oblong, 0.8–1.1 mm long × 0.7–0.8 mm wide, dorsal margin arched, crenate, ventral margin straight to slightly arched, crenate, apex rounded to obtuse, usually plane; leaf cells convex, bulging outwards, isodiametric to elongate, 29–40 μm × 38–50 μm, trigones absent or small, intermediate thickenings absent; cuticle smooth; oil bodies not seen; lobule mostly reduced, when well-developed maximally 1/4× leaf length, free margin involute, tooth 1(–2) cells long, keel straight, crenate. *Underleaves* distant, 2.5–4× stem width, bifid to 1/3–1/2, sinus V-shaped, lobes broadly triangular, apices subacute, margins crenate, outer margins sometimes with a blunt tooth, bases cuneate to rounded, attached to the stem by a large cell, insertion line curved. *Autoicous*. *Androecia* on long or short branches, with 3–6 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on very short branches without or, occasionally, with a few vegetative leaves, with one (lejeuneoid) sterile or fertile innovation, bract lobe ovate-oblong, apex acute to obtuse, bracteole ovate, bifid to 1/4–1/3. *Perianths* subcylindrical, emergent to 1/3–1/2, with 5 short keels in the upper half, the keels terminating above in lamella-like projections or cilia, perianth base sometimes stalk-like elongate, beak 3 cells long.

Comment:—*Lejeunea quinqueumbonata* is very similar to *L. glaucescens* and *L. subsessilis*; all three species have gynoecia on very short branches without vegetative leaves. However, lamellate projections and cilia on perianth keels are lacking in *L. glaucescens* and *L. subsessilis*, the leaf apices are always rounded and the underleaves mostly smaller. *Lejeunea quinqueumbonata* also resembles *L. raddiana* in the crenate leaf margins and perianth keels, but the latter species has falcate leaves with an acute and usually reflexed apex, larger lobules and very small underleaves with rounded to obtuse lobules. *Lejeunea quinqueumbonata* also resembles *L. immersa* in the crenate leaf margins and in the shape of underleaves, but differs from the latter species by the perianth keels terminating above in lamella-like projections.

Lejeunea quinqueumbonata was originally described in *Otigoniolejeunea* (Spruce) Schiffn. but belongs in *Lejeunea* because the species lacks ocelli and has no pycnolejeuneoid innovations. *Lejeunea cyrtotis* Spruce is identical to *L. quinqueumbonata* and a synonym. Indeed, the original diagnoses of *L. cyrtotis* and *L. quinqueumbonata* (Spruce 1884, p. 229) are virtually identical.

World distribution:—Scattered in tropical America.

Distribution in Brazil:—Northern (type material), Northeastern, Southeastern. Further records: Middle-Western, Southern (Yano 2008).

Habitat:—Rainforest, on rotten logs and living trees.

Selected material examined:—BRAZIL. **Bahia**: Igrapiúna, Reserva Ecológica da Michelin, Mata da Vila Cinco, 14 February 2006, C. Bastos 4139 (ALCB). **São Paulo**: Peruíbe, Guarau, Estação Ecológica da Juréia, 3 July 1988, O. Yano *et al.* 11526 (SP).

46. *Lejeunea raddiana* Lindenb., in Gottsche *et al.* (1845: 342); Reiner-Drehwald & Goda (2000)

Lejeunea gomphocalyx Spruce, Trans. & Proc. Bot. Soc. Edinburgh 15: 174. 1884 (*Harpalejeunea gomphocalyx* [Spruce] Steph.), *syn. nov.* Type:—VENEZUELA: *Spruce s.n.* (lectotype, designated by Grolle & Reiner-Drehwald 1999, MANCH-000004 [= CC17830]! isolectotype, MANCH-CC17831!).

Harpalejeunea pellucida Herzog (syn. fide Grolle & Reiner-Drehwald 1999).

Description and illustration: Reiner-Drehwald & Goda (2000).

Plants 0.6–0.9 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, wide spreading; lobe ovate to ovate-falcate, 250–350 μm long × 250–300 μm wide, dorsal margin arched, crenate, usually bordered by transversely oriented mammillose cells, ventral margin straight, crenate, apex acute to apiculate, usually strongly recurved; leaf cells oblong to hexagonal, trigones small, intermediate thickenings absent; cuticle smooth; oil bodies not seen; lobule ovate, inflated, 1/3 of leaf length, free margin involute, tooth short, keel arched. *Underleaves* small, 1.0–1.4× stem width, distant, obovate, bifid to 1/2, sinus V-shaped, lobes triangular, tips rounded to obtuse, bases cuneate, insertion line weakly arched. *Autoicous*. *Androecia* on long or short branches, with 3–6 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on stem or on short branches, with one sterile innovation, bract lobe ovate-lanceolate, apex acute to apiculate, bracteole ovate, bifid to 1/2–1/3. *Perianths* obovoid, emergent to 1/2, 5-keeled, keels crenate with a characteristic border of transversely oriented mammillose cells, with or without cilia, beak 2–3 cells long, perianth base sometimes stalked.

Comment:—According to Reiner-Drehwald & Goda (2000), the leaf apex in *L. raddiana* is recurved or flat; in the Brazilian specimens, however, most leaves have a strongly recurved apex.

World distribution:—Brazil, tropical Andes (Colombia, Ecuador, Bolivia) and Panama (Schäfer-Verwimp 2014).

Distribution in Brazil:—Northeastern, Southeastern. Further records: Northern, Southern (Yano 2008).

Habitat:—Lowland and montane rain-forest, on living trees and on twigs.

Selected material examined:—BRAZIL. **Bahia**: Abaíra, Catolés, Serra do Barbado, Mata da Forquilha, 13°17'27"S, 41°54'015"W, 1594 m, 5 September 2008, *C. Bastos 5154p.p.* (ALCB). **Espírito Santo**: Domingos Martins, Parque Estadual Pedra Azul, *L.T. Penha 391* (ALCB).

47. *Lejeunea ramulosa* Spruce (1884: 274); Reiner-Drehwald (2010b)

Description and illustration: Reiner-Drehwald (2010b).

Plants 0.9–1.3 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate to contiguous, wide spreading; lobe ovate to ovate-lanceolate, 500–650 µm long × 300–350 µm wide, 1.5–4× longer than wide, dorsal margin arched, entire, ventral margin straight to slightly arched, entire, apex acute to acuminate, straight or curved; leaf cells oblong to hexagonal, 25–35 × 20–30 µm, thin-walled, trigones small, intermediate thickenings 0–1 per cell; cuticle finely papillose; oil bodies not seen; lobule ovate to subrectangular, inflated, small, to 1/5 of leaf length, free margin plane to slightly involute, tooth short, keel straight to weakly arched. *Underleaves* ovate, contiguous to imbricate, 2.5–4× stem width, bifid to 1/2, sinus V-shaped to U-shaped, lobes acute to acuminate, margin entire or with one tooth at the side, bases rounded, insertion line straight. *Dioicous*. *Androecia* on main stem or on short or long branches, with 2–7 pairs of bracts, bracteoles present throughout the spike. *Gynoecia* on main stem or on short branches with one sterile innovation (rarely fertile), bract lobe ovate to ovate-lanceolate, margin entire, apex acuminate, bracteole ovate to suborbicular, bifid to 1/2. *Perianths* obovoid, emergent to 1/3–1/2, 5-keeled, keels 2-winged, dentate-laciniate but not undulate-crisped, beak 3 cells long.

Comment:—The delicate, prostrate, very translucent whitish-green plants with wide spreading ovate-lanceolate, acute-acuminate leaves and a strongly papillose cuticle, are unmistakable.

World distribution:—Throughout tropical America (Reiner-Drehwald 2010b).

Distribution in Brazil:—Southern.

Habitat:—Rainforest, on living trees and rotten logs.

Selected material examined:—BRAZIL. **Santa Catarina**: Serra do Rio do Rastro, between São Joaquim and Bom Jardim da Serra, 1460 m, 28°12'S, 49°50'W, 14 October 1987, *A. Schäfer-Verwimp & I. Verwimp 9168* (hb. Schäfer-Verwimp).

48. *Lejeunea reflexistipula* (Lehmann & Lindenberg 1833: 10) Spruce (1884: 235); Reiner-Drehwald 1993, 2005a)

Jungermannia reflexistipula Lehm. & Lindenb. (*Amphilejeunea reflexistipula* [Lehm. & Lindenb.] Gradst., *Cryptogynolejeunea reflexistipula* [Lehm. & Lindenb.] R.M.Schust.).

Description and illustration: Reiner-Drehwald (1993, 2005a), Gradstein & Ilkiu-Borges (2009).

Plants ca. 1.2 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide spreading; lobe ± convex, ovate, 525–675 µm long × 450–475 µm wide, dorsal margin slightly arched, crenulate, ventral margin slightly arched, weakly crenulate, apex rounded; leaf cells oblong-hexagonal, 35–53 × 25–30 µm, thin-walled, trigones small, intermediate thickenings distinct; cuticle finely papillose; oil bodies homogeneous, 12–30 per cell; lobule small, 1/5 of leaf length, free margin incurved, tooth short, keel slightly arched. *Underleaves* very large, reniform, 6–8× stem wide, imbricate, undivided, apex recurved, bases rounded to auriculate, insertion line deeply arched. *Dioicous*. *Androecia* not seen. *Gynoecia* on short branches, bract lobe obovate, margins entire, bracteole obovate, undivided. *Perianths* oblong-obovoid, emergent to 1/3, 5-keeled, keels smooth, beak 2–3 cells long.

Comment:—*Lejeunea reflexistipula* is a common tropical South American species that is readily distinguished by the very broad, reniform, undivided underleaves with a recurved apex and deeply arched insertion.

World distribution:—Tropical South America and Central America (Costa Rica, Panama).

Distribution in Brazil:—Northern, Northeastern. Further records: Middle-Western, Southeastern (Yano 2008).

Habitat:—Rainforest, on living trees.

Selected material examined:—BRAZIL. **Amazonas**: Manaus–Caracarai road km 60 and 130, July–August 1974, *D. Griffin et al. 233, 438*, det. R. Grolle (U). **Bahia**: Camacan, Serra Bonita, 15°23'32"S, 39°33'54"W, 25 February 2015, *R.P. Correia 76* (ALCB). **Roraima**: Vicinity of Auaris, 4°6'N, 64°25'W, 800 m, 29 July 1974, *G.T. Prance et al. 21512* (INPA).

49. *Lejeunea rionegrensis* Spruce (1885: 579); Reiner-Drehwald & Schäfer-Verwimp (2008a)

Description and illustration: Reiner-Drehwald & Schäfer-Verwimp (2008a).

Plants 0.7–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide spreading; lobe ovate to suborbicular, 400–600 µm long × 400–500 µm wide, dorsal margin arched, entire, ventral margin straight to slightly arched, entire, apex rounded; leaf cells oblong to hexagonal, 27–32 × 30–32 µm, trigones very small, intermediate thickenings absent, cuticle smooth; oil bodies not seen; lobule ovate, inflated, 1/6–1/4 of leaf length, free margin incurved, tooth short, keel straight to arched. *Underleaves* imbricate, reniform to suborbicular, 3–4× stem wide, bifid to 1/2, sinus V-shaped, lobes broadly triangular, bases rounded, insertion line curved. *Dioicous*. *Androecia* on short branches, with 3–4 pairs of bracts, bracteoles present throughout the male spike. *Gynoecia* on short branches, bract lobe obovate, margins entire, apex acute to apiculate, bracteole suborbicular, bifid to 1/3. *Perianths* obovoid, emergent to ca. 1/3, 5-keeled, keels crenulate, beak 1–2 cells long. Vegetative reproduction by caducous leaves and branches.

Comment:—*Lejeunea rionegrensis* can be recognized by the rather large (3–4× stem width), wider than long and imbricate underleaves, small leaf lobules (to maximally 1/4 of leaf length) and frequent vegetative reproduction by caducous whole leaves (including lobules). *Lejeunea rionegrensis* is very similar to *L. parviloba* but differs from the latter species in the thin-walled leaf cells with very small trigones and without intermediate thickenings, and in producing caducous whole leaves, including lobules.

World distribution:—Bolivia, Brazil, Peru and Venezuela.

Distribution in Brazil:—Northern, Southeastern. Further records: Northeastern [Pernambuco: Inajá, O. Yano & D. Andrade-Lima 2960 [SP]].

Habitat:—Rainforest, on living trees and rotten wood.

Selected material examined:—BRAZIL. **Amazonas**: São Gabriel da Cachoeira, Rio Uaupés, Sítio São Paulo, 22 December 2017, A.M. Sierra 5078 (INPA). **Espírito Santo**: Domingos Martins, SE of Venda Nova, 20°27'S, 41°02'W, 1060 m, 10 October 1988, A. Schäfer-Verwimp & I. Verwimp 10182 (hb. Schäfer-Verwimp). **São Paulo**: Águas de Santa Barbara, 600 m, 16 February 1988, A. Schäfer-Verwimp & I. Verwimp 9474/B (hb. Schäfer-Verwimp). ECUADOR (new): **Morona Santiago**: Bomboiza, along Rio Bomboiza, 1 October 2019, S.R. Gradstein & A. Pérez 11570 (QCA, PC). **Orellana**: near Yasuni Biological Station, ca. 200 m, March 2019, M. Berdugo et al. IVV (QCA).

50. *Lejeunea serpillifolioides* (Raddi 1822: 1) Gradst. in Gradstein et al. (2018: 87); Costa (2009, as *Taxilejeunea serpillifolioides*)

Jungermannia serpillifolioides Raddi (*Taxilejeunea serpillifolioides* [Raddi] D.P.Costa).

Taxilejeunea isocalycina (Nees 1833: 356) Steph., Hedwigia 29(3): 141. 1890.

Illustration: Gradstein & Costa (2003, as *Taxilejeunea isocalycina*).

Plants 1.5–1.9 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, obliquely spreading, ± asymmetrical; lobe ovate, 0.7–1.1 mm long × 0.6–0.8 mm wide, dorsal margin slightly arched, entire or with 1–2 small teeth near the apex, ventral margin straight to slightly arched, entire, apex acute to short-apiculate; leaf cells hexagonal to oblong, 35–55 × 28–33 µm, thin-walled, trigones minute or well-developed, intermediate thickenings absent; cuticle smooth; oil bodies not seen; lobule ovate, to maximally 1/4 of leaf length, frequently reduced, free margin incurved, tooth short, keel arched. *Underleaves* large, 5–7× stem width, wider than long, broadly ovate, imbricate, shallowly bifid to 1/6–1/5 with a narrow U-shaped incision, lobes frequently overlapping, tips acute, bases with very large auricles, insertion line deeply arched. *Autoicous*. *Androecia* on short branches, with few pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* arranged in a row on innovating branches, bracts smaller than leaves, apices acute, margin crenulate, entire or with 1–2 small teeth near the apex. *Perianths* terete, without keels, mouth recessed, beak 1 cell long.

Comment:—The main characters of this species are the slender, whitish-green, frequently pendent habit, the subentire leaves with obtuse to apiculate apex, the large shallowly bifid underleaves (ca. 5–7× stem width) with large auricles, and the terete perianths arranged in rows on innovating branches. The mouth of the perianth is recessed and the beak is usually minute. *Lejeunea serpillifolioides* is very similar to *L. sulphurea* (Lehm. & Lindenb.) Schiffn., a species widespread in Tropical America and not known from Brazil, but the leaves in *L. sulphurea* are always toothed, with (2–)3–7 teeth near the apex. The plant illustrated in the liverwort flora of French Guiana (Gradstein & Ilkiu-Borges 2009) as *L. serpillifolioides* (= *L. isocalycina*) belongs to *L. sulphurea*.

World distribution:—Widespread in tropical America.

Distribution in Brazil:—Northern, Northeastern, Southeastern. Further records: Southern (Yano 2008).

Habitat:—Rainforest, on living trees and rock

Selected material examined:—BRAZIL. **Amazonas**: São Gabriel, R. Spruce L501 (MANCH000427, as *L. sulphurea*). **Bahia**: Santa Teresinha, povoado de Pedra Branca, Serra da Jiboia, Morro da Pioneira, 12°50'51"S, 39°28'29"W, 770 m, 17 October 2016, C. Bastos 5826 (ALCB). **Espírito Santo**: Domingos Martins, Parque Estadual Pedra Azul, 7 March 2009, L.T. Penha 159 (ALCB). **São Paulo**: Apiaí, ca. 3 km E de Apiaí, 24°32'S, 48°49'W, 11 May 1983, D.M. Vital 10994 (SP).

51. *Lejeunea setiloba* Spruce (1884: 281); Reiner-Drehwald (2000a)

Description and illustration: Reiner-Drehwald (2000a).

Plants 0.7–1.5 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, wide spreading; lobe ovate to ovate-oblong, somewhat convex, 360–420 µm long × 300–250 µm wide, dorsal margin slightly arched, entire, ventral margin straight, entire, apex rounded; leaf cells oblong to hexagonal, 15–30 × 13–20 µm, thin-walled with minute trigones; cuticle smooth; oil bodies segmented; lobule small, flat to inflated, quadrate to rectangular, 1/5–1/4 of leaf length, free margin plane, tooth 3–4(–6) cells long, 1–2 cells wide, tipped by a slime papilla, keel straight. *Underleaves* distant, 1.5–2.5× stem width, bifid to 1/2, sinus V- or U-shaped, lobes triangular-acute, bases cuneate, insertion line straight. *Autoicous*. *Androecia* on short branches, with 2–4 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short on long branches, with 1–2 fertile innovations, resulting resulting in 1–2 gynoecia in a row, bract lobe oblong, margins entire, apex rounded to obtuse, bracteole oblong, bifid to 1/2–1/3. *Perianths* obpyriform, longly exerted, inflated, with 5 short, crenate keels in the upper half, beak 1 cell long.

Comment:—*Lejeunea setiloba* is recognized by leaf lobes ovate to ovate-oblong, margins entire, apex rounded, leaf lobule quadrate to rectangular, and, especially, lobule tooth 3–6 cells long and 1–2 cells wide, tipped by a slime papilla.

World distribution:—Scattered in tropical America, uncommon; rather xerophytic species from low elevations.

Distribution in Brazil:—Northeastern, Southeastern. Further records: Northern, Middle-Western (Yano 2008).

Habitat:—Rainforest and deciduous forest, on living trees and on rotten logs.

Selected material examined:—BRAZIL. **Bahia**: Ruy Barbosa, Serra do Orobó, trilha para o Pátio das Orquídeas, 12°17'59"S, 40°29'13"W, 522 m, 16 January 2015, C. Bastos 5523 (ALCB). **Rio de Janeiro**: Tijuca, 22°57'51"S, 43°12'43"W, Santos et al. 494 (GOET, RB). **São Paulo**: Ibiúna, bairro Sorocabuçu, ca. 8 km da rodovia SP-125, 30 November 2008, O. Yano & T. Yano 31368 (SP).

52. *Lejeunea sporadica* Beschereille & Spruce (1889: 180); Reiner-Drehwald & Goda (2000, as *L. elliottii*)

Lejeunea elliottii Spruce (syn. fide Schäfer-Verwimp & Reiner-Drehwald 2009).

Description and illustration: Reiner-Drehwald & Goda (2000, as *L. elliottii*).

Plants 400–700 µm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, wide to obliquely spreading; lobe ovate, 365–400 µm long × 230–295 µm wide, dorsal margin arched, crenulate to strongly crenate by projecting, ovate, transversely oriented cells, ventral margin arched to straight, crenate, apex rounded to obtuse; leaf cells oblong to hexagonal, 25–45 × 18–24 µm, thin-walled, trigones small, intermediate thickenings absent; cuticle smooth to finely papillose; oil bodies not seen; lobule ovoid, large, 1/3–1/2 of leaf length, inflated, free margin plane, mostly appressed to the lobe, tooth short, keel arched. *Underleaves* small, 1–2× stem width, oblong, distant, bifid to 1/2, sinus V-shaped to U-shaped, lobes triangular-acute, bases cuneate, insertion line curved. *Autoicous*. *Androecia* on short branches, with 2–3 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, with one sterile innovation, bract lobe obovate, margins crenate, apex rounded to obtuse, bracteole ovate, bifid to 1/3. *Perianths* obovoid, longly exerted, 5-keeled, keels strongly crenate, with cilia, beak 2–3 cells long.

Comment:—*Lejeunea sporadica* is recognized by the very small plants (400–700 µm wide), with leaf margins strongly crenate by transversely oriented, ovate, mammillose cells, very small, longer than wide underleaves (1–2× stem width), and perianth keels strongly crenate and with cilia. *Lejeunea sporadica* resembles *L. immersa* in the strongly crenate leaf margins, but the latter species is a larger plant with larger, orbicular underleaves (2–3× stem width) and crenate perianth keels without cilia.

World distribution:—Brazil, Guyana, West Indies (Cuba, Dominica) (Reiner-Drehwald & Goda 2000).

Distribution in Brazil:—Northeastern. Further records: Northern (Costa *et al.* 2017), Southern (Ristow *et al.* 2015).

Habitat:—Rainforest, on living trees, rotten logs and rock

Selected material examined:—BRAZIL. **Bahia**: Eunápolis, Estação Veracruz, 16°22'S, 39°10'W, 70–100 m, 8 September 1999, C. Bastos 1628 (ALCB); Igrapiúna, Reserva Ecológica da Michelin, 13°50'S, 39°10'W, 90–383 m, Mata da Vila Cinco, 14 February 2006, S.B. Vilas Bôas-Bastos 1825 (ALCB).

53. *Lejeunea subplana* (Stephani 1913: 310) Bastos (2014: 249)

Trachylejeunea subplana Steph. Type:—BRAZIL. São Paulo: Apiaí, Puiggari *s.n.* (isotype, NY-1059636! ster.).

Description and illustration: Bastos (2014).

Plants ca. 670 µm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous, wide spreading; lobe triangular-ovate, 230–350 µm long × 160–260 µm wide, dorsal margin slightly arched, entire, ventral margin straight, entire, apex acute, mostly recurved; leaf cells oblong-hexagonal, 15–25 × 10–20 µm, thin-walled, trigones small, intermediate thickenings absent; cuticle smooth; oil bodies not seen; lobule large, 1/3–1/2 of leaf length, ovate, inflated, free margin involute to plane, tooth elongate, straight to weakly curved, keel arched. *Underleaves* very small, 1–1.5× stem width, distant, ovate-orbicular, sinus V-shaped, lobes triangular, bases cuneate, insertion line curved. *Dioicous*. *Androecia* on main stem or on short branches, with 2–3 pairs, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, with one sterile innovation, bract lobe ovate, margins entire, apex rounded, bracteole obovate, bifid to 1/4. *Perianths* obovoid, emergent ca. 2/3, 5-keeled, keels smooth, beak 1–2 cells long.

Comment:—*Lejeunea subplana* is characterized by the very small plants (ca. 670 µm wide) with wide-spreading, triangular-ovate leaves with a recurved, acute apex, large lobules (to 1/2× leaf length) with a long tooth, and very small ovate-orbicular underleaves (1.0–1.5× stem width). Stephani (1913) described only the female plant. Here, we newly describe the androecia, seen in the specimen from Minas Gerais.

World distribution:—Only known from Brazil.

Distribution in Brazil:—Southeastern, Southern.

Habitat:—Rainforest, on living trees.

Selected material examined:—BRAZIL. **Minas Gerais**: Lima Duarte, Parque Estadual do Ibitipoca, Mata Grande, 17 April 2009, T.S. Siviero *et al.* 95 (CESJ). **Paraná**: Nordparaná, Waldweid and der Straße Castro-Tibagi (bei 20 km), 1220 m, 16 December 1991, A. Schäfer-Verwimp & I. Verwimp 15157 (hb. Schäfer-Verwimp; ALCB).

54. *Lejeunea subsessilis* Spruce (1884: 282); Reiner-Drehwald (2000a, as *L. monimiae*)

Eulejeunea monimiae Steph., Hedwigia 35: 91. 1896 (*Lejeunea monimiae* [Steph.] Steph.), *syn. nov.* Type:—BRAZIL. Santa Catarina: Tubarão, Ule 264 (lectotype, designated by Reiner-Drehwald 2000a, G00282342!).

? *Lejeunea muscicola* Spruce var. *palmicola* Spruce, Trans. & Proc. Bot. Soc. Edinburgh 15: 282. 1884. Type:—BRAZIL. Pará: on palm trunks, Spruce *s.n.* (material lost? Not found in MANCH and G).

Description and illustration: Reiner-Drehwald (2000a, as *L. monimiae*).

Plants 0.8–1.3 mm wide. *Ventral merophyte* two cells wide. *Leaves* imbricate, obliquely to widely spreading; lobe ovate, 580–810 µm long × 360–620 µm wide, dorsal margin slightly arched, entire to crenate, ventral margin straight, entire to crenate, apex rounded to obtuse, plane; leaf cells oblong to hexagonal, 16–50 × 13–30 µm, thin-walled, trigones absent or minute, intermediate thickenings absent; cuticle smooth; oil bodies not seen; lobule small, ovate, 1/5–1/4 of leaf length, free margin slightly involute, tooth short, keel straight. *Underleaves* distant, slightly wider than long, 2–3× stem width, bifid to 1/2, sinus V-shaped, lobes triangular, bases cuneate, insertion line straight to slightly curved. *Autoicous*. *Androecia* on short branches, with 2–5 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on very short branches without vegetative leaves and with one short, sterile innovation, bract lobe ovate, margins entire, bracteole oblong to ovate, short-bifid. *Perianths* pyriform, longly exerted, 5-keeled, keels crenate, beak 3 cells long.

Comment:—*Lejeunea subsessilis* is a very delicate and translucent species, growing tightly appressed to the substrate and often highly fertile with numerous androecia and gynoecia. The gynoecia are almost sessile on the main stem, being positioned on very short branches without vegetative leaves. The oil bodies are granular, 2–5 per cell. The

species is very close to *L. glaucescens* but the underleaves in the latter species are smaller, 1.5–2× wider than stem, and longer than wide or as long as wide. Based on the original description, *L. muscicola* var. *palmicola* Spruce might be a synonym of *L. subsessilis*. This variety was said to differ from typical *L. muscicola* (= *L. glaucescens*) by larger underleaves and less crenate leaves and perianth keels (Spruce 1884). The type could not be located.

World distribution:—Brazil, northern Argentina (Reiner-Drehwald 2000) and northern Andes (Colombia, Ecuador).

Distribution in Brazil:—Southeastern. Further records: Northern, Northeastern, Southern (Yano 2008, Ristow *et al.* 2015, Costa 2017).

Habitat:—Rainforest, on living trees and leaves.

Selected material examined:—BRAZIL. **Minas Gerais**: Serra de Itatiaia, between Itamonte and Abrigo Rebouças, 1940 m, 5 July 1991, A. Schäfer-Verwimp & I. Verwimp 14593 (hb. Schäfer-Verwimp).

55. *Lejeunea subspathulata* Spruce (1884: 173); Ilkiu-Borges (2005)

Echinocolea dilatata (A. Evans) R. M. Schust. (syn. fide Ilkiu-Borges 2005).

Description and illustration: Ilkiu-Borges (2005).

Plants 0.4–0.9 mm wide. *Ventral merophyte* two cells wide. *Leaves* wide spreading, distant to imbricate; lobe obovate to obovate-falcate, from a short to long narrow base abruptly dilated distally, 250–430 µm long × 230–420 µm wide, dorsal margin arched, strongly crenate, ventral margin arched, crenate, apex rounded, plane or recurved; dorsal surface of lobe smooth up to leaf middle, roughened in upper half of leaf and towards margins due to convex to conically projected mammillose cells; basal leaf cells oblong median cells oblong to isodiametrical, trigones small or lacking, intermediate thickenings lacking; cuticle smooth; oil bodies not seen; lobules suborbicular to ovate, ca. 1/3 of lobe length, 1/3–1/2 of leaf length, inflated, free margin involute, tooth short, falcate, keel arched, smooth or weakly crenate. *Underleaves* suborbicular, distant, wider than long, 1.2–2× stem width, bifid to 1/2, lobes triangular, straight to ± divergent, acute to subacute, rarely apiculate, bases cuneate, insertion line shallowly curved. *Autoicous*. *Androecia* terminal on very short or long branches, with 2–11 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on short branches, usually with one innovation, bract lobe ovate to obovate, apex subacute to rounded, bracteole ovate, bifid to 1/4. *Perianths* obovoid to cylindrical, shortly emergent, 5-keeled, keels bicarinate, crenate to ciliate-laciniate, beak 2–4 cells long, perianth base sometimes shortly stalked (Ilkiu-Borges 2005).

Comment:—*Lejeunea subspathulata* is morphologically close to *L. asperrima* but the latter species is a smaller plant (less than 0.5 mm wide) with the keel and entire dorsal leaf surface strongly roughened by conically projecting cells. *Lejeunea subspathulata* is very rare in Brazil where it has been found only once, in the state of São Paulo (Visnadi 1998).

World distribution:—Scattered throughout tropical America.

Distribution in Brazil:—Southeastern (Visnadi 1998).

Habitat:—Rainforest, on living trees, rotten wood and soil.

56. *Lejeunea terricola* Spruce (1889: 191)

Taxilejeunea terricola (Spruce) Steph., Sp. Hepat. 5: 480. 1914. Type:—PARAGUAY. Asunción: *Balansa 1282* (holotype, MANCH-000441!).

Description and illustration: Reiner-Drehwald (2000a, as *Taxilejeunea terricola*).

Plants 1.2–1.4 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, wide spreading; lobe ovate, 470–640 µm long × 360–510 µm wide, dorsal margin arched, entire, ventral margin straight, apex rounded to obtuse, usually plane; leaf cells hexagonal to oblong, 30–45 × 23–30 µm, thin-walled, trigones small, intermediate thickenings absent to occasional; cuticle smooth; oil bodies not seen; lobules reduced, ca. 1/6–1/5 of leaf lobe length, plane, elongate to rectangular, tooth obtuse to blunt. *Underleaves* distant, ovate, 2.5–3.5× stem width, bifid to 1/2, sinus V-shaped, lobes triangular, bases rounded to cuneate, insertion line slightly curved. *Autoicous*. *Androecia* on very short branch, with 2–4 pairs of bracts, bracteoles restricted to the base of the spike. *Gynoecia* on stem or on short branches, with one repeatedly fertile innovation, resulting in rows of up to 4 gynoecia, bract lobe ovate to ovate-oblong, margins entire, apex acute, bracteole oblong, bifid to 1/3. *Perianths* oblong, emergent to 1/2, 5-keeled, keels slightly crenulate, beak 2 cells long.

Comment:—*Lejeunea terricola* is an uncommon species in Brazil that is mainly characterized by ovate leaf lobes with entire margins and a rounded apex, leaf lobules mostly reduced, underleaves 2.5–3.5× stem width, distant, bifid to 1/2, gynoecea in rows on branches, and perianths with somewhat expanded, crenulate keels.

World distribution:—Northern Argentina, Paraguay and Brazil.

Distribution in Brazil:—Northeastern. Further records: Southeastern (Yano 2008).

Habitat:—Rainforest, on living trees, soil and rock

Selected material examined:—BRASIL. **Bahia**: Boa Nova, Parque Nacional de Boa Nova, Timorante, 14°26'07"S, 40°05'07"W, 512 m, 8 November 2018, *J. Nogueira 96* (ALCB).

57. *Lejeunea topoensis* Gradstein & Reiner-Drehwald (2007: 488); Gradstein & Reiner-Drehwald (2007)

Description and illustration: Gradstein & Reiner-Drehwald (2007).

Plants 1.1–2.2 mm wide. *Ventral merophyte* 4–8 cells wide. *Leaves* imbricate, wide spreading, insertion of leaf lobes about half the width of the leaves; lobe ovate, 0.9–1.3 mm long × 0.7–1.1 mm wide, dorsal margin arched, entire, ventral margin straight, entire, apex acute to rounded; leaf cells oblong to hexagonal, 13–25 × 18–50 μm, thin-walled, trigones small, intermediate thickenings occasional; cuticle smooth; oil bodies homogeneous, globose to ellipsoid; lobule frequently reduced, when well-developed ovate to rectangular, 1/4–1/3 of leaf length, free margin plane, tooth short, keel straight. *Underleaves* distant, ovate, 1.5–2.5× stem width, narrowly bifid to 2/5, lobes triangular-acute, bases cuneate, insertion line straight to slightly curved. *Autoicous*. *Androecia* on short to long branches, with 2–9 pairs of bracts, bracteole restricted to the base of the spike. *Gynoecea* on main stem or on short branches with 1–2 innovations, bract lobe ovate, margins entire, apex acute to rounded, bracteole oblong, bifid to 1/3. *Perianths* obovoid, 5-keeled, keels smooth, beak 1–2 cells long (Gradstein & Reiner-Drehwald 2007).

Comment:—*Lejeunea topoensis* is a rare rheophytic species characterized by stems with a 4–8 cells wide ventral merophyte. The species is close to *L. juruana* and *L. polyantha* but the leaf lobe insertion is much longer in the latter two species, almost as long as the leaf width (ca. 1/2× leaf width in *L. topoensis*).

World distribution:—Ecuador and southern Brazil (Santa Catarina: Serra do Rastro, Uribici, ca. 1300 m, *Schäfer-Verwimp 10504* [JE]).

Distribution in Brazil:—Southern.

Habitat:—Found once submerged in running water of a spring bog at ca. 1300 m. In Ecuador growing periodically submerged on twigs of small shrubs along black-water rivers (Río Topo, Río Nangaritzá) at ca. 1000–1500 m.

58. *Lejeunea trinitensis* Lindenb., in Gottsche *et al.* (1845: 381); Reiner-Drehwald (2000a)

Lejeunea prorepens Spruce (syn. fide Pócs *et al.* 2015).

Description and illustration: Reiner-Drehwald (2000a).

Plants 1.0–1.3 mm wide. *Ventral merophyte* two cells wide. *Leaves* contiguous to imbricate, wide spreading; lobe suborbicular, flat, 480–625 μm long × 440–465 μm wide, dorsal margin arched, entire, ventral margin straight, entire, apex rounded; leaf cells hexagonal, 22–24 × 16–20 μm, thin-walled, trigones small to indistinct, intermediate thickenings occasional; cuticle smooth; oil bodies not seen; lobule small, rectangular, 1/5–1/4 of leaf length, tooth very long, (4–)6–12 cells long, 1–2 cells wide, tipped by a slime papilla, keel straight. *Underleaves* small, 1.8–3× stem width, distant, bifid to 1/2–2/3, sinus V-shaped, lobes narrowly triangular-acute, bases cuneate, insertion line curved. *Autoicous*. *Androecia* on short branches, with 2–4 pairs of bracts, bracteole restricted to the base of the spike. *Gynoecea* on main stem with 1–2 sterile innovations, bract lobe obovate, margins entire, apex rounded, bracteole oblong, bifid to ca. 1/3. *Perianths* obcordate, flattened, emergent to ca. 1/3, 5-keeled, keels smooth, beak 1 cell long.

Comment:—*Lejeunea trinitensis* is mainly recognized by suborbicular leaf lobes, small lobules with a very long tooth, being 6–12 cells long and 1–2 cells wide, and the flattened, obcordate perianth, keeled over its whole length with 5 smooth keels. *Lejeunea trinitensis* is close to *L. setiloba* but the latter species differs in the ovate-oblong leaf lobe, the shorter lobule tooth, 3–4(–6) cells long, and the inflated perianth keeled only in the upper half, with crenate keels.

World distribution:—Peri-Afroamerican (tropical America, tropical Africa: Comores); particularly common in the West Indies, Brazil and northern Argentina.

Distribution in Brazil:—Northern, Northeastern, Middle-Western. Further records: Southeastern, Southern (Yano 2008).

Habitat:—Rainforest, dry forest, campo rupestre, cerrado and urban environments, on living trees and leaves.

Selected material examined:—BRAZIL. **Amazonas**: Juruá Mirim, January 1901, *E. Ule* 560 (HBG, as *Lejeunea spiniloba* Lindenb. & Gottsche). **Bahia**: Ipirá, Fazenda Nova Favela, 17 September 1995, *C. Bastos et al.* 740, 743 (ALCB). **Goiaás**: Fazenda Santa Vitoria – Itauçú, 19 December 1964, *D.M. Vital* 288, det M.E. Reiner-Drehwald (SP, U). **Mato Grosso**: Cáceres, Ilha de Taimã, Estirão do Saranzeiro, 4 June 1984, *N. Saddi & D.M. Vital* 6142 (UB). **Sergipe**: Itabaiana, Rio Tabora, *D.M. Vital* 2868, det. R. Grolle (SP, U).

New synonyms

Lejeunea caulicalyx (Steph.) M.E.Reiner & Goda = *Lejeunea glaucescens*
Lejeunea cordiflora Spruce = *Lejeunea flava*
Lejeunea cristuliflora (Steph.) M.E.Reiner & Goda = *Lejeunea acanthogona* var. *cristulata*
Lejeunea gomphocalyx Spruce = *Lejeunea raddiana*
Lejeunea humefacta Spruce = *Lejeunea aphanes*
Lejeunea leptophylla Ångstr. = *Lejeunea cancellata*
Lejeunea lusoria Lindenb. & Gottsche = *Lejeunea flaccida*
Lejeunea lusoria auct. (non typus) = *Lejeunea bombonasensis*
Lejeunea monimiae (Steph.) Steph. = *Lejeunea subsessilis*
Lejeunea muscicola Spruce = *Lejeunea glaucescens*
Lejeunea obidensis Spruce = *Lejeunea adpressa*
Lejeunea obtusangula Spruce = *Lejeunea flaccida*
Lejeunea tapajosensis Spruce = *Lejeunea parviloba*
Taxilejeunea brasiliensis Steph. = *Lejeunea glaucescens*
Taxilejeunea fissistipula Steph. = *Lejeunea controversa*
Taxilejeunea foliicola Steph. = *Lejeunea flaccida*
Taxilejeunea fusciorufa Steph. = *Lejeunea controversa*
Taxilejeunea jeringii Steph. = *Lejeunea flaccida*
Taxilejeunea lindbergiana Steph. = *Lejeunea capensis*
Taxilejeunea multiflora Steph. = *Lejeunea flaccida*
Taxilejeunea obtusifolia Steph. = *Lejeunea catinulifera*
Taxilejeunea uleana Steph. = *Lejeunea glaucescens*
Trachylejeunea didrichsenii Steph. = *Lejeunea acanthogona* var. *cristulata*

Excluded species and dubious records

The following species recorded from Brazil by Yano (2008) and others are excluded or are dubious records:

Lejeunea abyssinica (Gola) Cufod. (= *L. confusa* E.W.Jones). African species, probably not in Brazil. The Brazilian specimens, all recorded as *L. confusa*, may belong to *L. aphanes*.
Lejeunea cavifolia (Ehrh.) H.Lindb. Holarctic species, excluded from the flora of Brazil. The specimens reported by Bastos *et al.* (2000) as *L. cavifolia* belong to *L. cancellata*.
Lejeunea cladogyna A.Evans. North American-northern Caribbean species, probably not in Brazil. The Brazilian specimens examined identified as *L. cladogyna* belong to *L. glaucescens* but not all Brazilian records of *L. cladogyna* have been verified.
Lejeunea cocoes Mitt. (= *L. proliferans* Herzog; fide So & Zhu 1998). The occurrence of this Asiatic species in Brazil is unlikely.
Lejeunea compressiuscula (Steph.) G.E.Lee *et al.* The occurrence of this rare Asiatic species (see Lee *et al.* 2018) in Brazil is unlikely.
Lejeunea floridana A.Evans. The occurrence of this North American-northern Caribbean species in Brazil could not be confirmed.
Lejeunea lamacerina (Steph.) Schiffn. Holarctic species, probably not in Brazil.
Lejeunea laxa (Nees) Lindenb. Asiatic species, probably not in Brazil.
Lejeunea grossecristata (Steph.) E.W.Jones (= *L. longirostris* (Steph.) E.W.Jones nom. illeg. = *L. longirostrata* R.M.Schust.; e.g., Wigginton 2018). The occurrence of this African species in Brazil could not be confirmed.
Lejeunea minutiloba A.Evans. The Brazilian specimens examined identified as *L. minutiloba* belong to *L. glaucescens* but not all Brazilian records of this West Indian species could be verified.
Lejeunea ruthii (A.Evans) R.M.Schust. The occurrence of this North American species in Brazil could not be confirmed. The Brazilian records might belong to *Lejeunea oligoclada*.
Lejeunea seriata Lindenb. & Gottsche. The occurrence of this Mexican species in Brazil could not be confirmed.
Lejeunea siccata Spruce. The status of this species described from Brazil could not be checked.
Lejeunea tabularis (Spreng.) Gottsche *et al.* An African species, probably not in Brazil. The Brazilian specimens recorded as *L. tabularis* may belong to *L. parviloba*.
Lejeunea villaumei (Steph.) Grolle. An African species, probably not in Brazil.

Acknowledgements

The authors are very grateful to the directors and curators of the herbaria cited in the text for the loan of specimens, to Alfons Schäfer-Verwimp (Herdwangen-Schönach), Charles E. Zartman and Adriel M. Sierra (INPA) for donating specimens, to Elena M. Reiner-Drehwald for comments on selected species. The first author thanks the Universidade Federal da Bahia (Federal University of Bahia) for supporting fieldwork; for collecting permits he thanks the owner of RPPN Serra do Teimoso, ICMBio for authorization to collect in Parque Nacional de Boa Nova and Reserva Biológica da Una (Authorization No. 62737-1), and INEMA for authorization to collect in Estação Ecológica de Wenceslau Guimarães (Ordinances No. 13878, 15191, 17154), Parque Estadual das Sete Passagens (Ordinance No. 16086) and ARIE Serra do Orobó (Ordinance No. 9095).

References

- Alvarenga, L.D.P., Silva, M.P.P., Oliveira, J.R.P.M. & Pôrto, K.C. (2007) Novas ocorrências de briófitas para Pernambuco, Brasil. *Acta Botanica Brasilica* 21: 349–360.
<https://doi.org/10.1590/S0102-33062007000200009>
- Ångström, J. (1876) Primae lineae muscorum cognoscendorum, qui ad Caldas Brasiliae sunt collecti. Continuatio. II. Hepaticae. *Öfversigt af Kongliche Vetenskaps-Akademiens Förhandlingar* 33: 77–92.
- Bastos, C.J.P. (2014) On *Trachylejeunea subplana* Steph. (Lejeuneaceae, Marchantiophyta). *Journal of Bryology* 36: 249–250.
<https://doi.org/10.1179/1743282014Y.0000000093>
- Bastos, C.J.P. (2018a) *Lejeunea* in Flora do Brasil 2020 em construção. Jardim Botânico do Rio de Janeiro. Disponível em.
- Bastos, C.J.P. (2018b) *Lejeunea apiahyna*, a new synonym of *Lejeunea cristuliflora* (Lejeuneaceae, Marchantiophyta). *Phytotaxa* 360 (1): 69–70.
<https://doi.org/10.11646/phytotaxa.360.1.7>
- Bastos, C.J.P. & Valente, E.B. (2008) Hepáticas (Marchantiophyta) da Reserva Ecológica da Michelin, Igrapiúna, Bahia, Brasil. *Sitentibus, Sér. Ciências Biológicas* 8: 280–293.
- Bastos, C.J.P. & Yano, O. (2009) O gênero *Lejeunea* Libert (Lejeuneaceae) no Estado da Bahia, Brasil. *Hoehnea* 36: 303–320.
<https://doi.org/10.1590/S2236-89062009000200008>
- Bastos, C.J.P., Reiner-Drehwald, M.E. & Schäfer-Verwimp, A. (2017) A new species of the genus *Lejeunea* Lib. (Marchantiophyta, Lejeuneaceae) from Brazil. *Phytotaxa* 336 (1): 71–76.
<https://doi.org/10.11646/phytotaxa.326.1.6>
- Bastos, C.J.P., Cruz, F.C.O. & Silva, M.P.P. (2019) On the occurrence of *Lejeunea pulverulenta* (Marchantiophyta, Lejeuneaceae) in Brazil. *Rodriguésia* 70.
<https://doi.org/10.1590/2175-7860201970016>
- Bastos, C.J.P., Gradstein, S.R., Vilas Bôas-Bastos, S.B. & Schäfer-Verwimp, A. (2018) A new and interesting species of *Lejeunea* Lib. (Marchantiophyta, Lejeuneaceae) from Brazil. *Nova Hedwigia* 106: 59–64.
https://doi.org/10.1127/nova_hedwigia/2017/0455
- Bescherelle, E. & Spruce, R. (1889) Hépatiques nouvelles des colonies Françaises. *Bulletin de la Société Botanique de France (Congrès de Botanique)* 36: clxxvii–clxxxix.
<https://doi.org/10.1080/00378941.1889.10835894>
- Bonner, E.B. (1953) De Hepaticis III. A contribution to the study of the genus *Ceratolejeunea* (Spruce) Schiffner. *Candollea* 14: 163–252.
- Breil, D.A. (1970) Liverworts of the Mid-Gulf Coastal Pain. *The Bryologist* 73: 409–491.
[https://doi.org/10.1639/0007-2745\(1970\)73\[409:LOTMCP\]2.0.CO;2](https://doi.org/10.1639/0007-2745(1970)73[409:LOTMCP]2.0.CO;2)
- Costa, D.P. (2017) Bryophyte results from a botanical expedition to Serra do Aracá, State Amazonas, Brazil: diversity, distribution, and endemismo. *The Bryologist* 120: 45–50.
<https://doi.org/10.1639/0007-2745-120.1.045>
- Costa, D.P. & Peralta, D.F. (2015) Bryophytes diversity in Brazil. *Rodriguésia* 66: 1063–1071.
<https://doi.org/10.1590/2175-7860201566409>
- Costa, D.P., Imbassahy, C.A.A. & Silva, V.P.A.V. (2005) Diversidade e importância das espécies de briófitas na conservação dos ecossistemas do Rio de Janeiro. *Rodriguésia* 56: 13–49.
<https://doi.org/10.1590/2175-78602005568702>

- Costa, D.P., Peralta, D.F., Buck, W.R., Larrain, J. & von Konrat, M. (2017) Serra do Cuririari, Amazon State, Brazil: the first bryofloristic analysis for a Brazilian mountain in the Amazonian forest. *Phytotaxa* 303 (3): 201–217.
<https://doi.org/10.11646/phytotaxa.303.3.1>
- Dauphin, G. (2003) *Ceratolejeunea*. *Flora Neotropica Monograph* 90: 1–86.
- Dauphin, G. (2005) Catalogue of Costa Rican Hepaticae and Anthocerotae. *Tropical Bryology* 26: 141–218.
<https://doi.org/10.11646/bde.26.1.17>
- Evans, A.W. (1902) The Lejeuneae of the United States and Canada. *Memoirs of the Torrey Botanical Club* 8: 113–183.
<https://doi.org/10.5962/bhl.title.97556>
- Evans, A.W. (1906) The Hepaticae of Bermuda. *Bulletin of the Torrey Botanical Club* 33: 129–135.
<https://doi.org/10.2307/2478823>
- Gottsche, C.M. & Rabenhorst, G.L. (1855–1879) *Hepaticae Europaea. Exsiccatae. Decades I–LXVI, numbers 1–660*. Dresden.
- Gottsche, C.M., Lindenberg, J.B.W. & Nees von Esenbeck, C.G. (1845) *Synopsis Hepaticarum, fasc. 3*. Meissner, Hamburg, pp. 305–464.
- Gottsche, C.M., Lindenberg, J.B.W. & Nees von Esenbeck, C.G. (1847) *Synopsis Hepaticarum, fasc. 5*. Meissner, Hamburg, pp. 625–834.
- Gradstein, S.R. (1979) Genera of Lejeuneaceae: Past and Present. In: Clark, G.C.S. & Duckett (Eds.) *Bryophyte Systematics*. Academic Press, London, pp. 83–107.
- Gradstein, S.R. (1994) Lejeuneaceae: Ptychantheae, Brachiolejeuneae. *Flora Neotropica Monograph* 62: 1–216.
- Gradstein, S.R. (2018) Amphi-Pacific tropical disjunctions in the bryophyte floras of Asia and the New World. *Philippine Journal of Systematic Biology* 12: 1–11.
<https://doi.org/10.26757/pjsb.2018a12012>
- Gradstein, S.R. (in press). The Liverworts and Hornworts of Colombia and Ecuador. *Memoirs of the New York Botanical Garden*.
- Gradstein, S.R., Churchill, S.P. & Salazar Allen, N. (2001) Guide to the Bryophytes of Tropical America. *Memoirs of the New York Botanical Garden* 86: 1–577.
- Gradstein, S.R. & Costa, D.P. (2003) The Hepaticae and Anthocerotae of Brazil. *Memoirs of the New York Botanical Garden* 87: 1–318.
- Gradstein, S.R. & Ilkiu-Borges, A.L. (2009) Guide to the Plants of Central French Guiana. Part 4. Liverworts and Hornworts. *Memoirs of the New York Botanical Garden* 76: 1–140.
- Gradstein, S.R. & Reiner-Drehwald, M.E. (2007) The status of *Neopotamolejeunea* (Lejeuneaceae) and description of a new species from Ecuador and Southern Brazil. *Systematic Botany* 32: 487–492.
<https://doi.org/10.1600/036364407782250571>
- Gradstein, S.R. & Uribe-M., J. (2016) Marchantiophyta. In: Bernal, R., Gradstein, S.R. & Celis, M. (Eds.) *Catálogo de plantas y líquenes de Colombia*. Universidad Nacional de Colombia, Bogotá, pp. 282–352.
- Gradstein, S.R., Uribe-M., J., Gil-N., J.E., Morales, C. & Negritto, M.A. (2018) Liverworts new to Colombia. *Caldasia* 40: 82–90.
<https://doi.org/10.15446/caldasia.v40n1.68077>
- Grolle, R. (1985) Miscellanea hepaticologica 231–240. *Journal of the Hattori Botanical Laboratory* 58: 197–202.
- Grolle, R. (1988) Zur Kenntnis der Lejeuneoideae in Cuba (2): *Lejeunea* subg. *Macrolejeunea* Spruce. *Wissenschaftliche Zeitschrift der Friedrich-Schiller-Universität, Mathematisch-naturwissenschaftliche Reihe* 37: 169–176.
- Grolle, R. & Reiner-Drehwald, M.E. (1999) Review of the genus *Harpalejeunea* (Lejeuneaceae) including the description of *H. grandis*, a new species from the páramos of Colombia. *Journal of Bryology* 21: 31–45.
<https://doi.org/10.1179/jbr.1999.21.1.31>
- He, X.-L. (1996) On the taxonomic significance of lobule characters in the Lejeuneaceae (Hepaticae). *Annales Botanici Fennici* 33: 311–316.
- Heinrichs, J., Dong, S., Schäfer-Verwimp, A., Pócs T., Feldberg, K., Czumai, A., Schmidt, A.R., Reitner, J., Renner, M.A.M., Hentschel, J., Stech, M. & Schneider, H. (2013) Molecular phylogeny of the leafy liverwort *Lejeunea* (Porellales): Evidence for a neotropical origin, uneven distribution of sexual systems and insufficient taxonomy. *PLoS ONE* 8 (12): e82547.
<https://doi.org/10.1371/journal.pone.0082547>
- Ilkiu-Borges, A.L. (2005) A taxonomic revision of *Echinocolea* (Lejeuneaceae, Hepaticae). *Nova Hedwigia* 80: 45–71.
<https://doi.org/10.1127/0029-5035/2005/0080-0045>
- Ilkiu-Borges, A.L. & Oliveira-da-Silva, F.R. (2018) Flora das cangas da Serra dos Carajás, Pará, Brasil: Lejeuneaceae. *Rodriguésia* 69: 989–1012.
<https://doi.org/10.1590/2175-7860201869305>
- Jack, J.B. & Stephani, F. (1892) Hepaticae Wallisiana. *Hedwigia* 31: 11–27.
- Lee, G.E. (2013) *A systematic revision of the genus Lejeunea Lib. (Marchantiophyta: Lejeuneaceae) in Malaysia*, 34. Cryptogamie, Bryologie, pp. 381–484.

<https://doi.org/10.7872/cryb.v34.iss4.2013.381>

- Lee, G.E., Bechteler, J. & Heinrichs, J. (2018) A revision of unrevised taxon names in the former genus *Taxilejeunea* (Marchantiophyta: Lejeuneaceae) from Asia. *Phytotaxa* 358 (1): 26–48.
<https://doi.org/10.11646/phytotaxa.358.1.2>
- Lehmann, J.G.C. (1832) *Novarum et minus cognitarum stirpium pugillus quartus*. Meissner, Hamburg, 64 pp.
- Lehmann, J.G.C. (1833) *Novarum et minus cognitarum stirpium pugillus quintus*. Meissner, Hamburg, pp. 1–28.
- Lehmann, J.G.C. (1834) *Novarum et minus cognitarum stirpium pugillus sextus*. Meissner, Hamburg, pp. 1–66.
- Libert, M.A. (1820) Sur un genre nouveau d'hépatiques, *Lejeunia*. *Annales générales des sciences physiques* 6: 372–374.
- Lindenberg, J.B.W. & Gottsche, C.M. (1851[1852]) Plantae Kegelianae. Expositio Hepaticarum surinamensium. *Linnaea* 24: 625–639.
- Massalongo, C. (1881) Duae species novae e genere *Lejeunia*, quas circa Buenos-Ayres legit C. Spegazzini. *Nuovo Giornale Botanico Italiano* 13: 122–124.
- McNeill, J. (2014) Holotype specimens citations: General issues. *Taxon* 63: 1112–1113.
<https://doi.org/10.12705/635.7>
- Montagne, J.F.C. (1838) Centurie I. de plantes cellulaires exotiques nouvelles (suite). *Annales des Sciences Naturelles, Botanique, sér. 2*, 9: 38–57.
- Montagne, J.F.C. (1840) Seconde centurie de plantes cellulaires nouvelles. Decades VI, VII et VIII. *Annales des Sciences Naturelles, Botanique, sér. 2*, 14: 321–350.
- Montagne, J.F.C. (1842) Botanique. Plantes Cellulaires. In: de la Sagra, R.D.J. (Ed.) *Histoire Physique, Politique et Naturelle de l'île de Cuba*. Arthus Bertrand, Paris, pp. 427–492.
- Montagne, J.F.C. (1856) Septième Centurie de Plantes Cellulaires nouvelles, tant indigènes qu'exotiques. *Annales des Sciences Naturelles, Botanique, sér. 4*, 5: 333–374.
- Moura, O.S., Ilkiu-Borges, A.L. & Brito, E.S. (2013) Brioflora (Bryophyta e Marchantiophyta) da Ilha do Combu, Belém, PA, Brasil. *Hoehnea* 40: 143–165.
<https://doi.org/10.1590/S2236-89062013000100008>
- Moura, O.S., Ilkiu-Borges, A.L. & Reiner-Drehwald, M.E. (2012) A new species of *Lejeunea* Lib. (Lejeuneaceae) from Low Várzea forest in lower Amazon (Pará, Brazil). *Nova Hedwigia* 95: 197–202.
<https://doi.org/10.1127/0029-5035/2012/0033>
- Nees von Esenbeck, C.G. (1833) Hepaticae. In: von Martius, C.F.P. (Ed.) *Flora Brasiliensis seu Enumeratio Plantarum*, Vol. 1, Pars Prior. J.G. Cotta, Stuttgart, Tübingen, p. 294–390.
- Nees von Esenbeck, C.G. (1838) *Naturgeschichte der Europäischen Lebermoose mit besonderer Beziehung auf Schlesien und die Oertlichkeiten des Riesengebirgs, vol. 3*. Grass, Barth & Co., Breslau, 593 pp.
- Parolly, G., Kürschner, H., Schäfer-Verwimp, A. & Gradstein, S.R. (2004) Cryptogams of the Reserva Biológica San Francisco (Province Zamora-Chinchipe, Southern Ecuador) III. Bryophytes – Additions and new species. *Cryptogamie, Bryologie* 25: 271–289.
- Pócs, T., Zhu, R.L., Reiner-Drehwald, M.E., Söderström, L., Hagborg, A. & Von Konrat, M. (2015) Notes on Early Land Plants Today. 71. New synonyms, new names and new combinations in Lejeuneaceae (Marchantiophyta). *Phytotaxa* 208 (1): 97–102.
<https://doi.org/10.11646/phytotaxa.208.1.10>
- Raddi, G. (1822) *Crittogame Brasiliane raccolte e descritte dal Signor Guisepppe Raddi*. Società Tipografica, Modena, 33 pp.
<https://doi.org/10.5962/bhl.title.65673>
- Reiner-Drehwald, M.E. (1993) Las Lejeuneaceae (Hepaticae) de Misiones, Argentina. I. Las especies holostipas. *Tropical Bryology* 7: 13–45.
<https://doi.org/10.11646/bde.7.1.4>
- Reiner-Drehwald, M.E. (1999) On *Potamolejeunea polyantha* (Mont.) E. Reiner & Goda comb. nov. (Lejeuneaceae), a poorly known rheophytic liverwort from South America. *Hausknechtia Beiheft* 9: 299–306.
- Reiner-Drehwald, M.E. (2000a) Las Lejeuneaceae (Hepaticae) de Misiones, Argentina VI. *Lejeunea y Taxilejeunea*. *Tropical Bryology* 19: 81–131.
<https://doi.org/10.11646/bde.19.1.14>
- Reiner-Drehwald, M.E. (2000b) On *Potamonlejeunea* and *Neopotamolejeunea* gen. nov. (Lejeuneaceae, Hepaticae). *Nova Hedwigia* 71: 447–464.
- Reiner-Drehwald, M.E. (2003) *Lejeunea* Lib. [In: Gradstein, S.R. & Costa, D.P., The Hepaticae and Anthocerotae of Brazil]. *Memoirs of the New York Botanical Garden* 87: 155–163.
- Reiner-Drehwald, M.E. (2005a) On *Amphilejeunea* and *Cryptogynolejeunea*, two small genera of Lejeuneaceae (Jungermanniopsida), and two common neotropical *Lejeunea* species. *Nova Hedwigia* 81: 395–411.
<https://doi.org/10.1127/0029-5035/2005/0081-0395>
- Reiner-Drehwald, M.E. (2005b) *Taxilejeunea pulverulenta* (Lejeuneaceae, Jungermanniopsida), a poorly known species from the Neotropics,

- is transferred to *Lejeunea*. *Cryptogamie, Bryologie* 26: 59–65.
- Reiner-Drehwald, M.E. (2005c) On *Lejeunea rotundifolia* and *Di cladolejeunea* (Lejeuneaceae, Jungermanniopsida). *Systematic Botany* 30: 687–692.
<https://doi.org/10.1600/036364405775097860>
- Reiner-Drehwald, M.E. (2007) Preliminary key to the genus *Lejeunea* in Brazil. [http://www.drehwald.info/Lejeunea/Key_Lejeunea_Brazil_30_Apr.pdf]
- Reiner-Drehwald, M.E. (2009a) *Lejeunea*. [In: Gradstein, S.R. & Ilkiu-Borges, A.L., Guide to the Plants of Central French Guiana IV]. *Memoirs of the New York Botanical Garden* 76: 95–101.
- Reiner-Drehwald, M.E. (2009b) *Lejeunea adpressa* Nees (Lejeuneaceae), a widely distributed species of tropical America. *Cryptogamie, Bryologie* 30: 329–336.
- Reiner-Drehwald, M.E. (2010a) A taxonomic revision of *Lejeunea deplanata* (Lejeuneaceae, Marchantiophyta) from tropical America. *Nova Hedwigia* 91: 519–532.
<https://doi.org/10.1127/0029-5035/2010/0091-0519>
- Reiner-Drehwald, M.E. (2010b) On *Lejeunea* subgenus *Nanolejeunea* (Lejeuneaceae, Jungermanniopsida). *Beiheft Nova Hedwigia* 138: 117–128.
- Reiner-Drehwald, M.E. & Drehwald, U. (2002) *Sphaerolejeunea umbilicata* (Lejeuneaceae): a critically endangered epiphyllous liverwort of the Andes. *The Bryologist* 105: 422–430.
[https://doi.org/10.1639/0007-2745\(2002\)105\[0422:SULACE\]2.0.CO;2](https://doi.org/10.1639/0007-2745(2002)105[0422:SULACE]2.0.CO;2)
- Reiner-Drehwald, M.E. & Goda, A. (2000) Revision of the genus *Crossotolejeunea* (Lejeuneaceae, Hepaticae). *Journal of the Hattori Botanical Laboratory* 89: 1–54.
- Reiner-Drehwald, M.E. & Pôrto, K.C. (2007) *Lejeunea perpapillosa* (Lejeuneaceae), a new species from north-eastern Brazil. *Nova Hedwigia* 85: 541–546.
<https://doi.org/10.1127/0029-5035/2007/0085-0541>
- Reiner-Drehwald, M.E. & Schäfer-Verwimp, A. (2008a) *Lejeunea oligoclada* and *L. rionegrensis* (Lejeuneaceae) in tropical America: New data on morphology and geographical distribution. *Nova Hedwigia* 87: 175–184.
<https://doi.org/10.1127/0029-5035/2008/0087-0175>
- Reiner-Drehwald, M.E. & Schäfer-Verwimp, A. (2008b) On *Inflatolejeunea*, *Lejeunea* species with eplicate perianths and *Lejeunea talamancensis* sp. nov. from Costa Rica (Lejeuneaceae). *Nova Hedwigia* 87: 387–420.
<https://doi.org/10.1127/0029-5035/2008/0087-0387>
- Reiner-Drehwald, M.E., Schäfer-Verwimp, A. & Ilkiu-Borges, A.L. (2018) New synonyms and national records for *Lejeunea* (Lejeuneaceae, Marchantiophyta) in Tropical America. *Bryophyte Diversity & Evolution* 40: 6–10.
<https://doi.org/10.11646/bde.40.1.2>
- Reis, L.C., Oliveira, H.C. & Bastos, C.J.P. (2015) Hepáticas (Marchantiophyta) epífitas de duas áreas de Floresta Atlântica no Estado da Bahia, Brasil. *Pesquisas, Botânica* 67: 225–241.
- Ristow, R., Schäfer-Verwimp, A. & Peralta, D.F. (2015) New records of bryophytes for the State of Paraná, Brazil. *Pesquisas, Botânica* 67: 65–80.
- Sande Lacoste, C.M. (1855) Novae species Hepaticarum ex Insula Java detexit Dr. F. Junghuhn. *Nederlandsch Kruidkundig Archief. Verslagen en Mededelingen der Nederlandsche Botanische Vereeniging* 3: 521–522.
- Schäfer-Verwimp, A. (2014) Toward a more complete knowledge of the liverwort flora of Panama. *Phytotaxa* 172 (3): 201–234.
<https://doi.org/10.11646/phytotaxa.172.3.3>
- Schäfer-Verwimp, A. & Reiner-Drehwald, M.E. (2009) Some additions to the bryophyte flora of Guadeloupe, West Indies, and new synonyms in the genera *Diplasiolejeunea* and *Lejeunea* (Lejeuneaceae). *Cryptogamie, Bryologie* 30: 357–375.
- Schiffner, V. & Arnell, S. (1964) Ergebnisse der botanischen Expedition der kaiserlichen Akademie der Wissenschaften nach Süd-brasilien 1901. Hepaticae. *Österreichische Akademie der Wissenschaften Mathematisch-Naturwissenschaftliche Klasse, Denkschriften* 111: 1–156.
<https://doi.org/10.1007/978-3-7091-5790-9>
- Schuster, R.M. (1957) North America Lejeuneaceae. VI. *Lejeunea* subgenus *Lejeunea* (II, concluded). *Journal of the Elisha Mitchell Scientific Society* 73: 388–443.
- Schuster, R.M. (1963) An annotated synopsis of the genera and subgenera of Lejeuneaceae. I. Introduction; annotated keys to subfamilies and genera. *Beihefte zur Nova Hedwigia* 9: 1–203.
- Schuster, R.M. (1971) The ecology and distribution of Hepaticae in a mahogany hammock in tropical Florida. *Castanea* 36: 90–111.
- Schuster, R.M. (1980) *The Hepaticae and Anthocerotae of North America. IV*. Columbia University Press, New York, 1334 pp.
- So, M.L. & Zhu, R.L. (1998) On six species of the genus *Lejeunea* in China, including one new species. *The Bryologist* 101: 137–143.
[https://doi.org/10.1639/0007-2745\(1998\)101\[137:OSSOTG\]2.0.CO;2](https://doi.org/10.1639/0007-2745(1998)101[137:OSSOTG]2.0.CO;2)

- Söderström, L., Barrie, F.R., Hagborg, A., Crandall-Stotler, B.J., Gradstein, S.R., Stotler, R.E. & Von Konrat, M. (2015) Notes on Early Land Plants Today. 73. Genera of Lejeuneaceae established in the period 1884–1893: dates of validation and implications. *Phytotaxa* 220 (2): 143–198.
<https://doi.org/10.11646/phytotaxa.220.2.4>
- Söderström, L., Hagborg, A., Von Konrat, M., Bartholomew-Began, S., Bell, D., Briscoe, L., Brown, E., Cargill, D.C., Cooper, E.D., Costa, D.P., Crandall-Stotler, B.J., Dauphin, G., Engel, J.J., Feldberg, K., Glenny, D., Gradstein, S.R., He, X., Heinrichs, J., Hentschel, J., Ilkiu-Borges, A.L., Katagiri, T., Konstantinova, N.A., Larrain, J., Long, D.G., Nebel, M., Pócs, T., Puche, F., Reiner-Drehwald, M.E., Renner, M.A.M., Sass-Gyarmati, A., Schäfer-Verwimp, A., Segarra Moragues, J.G., Stotler, R.E., Sukkharak, P., Thiers, B.M., Uribe, J., Váña, J., Villarreal, J.C., Wigginton, M., Zhang, L. & Zhu, R.L. (2016) World checklist of hornworts and liverworts. *PhytoKeys* 59: 1–828.
<https://doi.org/10.3897/phytokeys.59.6261>
- Spruce, R. (1881) Musci praeteriti. *Journal of Botany, British and Foreign* 19: 33–40.
- Spruce, R. (1884) Hepaticae Amazonicae et Andinae. I. *Transactions and Proceedings of the Botanical Society of Edinburgh* 15: 1–308.
<https://doi.org/10.5962/bhl.title.115637>
- Spruce, R. (1889) *Hepaticae novae Americanae tropicae et aliae*. *Bulletin de la Société Botanique de France (Congrès de Botanique)* 36: clxxxix–cevvii.
- Spruce, R. (1895) Hepaticae Elliotianae, insulis Antillanis St. Vincent et Dominica a clar. W.R. Elliott, annuis 1891–92, lectae. *Journal of the Linnean Society, Botany* 30: 331–372.
<https://doi.org/10.1111/j.1095-8339.1894.tb02416.x>
- Stephani, F. (1889) Hepaticae Australiae 3. *Hedwigia* 28: 257–278.
- Stephani, F. (1896) Hepaticarum species novae IX. *Hedwigia* 35: 73–140.
- Stephani, F. (1911) *Species hepaticarum* 4. George & Cie, Genève & Bale, pp. 465–736.
- Stephani, F. (1913) *Species hepaticarum* 5. George & Cie, Genève & Bale, pp. 178–480.
- Stephani, F. (1914) *Species hepaticarum* 5. George & Cie, Genève & Bale, pp. 481–704.
- Stephani, F. (1915) *Species hepaticarum* 5. George & Cie, Genève & Bale, pp. 705–848.
- Stephani, F. (1985) Icones Hepaticarum. Microfiches. IDC, Microform Publishers, The Netherlands.
- Swartz, O. (1788) *Nova genera et species plantarum, seu prodromus*. Uppsala, 152 pp.
- Valente, E.B., Pôrto, K.C. & Bastos, C.J.P. (2013a) Species richness and distribution of bryophytes within different phytophysiognomies in the Chapada Diamantina region of Brazil. *Acta Botanica Brasilica* 27: 294–310.
<https://doi.org/10.1590/S0102-33062013000200006>
- Valente, E.B., Pôrto, K.C., Bastos, C.J.P. & Balejos-Loyola, J. (2013b) Diversity and distribution of the bryophyte flora in montane forest in the Chapada Diamantina region of Brazil. *Acta Botanica Brasilica* 27: 506–518.
<https://doi.org/10.1590/S0102-33062013000300008>
- Visnadi, S.R. (1998) *Briófitas em ecossistemas costeiros do Núcleo Picinguaba do Parque Estadual da Serra do Mar, Ubatuba, SP*. Doctoral thesis, Universidade Estadual Paulista, São Paulo, 273 pp.
- Wigginton, M. (2018) Checklist and distribution of the liverworts and hornworts of sub-Saharan Africa, including the East African Islands. *Tropical Bryology Research Reports* 9: 1–138.
- Yano, O. (2008) Catálogo de antóceros e hepáticas brasileiros: literatura original, basiônimo, localidade-tipo e distribuição geográfica. *Boletim do Instituto de Botânica* 19: 1–110.
- Yano, O. & Peralta, D.F. (2011) Flora da Serra do Cipó, Minas Gerais: briófitas (Anthocertophyta, Bryophyta e Marchantiophyta). *Boletim de Botânica da Universidade de São Paulo* 29: 135–299.
<https://doi.org/10.11606/issn.2316-9052.v29i2p135-299>
- Ye, W., Wei, Y.-M., Schäfer-Verwimp, A. & Zhu, R.-L. (2013) Phylogenetic position of *Oryzolejeunea* (Lejeuneaceae, Marchantiophyta): Evidence from molecular markers and morphology. *Journal of Systematics and Evolution* 51: 468–475.
<https://doi.org/10.1111/j.1759-6831.2012.00238.x>