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Las Lejeuneaceae (Hepaticae) de Misiones, Argentina
I. Las especies holostipas

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Resumen. Se describen e ilustran 17 especies holostipas (con anfigastrio entero) de la familia Lejeuneaceae (Jungermanniales) halladas en la provincia de Misiones, Argentina. Las especies pertenecen a dos subfamilias (Lejeuneoideae y Ptychanthoideae) y 15 géneros: *Anoplolejeunea*, *Lejeunea*, *Leucolejeunea*, *Omphalanthus*, *Acanthocoleus*, *Archilejeunea*, *Brachiolejeunea*, *Bryopteris*, *Caudalejeunea*, *Frullanoides*, *Lopholejeunea*, *Marchesinia*, *Mastigolejeunea*, *Odontolejeunea* y *Schiffneriolejeunea*. Todas las especies son citadas por primera vez para Misiones y con excepción de *Omphalanthus filiformis* y *Frullanoides densifolia* (conocidas para la provincia de Salta), son citas nuevas para Argentina. Para cada especie se indican también el habitat y la distribución geográfica mundial. Una clave para la identificación de estas especies y una sinopsis con la posición sistemática de las mismas completan el trabajo.

Abstract. Seventeen species of holostipous (underleaves undivided) Lejeuneaceae (Jungermanniales) found in the province of Misiones, Argentina, are described and illustrated. The species are members of the subfamilies Lejeuneoideae and Ptychanthoideae and belong to the genera *Anoplolejeunea*, *Lejeunea*, *Leucolejeunea*, *Omphalanthus*, *Acanthocoleus*, *Archilejeunea*, *Brachiolejeunea*, *Bryopteris*, *Caudalejeunea*, *Frullanoides*, *Lopholejeunea*, *Marchesinia*, *Mastigolejeunea*, *Odontolejeunea* and *Schiffneriolejeunea*. All of the species are new records for Misiones and, with exception of *Omphalanthus filiformis* and *Frullanoides densifolia* (known for the province of Salta), all of them are new records for Argentina. For each taxon the habitat and the geographical distribution are indicated. A key to the species and a synopsis of their systematic position are also provided.

La familia Lejeuneaceae (Jungermanniales) con 81 géneros (Grolle 1983) y aproximadamente 1500 taxa descriptos (Index Hepaticarum), es una de las mayores dentro de las hepáticas. El número de géneros, subgéneros y especies va modificándose a medida que se realizan monografías mundiales sobre distintos grupos. La distribución geográfica de las Lejeuneaceae se concentra en las regiones tropicales, subtropicales y templadas del mundo. En Argentina la familia está representada con mayor número de especies en los bosques andino-patagónicos (Solari 1983), en la selva Tucumano-Oranense (en el NO argentino) y en Misiones.

La provincia de Misiones está ubicada en el extremo NE de Argentina, aproximadamente entre los paralelos 25°30' y 28° S y entre los meridianos 53°30' y 56° O.

Fitogeográficamente, Misiones se encuentra dentro de la Provincia Paranense (Cabrera 1971). La vegetación de Misiones es tratada en detalle en Eskuche (1986).

Las Lejeuneaceae pueden dividirse en dos grupos: con y sin anfigastrios. Las especies con anfigastrios son subdivididas tradicionalmente en especies con anfigastrios enteros ("holostipous", holostipas) y especies con anfigastrios bífidos ("schizostipous"). A pesar de que estas clasificaciones no son naturales, son muy útiles a los fines de la identificación de especies (Gradstein 1985).

El objetivo de este trabajo es comenzar con el estudio de la familia Lejeuneaceae en Misiones. Esta primera contribución tratará las especies holostipas, es decir, aquellas que presentan anfigastrios enteros. Para Misiones existen citas de 7 especies de Lejeuneaceae (Massalongo 1906 y 1928, Herzog 1952), pero ninguna de éstas pertenece al grupo de las especies holostipas.

Metodología

La posición sistemática de los taxa estudiados figura en la sinopsis, basada en Grolle (1983) y en Gradstein (1990). Dentro de cada subfamilia los géneros fueron ordenados alfabéticamente.

En la clave se utilizaron principalmente caracteres vegetativos, para facilitar la identificación de material estéril. En algunos casos, sin embargo, cuando el material es muy escaso y no presenta la forma más típica (por ej. *Acanthocoleus aberrans* y *Frullanoides densifolia* pueden tener el ápice del lobo obtuso a redondeado en vez de la forma típica: ápice agudo hasta apiculado y generalmente incurvado) su identificación puede resultar más complicada.

Las descripciones de las especies están basadas exclusivamente en el material estudiado. La latitud de las plantas fue medida cuando las mismas se hallaban mojadas, y representa el ancho del tallo con hojas. El habitat se refiere al hallado en Misiones, salvo indicación contraria. Para cada especie se dibujaron el aspecto general de las mismas en vista ventral (con excepción de *Omphalanthus filiformis* y *Marchesinia brachiata* todos estos dibujos están realizados con la misma escala), células centrales del lobo, lobo y lóbulo, en algunos casos detalle de la región apical del lóbulo con dientes y papila hialina y el periantio con brácteas periqueciales (salvo pocos casos en los cuales no fueron hallados). Se realizaron los dibujos considerados necesarios para poder identificar correctamente plantas coleccionadas en el área de estudio. También se agregaron citas de trabajos en los cuales se pueden consultar más dibujos sobre las especies mencionadas. La distribución geográfica que se menciona es mundial; para Argentina se indican entre paréntesis las provincias en las cuales fue encontrada la especie en cuestión.

El material estudiado comprende principalmente muestras coleccionadas por la autora y por Uwe Drehwald en numerosos viajes a la provincia de Misiones. También se estudiaron muestras coleccionadas en un viaje realizado a las provincias de Jujuy y Salta (Argentina). El material estudiado se halla depositado en el herbario Drehwald; algunos duplicados se encuentran en el Herbario del Museo Argentino de Cs. Naturales B. Rivadavia (BA).

Abreviaturas utilizadas:

long. = longitud; lat. = latitud; * = indica que se trata de una nueva cita para la localidad indicada a continuación.

Sinopsis de las Lejeuneaceae holostipas de Misiones

LEJEUNEACEAE Cas.-Gil

A. LEJEUNEOIDEAE

I. *Anoplolejeunea* (Spruce) Schiffn.
1. *Anoplolejeunea conferta* (Meissn.) Evans
II. *Lejeunea* Lib.
2. *Lejeunea reflexistipula* (Lehm. & Lin denb.) Gott., Lindenb. & Nees
III. *Leucolejeunea* Evans
3. *Leucolejeunea unciloba* (Lindenb.) Evans
IV. *Omphalanthus* Lindenb. & Nees
4. *Omphalanthus filiformis* (Sw.) Nees

B. PTYCHANTHOIDEAE Mizut.

V. *Acanthocoleus* Schust.
5. *Acanthocoleus aberrans* (Lindenb. & Gott.) Kruijt
VI. *Archilejeunea* (Spruce) Schiffn.
6. *Archilejeunea auberiana* (Mont.) Evans
7. *Archilejeunea parviflora* (Nees) Schiffn.
VII. *Brachiolejeunea* (Spruce) Schiffn.
8. *Brachiolejeunea phyllorhiza* (Nees) Kruijt & Gradst.
VIII. *Bryopteris* (Nees) Lindenb.
9. *Bryopteris diffusa* (Sw.) Nees
10. *Bryopteris filicina* (Sw.) Nees
IX. *Caudalejeunea* (Steph.) Schiffn.
11. *Caudalejeunea lehmanniana* (Gott.) Evans
X. *Frullanoides* Raddi
12. *Frullanoides densifolia* Raddi ssp. *den sifolia*
XI. *Lopholejeunea* (Spruce) Schiffn.
13. *Lopholejeunea subfusca* (Nees) Schiffn.
XII. *Marchesinia* S. Gray
14. *Marchesinia brachiata* (Sw.) Schiffn.
XIII. *Mastigolejeunea* (Spruce) Steph.
15. *Mastigolejeunea auriculata* (Wils.) Schiffn.
XIV. *Odontolejeunea* (Spruce) Schiffn.
16. *Odontolejeunea lunulata* (Web.) Schiffn.
XV. *Schiffneriolejeunea* Verd.
17. *Schiffneriolejeunea polycarpa* (Nees) Gradst.

Clave para identificar las Lejeuneaceae holostipas de Misiones

1. Margen del lobo dentado, en toda su extensión o principalmente en la región apical, o el margen entero pero entonces el ápice agudo hasta apiculado (en *Frullanoides densifolia* el ápice puede ser obtuso a redondeado) 2
1. Margen del lobo entero, ápice obtuso hasta ampliamente redondeado (ápice redondeado, obtuso a subagudo en *Mastigolejeunea auriculata*) 7

2. Margen del anfigastrio dentado, en todo el contorno o principalmente en la región apical 3
2. Margen del anfigastrio entero 5

3. Plantas epifilas o epífitas; anfigastrios redondeados con dientes pequeños formados por una célula cónica; generalmente con discos rizoidíferos secundarios; periantio con quillas aladas y dentadas; tallo en corte transversal formado por corteza y médula; merofito ventral de 2 células .....
.....16. **Odontolejeunea lunulata**
3. Plantas epífitas, pendientes (pocas veces fueron halladas creciendo sobre roca); anfigastrios oblongos con dientes variables, pero no formados siempre por una única célula; sin discos rizoidíferos secundarios; periantio sin alas ni dientes; tallo en corte transversal formado por 3 capas: corteza, médula externa y médula interna; merofito ventral de 4 ó más células.....4

4. Ramificación seudodicotómica; lóbulo con margen libre plano, con 3 dientes variables; lobo con margen entero o con dientes en la región apical.....9. **Bryopteris diffusa**
4. Ramificación pinnada; lóbulo con margen libre involuto; lobo con márgenes dentados.....10. **Bryopteris filicina**

5. Base de los anfigastrios auriculada; lóbulo con 4-dientes.....12. **Frullanoides densifolia**
5. Base de los anfigastrios no auriculada; lóbulo con 0-2(3) dientes.....6

6. Merofito ventral de 8 células; anfigastrio 3,4-4,6 x el ancho del tallo; inserción del anfigastrio como una profunda U invertida .....14. **Marchesinia brachiata**
6. Merofito ventral de 2(4) células; anfigastrio 2,2-2,9 x el ancho del tallo; inserción del anfigastrio levemente arqueada ....5. **Acanthocoleus aberrans**

7. Merofito ventral de 2 células 8
7. Merofito ventral de 4 ó más células 9

8. Anfigastrio obcordado, ápice plano, 2,9-4,5 x el ancho del tallo, 300-420 µm de ancho; margen libre del lóbulo fuertemente involuto, curvado 1 vuelta sobre sí mismo ....1. **Anoplolejeunea conferta**
8. Anfigastrio reniforme, ápice generalmente incurvado, 4,5-6,5 x el ancho del tallo, 670-960 µm de ancho; margen libre del lóbulo apenas involuto.....2. **Lejeunea reflexistipula**

9. Plantas secas aplanadas, con las hojas extendidas.....10
9. Plantas secas casi cilíndricas, con las hojas curvadas sobre el eje 14

10. Plantas secas verdosas, pardas a negruzcas, brillantes; anfigastrio 5-5,6 x el ancho del tallo; quillas del periantio con dientes o lacinias .....13. **Lopholejeunea subfusca**
10. Plantas secas verde amarillentas a castaño claras; anfigastrio 2,8-4,8 x el ancho del tallo; quillas del periantio enteras (a veces con pequeños dientes).....11

11. Inserción del anfigastrio recta.....12
11. Inserción del anfigastrio ± arqueada 13

12. Lóbulo con 2 dientes ....6. **Archilejeunea auberiana**
12. Lóbulo con 0-1 diente ....7. **Archilejeunea parviflora**

13. Anfigastrio 3,4-4,8 x el ancho del tallo, ápice del mismo redondeado a suavemente truncado; lóbulo con 2 dientes, diente proximal agudo (3-7 células) y diente distal redondeado; periantio con 2 quillas laterales y 2 ventrales (a veces 1 quilla dorsal corta) ....3. **Leucolejeunea unciloba**
13. Anfigastrio 2,8-3,4 x el ancho del tallo, ápice del mismo truncado a retuso; lóbulo con 2 dientes, diente proximal corto y diente distal alargado (3-4 células); periantio con 2 quillas laterales y 1 ventral ....11. **Caudalejeunea lehmanniana**

14. Lobo redondeado; anfigastrios redondeados, inserción de los mismos en forma de una profunda U invertida y zona central convexa.....4. **Omphalanthus filiformis**
14. Lobo aovado a oval; anfigastrios obdeltoides o reniformes, inserción de los mismos ± recta o en forma de una corta U invertida.....15

15. Quillas del periantio con dientes o lacinias; anfigastrios ± reniformes ....8. **Brachiolejeunea phyllorhiza**
15. Quillas del periantio enteras; anfigastrios ± obdeltoides.....16

16. Ginoecio con 1-2 innovaciones; periantio con 3 quillas largas; ramas vegetativas de tipo *Lejeunea*; margen ventral del lobo algo ondulado o incurvado; inserción del anfigastrio ± recta con las bases levemente auriculadas .....15. **Mastigolejeunea auriculata**
16. Ginoecio sin innovaciones; periantio con 5 quillas cortas; ramas vegetativas de tipo *Frullania* o *Lejeunea*; margen ventral del lobo plano; inserción del anfigastrio arqueada ....17. **Schiffneriolejeunea polycarpa**

Descripción de las especies

1. ***Anoplolejeunea conferta*** (Meissn.) Evans (Fig. 1 A-D)

Evans, Bull. Torrey Bot. Club 35: 175. 1908. *Jungermannia conferta* Meissner ex Sprengel in Linnaeus, Syst. Veg. (ed. 16) 4(2): 325. 1827. Typus: Perú.

Plantas secas verdosas a amarillentas, pálidas; hojas extendidas, no curvadas sobre el tallo; 5-9 mm long. x 0,8-1,3 mm lat.; irregularmente pinnadas a bipinnadas, ramas de tipo *Lejeunea* con anillo basal notorio; se encuentran ramas microfilas con lobos muy pequeños. **Tallo** en corte transversal redondeado, 65-115 μm (6 células) de ancho x 80-90 μm (5-6 células) de alto; corteza de 7-8 células rectangulares de 16-20 x 26-33 μm, pared celular delgada a mediana; médula de 10-11 células irregulares de 9-14 x 13-20 μm, pared celular delgada.
Hojas imbricadas, ampliamente extendidas. **Lobo** aovado a redondeado, 450-700 μm long. x 350-650 μm lat.; cóncavo; márgenes enteros; ápice ampliamente redondeado, ocasionalmente incurvado; margen libre dorsal redondeado, cubre o excede apenas el tallo. **Células** centrales del lobo isodiamétricas, algunas hexagonales, 19-23 x 23-27 μm, pared celular delgada a mediana con trígonos; células marginales cuadradas a rectangulares de 13-17 x 16-20 μm. **Lóbulo** oval a redondeado, 190-230 μm long. x 150-200 μm lat.; inflado; margen libre fuertemente involuto, curvado una vuelta sobre sí mismo; quilla arqueada, continua con el margen ventral del lobo o formando un ángulo amplio con éste; ocasionalmente hay lóbulos reducidos, ovales, margen libre apenas incurvado, poco inflados. **Anfigastrios** continuos; obcordados, 300-420 μm ancho x 230-300 μm alto; 2,9-4,5 x el ancho del tallo; márgenes enteros; ápice truncado a retuso; inserción ± recta; generalmente con rizoides en la base; merofito ventral de 2 células.

Habitat: Crece sobre corteza, generalmente de *Araucaria angustifolia* (Bert.) O. Ktze. Fue hallada entre 200 y 800 m s.n.m.

Observaciones: El material de las muestras es muy escaso y está estéril.
En la base de algunos lobos se observaron grupos de 3 células de 23-27 x 29-37 μm, algo mayores que el resto; el contenido celular se hallaba destruído, pero podría tratarse de ocelos con un solo oleocuerpo grande por célula (Evans 1908: 177).
Entre las células basales se encontró ocasionalmente 1 espesamiento intercelular por lado.
Ilustraciones: Evans 1908 (pl. 8: fig. 9-23).
Distribución geográfica: América tropical, *Argentina (Misiones).
Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Iguazú. Parque Nacional Iguazú, Cataratas, U.Drehwald 2646, 10-XII-1987. Dpto. Gral. M. Belgrano. San Antonio, bosque cerca de la pista de aterrizaje, U.Drehwald A.284, 12-XII-1987; U.Drehwald 2693, 13-XII-1987. Bernardo de Irigoyen, U.Drehwald A.320, 16-XII-1987. Dpto. San Pedro. ruta 14, ± 5 km al E de San Pedro, M.E.Reiner 1670, U.Drehwald 2585, 11-IX-1987.

2. ***Lejeunea reflexistipula*** (Lehm. & Lindenb.) Gott., Lindenb. & Nees
(Fig. 1 E-G)

Gottsche, Lindenberg & Nees, Syn. Hep.: 335. 1845. *Jungermannia reflexistipula* Lehm. & Lindenb., in Lehmann, Nov. Stirp. Pug. 5: 10. 1833. Typus: Brasil, "Serra de Estrella", leg. Beyrich.

Plantas secas verdosas; hojas extendidas; 0,4-1 cm long. x 1,1-1,3 mm lat.; ramificación escasa, ramas cortas de tipo *Lejeunea*. **Tallo** en sección transversal redondeado, 130-150 μm ancho; pared celular uniforme, delgada, hialina; corteza de 8 células ± rectangulares, de 16-37 x 46-53 μm; médula de 16 células de 13-23 x 16-30 μm.
Hojas imbricadas; oblicua hasta ampliamente extendidas. **Lobo** aovado, 0,6-0,7 mm long. x 0,5-0,7 mm lat.; base libre dorsal redondeada, excede un poco el tallo; márgenes enteros, contorno algo crenulado; ápice redondeado, plano a incurvado. **Células** del lobo poligonales, pared celular delgada con trígonos peque-

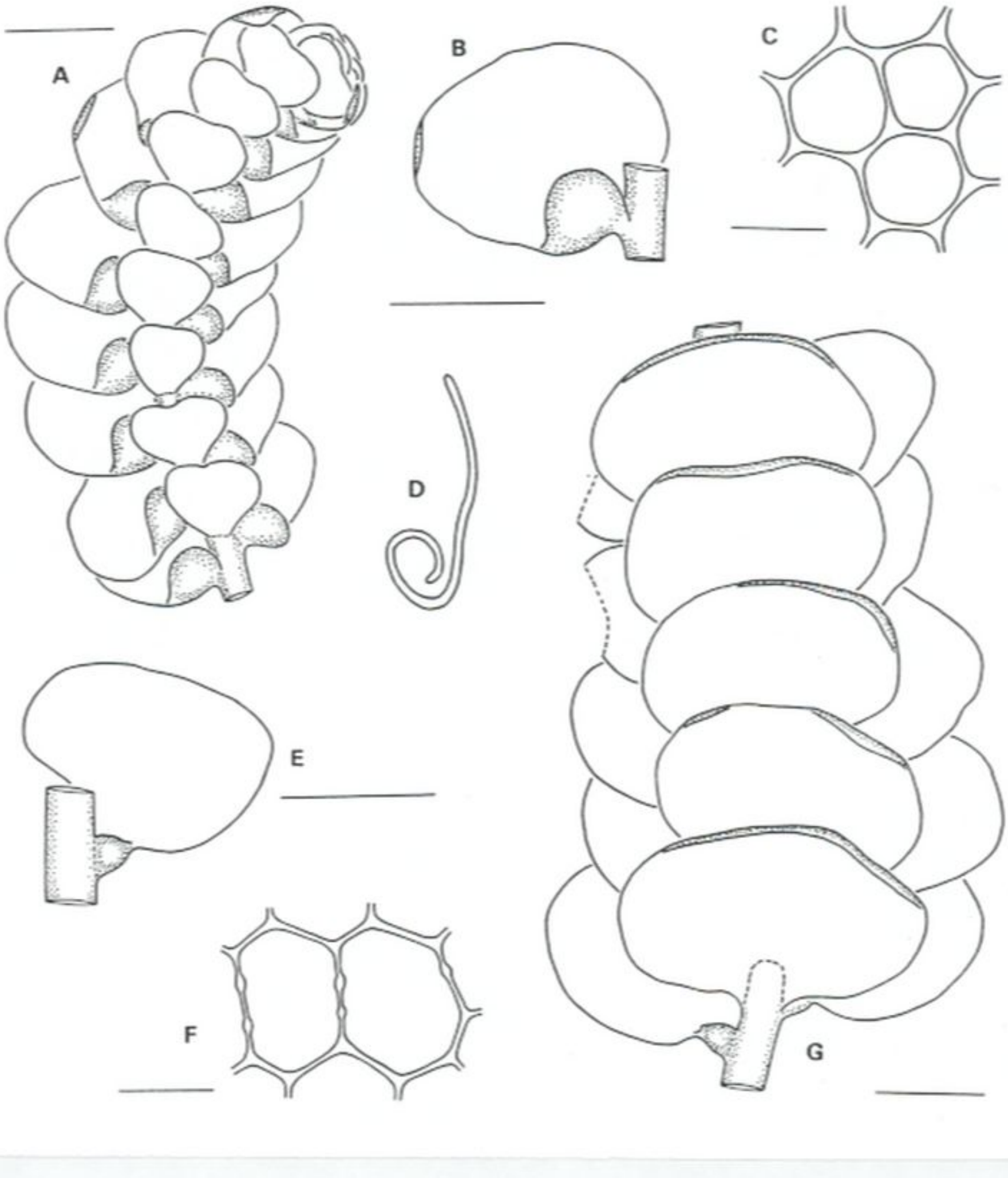

Fig. 1. A-D: ***Anoplolejeunea conferta***. A, aspecto general, vista ventral; B, lobo y lóbulo; C, células centrales del lobo; D, corte longitudinal de lobo y lóbulo. (M.E.Reiner 1670). E-G: ***Lejeunea reflexistipula***. E, lobo y lóbulo; F, células centrales del lobo; G, aspecto general, vista ventral. (U.Drehwald A.273). Escalas: A, B, D, E, G = 400 µm; C, F = 25 µm.

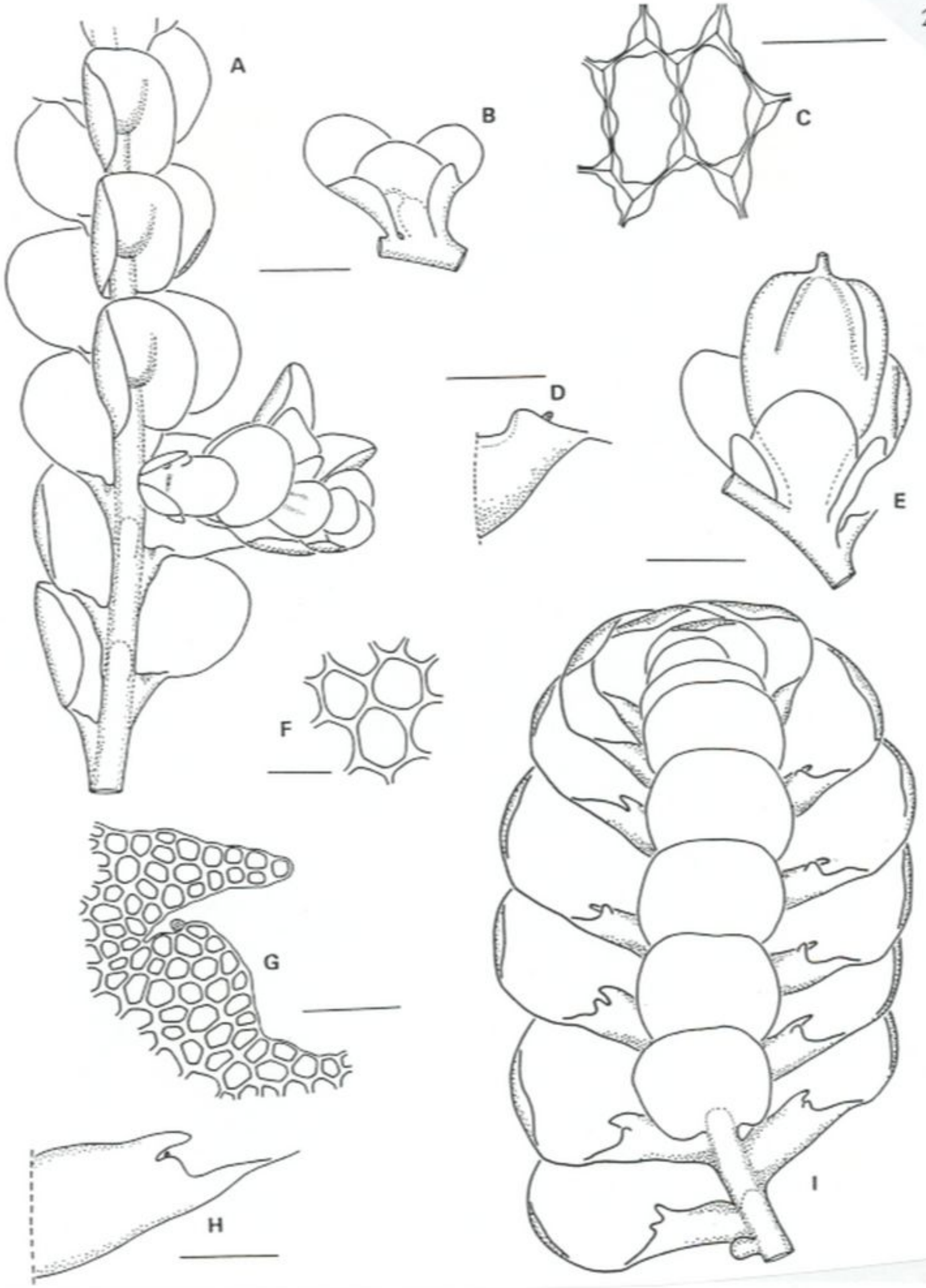

Fig. 2. A-D: ***Omphalanthus filiformis***. A, aspecto general de una planta femenina, vista ventral; B, brácteas y bractéola periqueciales; C, células centrales del lobo; D, lóbulo. (A-C: U.Drehwald 2776, D: U.Drehwald 2547). E-I: ***Leucolejeunea unciloba***. E, periantio, brácteas y bractéola periqueciales, vista ventral; F, células centrales del lobo; G, región apical del lóbulo en H; H, lóbulo; I, aspecto general, vista ventral. (U.Drehwald 2579). Escalas: A, B, E, I = 400 µm; C, F = 25 µm; D, H = 200 µm; G = 50 µm.

base y con 1 innovación (raras veces 2) que puede volver a originar un ginoecio, este último con o sin innovación. Lobo de la bráctea periquecial ovalado, 540-750 µm long. x 360-430 µm lat.; margen entero; ápice obtuso a redondeado, en ocasiones incurvado. Lóbulo de la bráctea como un pliegue rectangular de 310-470 µm long. x 110-135 µm lat.; ápice obtuso a redondeado. Bractéola periquecial redondeada, 320-430 µm ancho x 340-540 µm alto; libre. No se observó ningún tipo de reproducción asexual.

Habitat: epífita sobre corteza de árboles, generalmente pendiente. En algunos casos las plantas crecían sobre la corteza de *Araucaria angustifolia* (Bert.) O. Ktze. Fue hallada entre 300 y 800 m s.n.m.
Observaciones: Se observaron unos pocos periantios pequeños y mal formados, probablemente originados sin fecundación.
En esta especie el periantio es obovoide a obcónico, terete o levemente trígono en sección transversal, de 0,85 mm alto x 0,55 mm ancho (Evans 1907: 19).
Ilustraciones: Evans 1907 (pl. 3: 1-9); Lorscheitter Baptista 1977 (pl. V, XXXIV: 1).
Distribución geográfica: Zonas montañosas de América tropical, Argentina (Salta: Jack & Stephani 1896; *Misiones).
Material estudiado: ARGENTINA. Prov. Salta: ``In der Flussaue am Río Seco zwischen Orán und San Andrés", leg. Lorentz s/n (G). Prov. Misiones: Dpto. Gral. M. Belgrano. ± 6 km S Bernardo de Irigoyen, U.Drehwald 2731, 2733 y 2741, U.Drehwald A.320 y 324, 16-XII-1987. Bernardo de Irigoyen, Salto Andrecito, U.Drehwald 2776, 16-XII-1987. San Antonio, U.Drehwald A.317, 16-XII-1987. Dpto. San Pedro. entre Tobuna y San Pedro, camino lateral, ± 5 km San Pedro, M.E.Reiner 1631, U.Drehwald 2538, 2545, 2546 y 2547, 10-IX-1987. Ruta 14, ± 5 km E San Pedro, M.E.Reiner 1673, U.Drehwald 2584 y 2589, U.Drehwald A.B 1 y B 3, 11-IX-1987. Dpto. Ldor. Gral. San Martín. Salto Encantado, M.E.Reiner 1704, U.Drehwald 2612, 12-IX-1987. Dpto. Oberá. Oberá. Salto Berrondo, M.E.Reiner 1576, U.Drehwald 2483 y 2489, 8-IX-1987; U.Drehwald 845 y 846, 20-I-1987.

5. ***Acanthocoleus aberrans*** (Lindenb. & Gott.) Kruijt
(Fig. 3 A-F)

Kruijt, Bryophyt. Biblioth. 36: 62. 1988. *Lejeunea aberrans* Lindenb. & Gott., en Gottsche, Lindenberg & Nees, Syn. Hep.: 751. 1847. Typus: "México, Huatusco, Liebmann" (G 22616, isotypus).

Plantas secas verde oliváceas a verde oscuras; 0,7-1,1 cm long. x 0,9-1,8 mm lat. Ramificación irregularmente pinnada, ramas vegetativas de tipo *Lejeunea* y ocasionalmente algunas de tipo *Frullania*. **Tallo** en sección transversal oval-redondeado, 125-175 µm (8-9 células) de ancho x 115-125 µm (7-8 células) de alto; corteza de 10-14 células de 13-27 x 26-40 µm, las dorsales y ventrales similares, pared celular ± delgada y castaña clara; médula de 15-35 células de 13-17 x 13-23 µm, pared celular delgada, amarillenta.
Hojas imbricadas a subcontinuas; cuando secas curvadas sobre el eje, cuando húmedas ampliamente extendidas. **Lobo** aovado, 0,7-1 mm long. x 0,4-0,8 mm lat.; ápice agudo hasta apiculado, generalmente incurvado, ocasionalmente también redondeado; márgenes enteros o suavemente dentados cerca del ápice; base libre dorsal redondeada, cubre el tallo. **Células** del lobo ± alargadas; con trígonos medianos a pequeños, cordados; con algunos espesamientos intercelulares en las células basales y centrales; basales de 23-30 x 33-47 µm; centrales de 16-27 x 23-40 µm; marginales cuadradas a rectangulares de 13-17 x 16-20 µm. **Lóbulo** muy variable: generalmente se encuentra reducido a un pequeño pliegue de 2-4 células de alto x 8-10 células de largo; cuando está bien desarrollado: aovado a oblongo, 270-400 µm long. x 120-190 µm lat.; inflado; región apical plana y adpresa al lobo; diente apical de 2 células curvado hacia el lobo, papila hialina ± 2 células por debajo de este diente en la cara interna del lóbulo; diente proximal de 1 célula, generalmente poco notorio; entre los dos dientes 3-4 células; quilla arqueada. **Anfigastrios** distantes a subcontinuos; redondeados, 310-515 µm ancho x 320-480 µm alto; 2,2-2,9 x el ancho del tallo; ápice ampliamente redondeado a trunca-

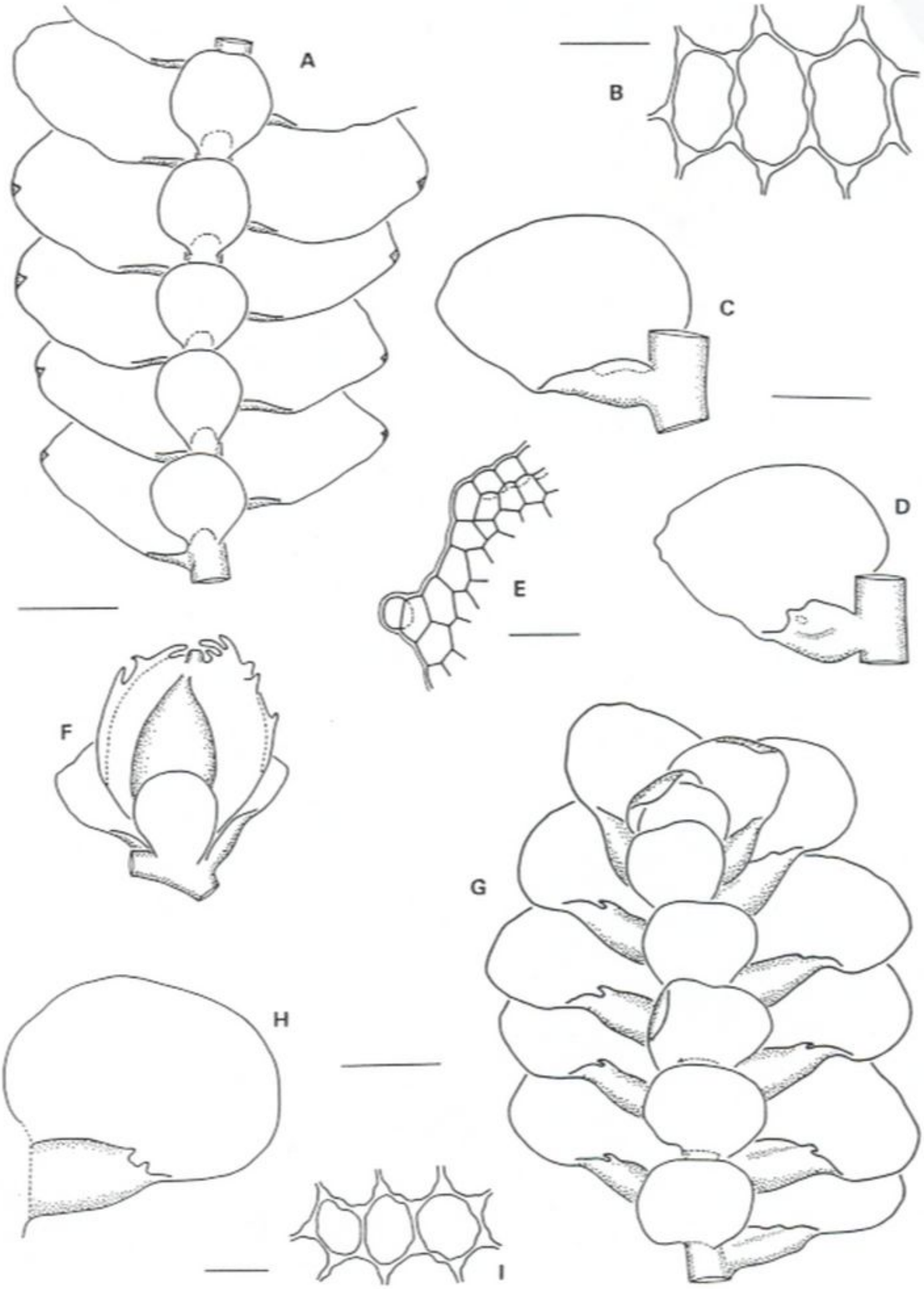

Fig. 3. A-F: ***Acanthocoleus aberrans***. A, aspecto general, vista ventral; B, células centrales del lobo; C y D, lobo y lóbulo; E, región apical del lóbulo en D; F, periantio, brácteas y bractéola periqueciales, vista ventral. (A: M.E.Reiner 1353, B-F: M.E.Reiner 1142). G-I: ***Archilejeunea auberiana***. G, aspecto general, vista ventral; H, lobo y lóbulo; I, células centrales del lobo. (M.E.Reiner 1030). Escalas: A, C, D, F-H = 400 µm; B, I = 25 µm; E = 50 µm.

do; márgenes enteros; inserción en forma de una corta U invertida, bases 1-2 células decurrentes; zona inicial de los rizoides formada por numerosas células pequeñas de pared celular muy oscura, rizoides hialinos a castaño rojizos; merofito ventral de 2(4) células.

Autoica. **Androecio** terminal en una corta rama de tipo *Lejeunea* sin hojas vegetativas en la base; espiga de 490-950 µm long. x 450-540 µm lat., 2-5(6) pares de brácteas perigoniales; lóbulos inflados, imbricados, quilla fuertemente arqueada; bractéolas en toda la extensión del androecio, similares pero de menor tamaño que los anfigastrios. **Ginoecio** terminal sobre el eje principal, sobre ramas o sobre innovaciones, con 1-2 innovaciones que pueden volver a ser fértiles; un par de brácteas periqueciales; lobo aovado, 580-750 µm long. x 380-540 µm lat., ápice agudo, márgenes enteros a levemente dentados cerca del ápice; lóbulo reducido a un pequeño pliegue o ± rectangular a oblongo, 200-230 µm long. x 60-70 µm lat.; bractéola redondeada, 350-380 µm ancho x 365-380 µm alto, márgenes enteros, libre. **Periantio** cuando maduro excede 1/2 las brácteas; obcordado, 615-750 µm ancho x 740-950 µm alto, a veces con un pie de 120-170 µm de alto; dos quillas laterales, una quilla ventral ancha y en vista dorsal muy cóncavo, ocasionalmente en la superficie dorsal se encuentra una quilla corta poco elevada; el margen de las quillas es muy variable, generalmente se encuentra un ala de 1-2 células de ancho con numerosos dientes (hasta 8 células de alto x 2 de ancho en la base) o lacinias; rostro corto de 30-45 µm (3-4 células) de alto.

No se observó ningún tipo de reproducción asexual.

Habitat: epífita sobre corteza y rama de árboles, sobre troncos en descomposición (no es muy común) o sobre rocas. En Misiones fue hallada entre 150 y 800 m s.n.m.

Observaciones: la forma de los lóbulos es muy variable; se encuentran hojas con lóbulos nulos o reducidos a un pequeño pliegue; lóbulos oblongos, inflados, con el margen libre involuto; lóbulos con la región apical visible in situ y con dos dientes. Se observó que las plantas con lóbulos muy reducidos tenían lobos con ápice apiculado incurvado y con tendencia a una región apical dentada, mientras que en plantas con lóbulo muy desarrollado el ápice del lobo no es tan agudo, generalmente es plano y no se observan dientes en la región apical. La forma y tamaño de los dientes o lacinias del periantio son también caracteres muy poco constantes.

Ilustraciones: Kruijt 1988 (pl. 6); Schuster 1970 (fig. 2, como *Acanthocoleus fulvus*).

Distribución geográfica: América tropical, * Argentina (Jujuy, Salta, Misiones, Entre Ríos). Madera, Islas Canarias (La Palma, Gomera). Africa tropical, Madagascar.

Material estudiado: BRASIL. Dpto. Paraná. Parque Nacional Iguazú, Cataratas, M.E.Reiner 1056, 4-VIII-1986. ARGENTINA. Prov. Jujuy: Dpto. Capital. Termas de Reyes, M.E.Reiner 1238, 18-XI-1986. Cerro Zapla, M.E.Reiner 1305, 22-XI-1986. Dpto. El Carmen. sobre ruta 9, Abra de Santa Laura, M.E.Reiner 1264, 1267, 1270, 1272, 1277 y 1278, U.Drehwald S 155, 21-XI-1986. Prov. Salta: Dpto. La Capital. Quebrada de San Lorenzo, M.E.Reiner 296 y 299, 22-IX-1985. Dpto. Anta. sobre ruta 20, camino al Parque Nacional El Rey, a 4 km de la ruta 5, M.E.Reiner 1163 y 1164, 14-XI-1986. Parque Nacional El Rey, camino entre el río La Sala y Pozo Verde, M.E.Reiner 1183, 1185, 1188, 1189 y 1193, U.Drehwald S 29, 15-XI-1986. Parque Nacional El Rey, sendero Santa Elena, M.E.Reiner 1228 y 1230, U.Drehwald S 76 y S 85, 16-XI-1986. Prov. Misiones: Dpto. Iguazú. Parque Nacional Iguazú, ruta 101, zona de palo rosa, U.Drehwald A.274, 9-XII-1987; U.Drehwald A.279 y 280, 10-XII-1987. Parque Nacional Iguazú, ruta 101, picada frente Seccional Yacuiba, M.E.Reiner 1030, U.Drehwald A.47 y 51, 3-VIII-1986. Parque Nacional Iguazú, Sendero Macuco, U.Drehwald A.9, 31-VII-1986. Dpto. Gral. M. Belgrano. San Antonio, U.Drehwald A.309, 311 y 312, 14-XII-1987. Bernardo de Irigoyen, U.Drehwald A.321, XII-1987. Dpto. Eldorado. Pt. Pinares, U.Drehwald 479, 8-VIII-1986. Dpto. San Pedro. sobre ruta 17, 10 km al E del empalme con la ruta 20, M.E.Reiner 1099, 8-VIII-1986. ruta 14, ± 5 km al E de San Pedro, U.Drehwald 2588, 11-IX-1987. sobre ruta 14 entre Macaca y Tobuna, M.E.Reiner 1604, U.Drehwald 2517, 2520 y 2523, 10-IX-1987. camino lateral ± 5 km de

San Pedro, U.Drehwald 2544, 10-IX-1987. Dpto. Montecarlo. Hostería ACA Montecarlo, M.E.Reiner 763, 765 y 766, 19-VII-1986; U.Drehwald 272, 21-VII-1986. Dpto. Guaraní. camino a Rosa Mística, U.Drehwald 2253, 25-VII-1987. Dpto. Ldor. Gral. San Martín. Gruta India, Salto 3 de Mayo, M.E.Reiner 1142, 9-VIII-1986. Salto Encantado, U.Drehwald 2166, 2169 y 2192, 22-VII-1987. Dpto. San Ignacio. Ruinas Jesuíticas de San Ignacio, M.E.Reiner 740, 18-VII-1986. San Ignacio, U.Drehwald A.103-106, 110 y 111, 1-X-1986. Jardín América, Salto del Tabay, U.Drehwald 2020 y 2053, 20-VII-1987. Dpto. Oberá. Oberá, Salto Berrondo, M.E.Reiner 1563, U.Drehwald 2473, 2491 y 2500, 8-IX-1987; U.Drehwald 844, 20-I-1987; U.Drehwald 870, U.Drehwald A.251, 21-I-1987. Dpto. Candelaria. Loreto, U.Drehwald A.127 y 131, 2-X-1986; U.Drehwald A.80 y 82, 29-IX-1986. cerca de Loreto, en el bosque, M.E.Reiner 1353, 1355 y 1360, U.Drehwald 642 y 644, U.Drehwald A.86 y 87, 30-IX-1986. Arroyo Yabebiry, detrás de la escuela, U.Drehwald 659, M.E.Reiner 1372, 2-X-1986; U.Drehwald A.164, 4-X-1986. Santa Ana, Ruinas, U.Drehwald 47, III-1986; U.Drehwald A.166, 167, 170-173, 178 y 179, 13-I-1987; U.Drehwald A.213, 216, 235 y 237, 17-I-1987
. Cerro Sta. Ana, U.Drehwald 741, 747, 748, 752, 761 y 763, U.Drehwald A.184, 185, 186, 189, 191 y 192, 14-I-1987. Prov. Entre Ríos: Dpto. Colón. Parque Nacional El Palmar, leg. A. Vinocur s/n, 31-V-1986.

6. ***Archilejeunea auberiana*** (Mont.) Evans
(Fig. 3 G-I)

Evans, Bull. Torrey Bot. Club 35: 168. 1908. *Lejeunea auberiana* Mont., in de la Sagra, Hist. Phys. Nat. Cuba (Bot. Pl. Cell.): 483. 1842. Typus: Cuba, leg. Auber.

Plantas cuando secas verde amarillentas; hojas extendidas, no curvadas sobre el eje; 0,7-1 cm long. x 1,5-1,7 mm lat.; irregularmente pinnadas (bipinnadas), ramas de tipo *Lejeunea*, generalmente fértiles. **Tallo** en sección transversal redondeado, 110-200 µm (7 células) de ancho x 130-140 µm (7 células) de alto; corteza de 13-16 células, médula de 22-30 células, no se diferencian las células de la corteza de las medulares, células irregulares de 13-23 x 19-30 µm, pared celular delgada a mediana, castaña clara.
Hojas imbricadas; oblicuamente extendidas. **Lobo** aovado, algo falcado, 0,7-1,1 mm long. x 0,4-0,8 mm lat.; cóncavo; ápice redondeado, plano o incurvado; márgenes enteros; base dorsal libre redondeada, cubre el tallo. **Células** del lobo irregulares, ± alargadas; pared celular delgada, con trígonos pequeños y 0-1 espesamiento intercelular; células basales de 23-30 x 29-40 µm, centrales de 19-27 x 29-37 µm, marginales de 9-14 x 13-17 µm. **Lóbulo** rectangular-aovado, 270-470 µm long. x 100-280 µm lat.; inflado; quilla suavemente arqueada, 340-570 µm, algo crenulada por el contorno de las células; margen libre involuto; ápice con un diente proximal de 3-4 células de alto x 2 células en la base, y un diente distal similar al anterior, separados por un seno cóncavo de 3-4 células, dientes rectos o curvados hacia el lobo; papila hialina en la base proximal del diente distal. **Anfigastrios** distantes a continuos; reniformes a redondeados, 400-600 µm ancho x 300-400 µm alto, 3,2-3,7 x el ancho del tallo; planos a escuarrosos; ápice ampliamente redondeado a truncado, plano u ocasionalmente incurvado; márgenes enteros; inserción ± recta; merofito ventral de 4-6 células.
Autoica. **Androecio** terminal en el eje principal o en ramas largas de tipo *Lejeunea*; 4-8 pares de brácteas perigoniales, imbricadas, menores que las hojas vegetativas, lóbulo inflado, quilla arqueada, ápice obtuso; bractéolas en toda la extensión del androecio, menores que los anfigastrios. **Ginoecio** terminal en el eje principal, en ramas o en innovaciones; con 1-2 innovaciones generalmente de tipo *Radula*, se observaron algunos ginoecios con dos innovaciones de las cuales una era de tipo *Lejeunea* (con collar basal); el primer elemento de la innovación es una hoja lateral; un par de brácteas periqueciales, lobo aovado, 670-770 µm long. x 450-520 µm lat., cóncavo, ápice redondeado, margen entero; lóbulo rectangular a ± triangular, 360-540 µm long. x 70-140 µm lat., ápice extendido; bractéola aovada-redondeada, 450-550 µm ancho x 580-750 µm alto, ápice redondeado, márge-

nes enteros. **Periantio** cuando maduro excede ½ las brácteas; oval-oblongo, 0,5-0,7 mm ancho x 0,9-1,1 mm alto; 5-carinado, 2 quillas laterales, 2 ventrales y 1 quilla dorsal poco elevada y corta; contorno de las quillas entero o con pequeños dientes; rostro notorio de 65-100 µm (5-7 células) de alto.
No se observó ningún tipo de reproducción asexual.

Habitat: epífita sobre pequeñas ramitas o sobre corteza de árboles. Se encontró a ± 200 m s.n.m.
Observaciones: Los lóbulos están generalmente bien desarrollados, pero se encuentran algunos menores y sin dientes.
Ilustraciones: Gradstein & Buskes 1985 (fig. 3 d, como *A. parviflora* var. *florentissima* (Spruce) Gradst. & Buskes); Montagne 1842 (tab. XIX fig. 1).
Distribución geográfica: América tropical, *Argentina (Misiones).
Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Iguazú. Parque Nacional Iguazú, Sendero Macuco, M.E.Reiner 814, U.Drehwald 286 y 316, 22-VII-1986. Parque Nacional Iguazú, sobre ruta 101, picada frente a la Seccional Yacuiba, M.E.Reiner 1030, 3-VIII-1986. ruta 12, 2 km al S del límite del Parque Nacional Iguazú, U.Drehwald A.273, 8-XII-1987.

7. ***Archilejeunea parviflora*** (Nees) Schiffn.
(Fig. 4 A-E)

Schiffner, Hedwigia 33: 181. 1894. *Jungermannia parviflora* Nees, in Martius, Fl. Brasil. 1,1: 353. 1833. Typus: Brasil, "Flumen Amazonum", Martius s.n. (G 20381, isotypus).

Plantas secas amarillentas a castaño claras; hojas ± extendidas, no curvadas sobre el eje; 0,5-1 cm long. x 1,2-1,6 mm lat.; generalmente fértiles. Irregularmente pinnadas, ramas de tipo *Lejeunea*. **Tallo** en sección transversal oval, 105-150 µm (9 células) de ancho x 110-130 µm (8 células) de alto; pared celular ± uniforme, castaña clara; corteza de 13-17 células ± rectangulares de 16-23 x 19-37 µm; médula de 22-36 células irregulares de 9-17 x 16-23 µm, algo menores que las corticales.
Hojas imbricadas; cuando húmedas ampliamente extendidas. **Lobo** aovado-oval, 0,7-1,1 mm long. x 0,5-0,7 mm lat.; algo cóncavo; ápice ampliamente redondeado y plano, ocasionalmente incurvado; márgenes enteros; base libre dorsal redondeada, cubre ½ o totalmente el tallo. **Células** del lobo isodiamétricas a levemente alargadas; trígonos pequeños a medianos, no cordados; con 0-1 espesamiento intercelular; células basales de 23-27 x 29-43 µm; centrales de 16-23 x 19-30 µm; marginales ± cuadradas de 9-17 x 13-27 µm. **Lóbulo** prácticamente nulo, reducido a un pequeño pliegue; o aovado-oblongo, hasta 300-340 µm long. x 80-130 µm alto; inflado; margen libre cerca del tallo algo involuto, hacia el ápice plano y extendiéndose en forma oblicua hasta su unión con el margen ventral del lobo; sin diente o con uno apenas definido, de 1 célula; quilla recta a muy suavemente arqueada, algo crenulada por la superficie convexa de las células. **Anfigastrios** distantes a sub-continuos; redondeados a reniformes, 340-460 µm ancho x 270-340 µm alto, 2,9-3,6 x el ancho del tallo; algo escuarrosos; ápice anchamente redondeado, a veces incurvado; márgenes enteros; inserción recta; merofito ventral de 4-7 células.
Autoica. **Androecio** intercalar en el eje o sobre ramas de tipo *Lejeunea*; 4-9 pares de brácteas perigoniales, imbricadas, algo menores que las hojas vegetativas; lóbulo inflado, quilla muy arqueada, ápice obtuso; bractéolas en toda la extensión del androecio, similares a los anfigastrios. **Ginoecio** terminal en el eje, ramas o innovaciones; con 1-2 innovaciones que pueden volver a ser repetidamente fértiles; el primer elemento de la innovación es una hoja lateral; un par de brácteas periqueciales; lobo oblongo a lanceolado, 0,8-1,1 mm long. x 0,4-0,5 mm lat., ápice agudo a obtuso, márgenes enteros; lóbulo muy reducido a ± rectangular, hasta 200 µm long. x 70 µm lat., ápice agudo; bractéola obovada, 0,4-0,5 mm ancho x 0,5-0,7 mm alto, ápice ampliamente redondeado, márgenes enteros. **Periantio** cuando maduro excede hasta 1/3 de su long. las brácteas; oblongo, 450-580 µm ancho x 700-1100 µm alto, con un corto pie; 2 quillas laterales, 2 quillas ventra-

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The moss genus Isopterygium (Hypnaceae) in Latin America

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Abstract. The pleurocarpous moss genus *Isopterygium* (Hypnaceae) is revised for Latin America. Although as many as 92 species and varieties have been reported for the region over past years, these are currently accommodated by the present revision into only eight species. The most common taxon throughout most of Latin America, *Isopterygium tenerum* (Sw.) Mitt., is also the most polymophic and presently 45 taxa are recognized as synonyms. The other seven species are *I. affusum* Mitt. (Guadeloupe, Honduras, Venezuela, Brazil), *I. acutifolium* Irel. (Venezuela, Guyana), *I. byssobolax* (C. Müll.) Par. (Brazil, Bolivia, Argentina), *I. jamaicense* (Bartr.) Buck (Mexico, Guatemala, Jamaica), *I. subbrevisetum* (Hampe) Broth. (West Indies, Costa Rica to southern Brazil), *I. subglobosum* Herz. (Bolivia), and *I. tenerifolium* Mitt. (West Indies, southern Mexico to northern Argentina).

Isopterygium is a genus of pleurocarpous mosses that occurs predominantly in terrestrial habitats at low elevations in the subtropics and tropics. It was described in 1869 by William Mitten who placed it in the tribe Stereodonteae. According to him, members of this tribe differ from other closely related tribes by sharing important distinguishing features of capsules on long setae, short, double leaf costae or costae lacking, and dense alar cells. Besides *Isopterygium*, the tribe contains an assemblage of 12 other genera, many of which are not considered very closely related today, such as *Acrocladium* Mitt., *Ctenidium* (Schimp.) Mitt., *Entodon* C. Müll., *Heterocladium* B.S.G., *Leucomium* Mitt., *Plagiothecium* B.S.G., *Pleurozium* Mitt. and *Ptychomnion* (Hook. f. & Wils.) Mitt. Later, as moss taxonomy was refined and these heterogeneous taxa were sorted out, bryologists past (Brotherus 1923; Sainsbury 1955) and present (Corley *et al.* 1981; Iwatsuki 1987), placed *Isopterygium* in the family Plagiothecíaceae. At the same time, other bryologists (Crum & Anderson 1981; Gangulee 1978; Vitt 1984) have placed it in the Hypnaceae. Buck and Ireland (1985), however, did a morphological evaluation of the genera in the Plagiotheciaceae and, as a result, removed all genera except *Plagiothecium* from the family. Therefore, in this treatment, *Isopterygium* is placed in the Hypnaceae where it is one of approximately 40 genera.

When Mitten (1869) described *Isopterygium* he used very few taxonomic characters that would be considered important by present day bryologists. His description stated stems procumbent, branches of unequal length, arranged in fascicles, leaves complanate, distichous, three upper rows (a central and intermediate ones) scarcely evident, three lower rows undifferentiated, very shortly bicostate, cells narrow, smooth, capsules inclined or horizontal, oblong, cilia united into one. It is puzzling what Mitten meant when he

described the branches in fascicles. Within his new genus he placed only eight species: *I. affusum* Mitten, *I. planissimum* Mitten, *I. tenerifolium* Mitten, *I. brachyneuron* (C. Müller) Mitten, *I. chrismarii* (C. Müller) Mitten, *I. curvicolle* (C. Müller) Mitten, *I. leucophyllum* (Hampe) Mitten and *I. tenerum* (Swartz) Mitten. All of the species were from localities in the West Indies, Mexico and South America. The genus soon became a depository for scores of miscellaneous complanate-foliate and difficult to determine pleurocarpous mosses. It grew enormously during the next century as species were either described as new or were transferred into it from the large, unwieldy genus *Hypnum* Hedw. Eventually *Isopterygium* comprised about 390 taxa in the world, 92 of which have been reported for Latin America (van der Wijk *et al.* 1964, 1969).

Taxonomic studies during the last 20-30 years now make it possible to clearly delimit the genus *Isopterygium* as it occurs in Latin America and elsewhere. The Japanese bryologist, Zennoske Iwatsuki, has done more than anyone to clarify the classification of this complex and disorganized genus. His studies of *Taxiphyllum* Fleisch. (Iwatsuki 1963), *Herzogiella* Broth. (Iwatsuki 1965, 1970, synonyms *Dolichotheca* Lindb., *Sharpiella* Iwats.), *Plagiothecium* B. S. G. (Iwatsuki 1970), *Isopterygiopsis* Iwats. (Iwatsuki 1970) and recently, *Isopterygium* Mitt. and *Pseudotaxiphyllum* Iwats. (Iwatsuki 1987) have helped immensely to unravel the taxa in the closely related genera so that *Isopterygium* is more clearly defined. Studies on the North American (Ireland 1969), Mexican (Ireland 1984) and Latin American (Ireland 1991) *Isopterygium* species also have helped to a certain extent. A reasonable estimate would be that there are presently only about 40-50 species of *Isopterygium* in the world.

I am recognizing eight species of *Isopterygium* in the present treatment which has been prepared as a contribution to the family Hypnaceae for Flora Neotropica. Admittedly, the species are often very similiar morphologically and difficult to separate even when sporophytes are present. Some of the species may conceivably be only environmental forms. However, I believe it is prudent to recognize these eight species at this time until future field and laboratory studies dictate otherwise.

Morphology

Stems

The stems of *Isopterygium* are yellowish green to reddish brown, creeping and usually sparsely and irregularly branched. There are 1-3 outer rows of small, thick-walled cells in cross-section, surrounding several larger, thin-walled cells, usually with no evidence of a central strand. Filamentous pseudoparaphyllia, which are always present, are generally abundant and easy to find. They consist of 3-6 cells and they are 1, rarely 2, cells wide at the base.

Rhizoids

Rhizoids are reddish brown, smooth, with oblique end walls, arising in small clusters immediately below the juncture of the leaf and stem, primarily on the ventral surface of stems and branches.

Leaves

Both stem and branch leaves are similar. The leaves are smooth, often wrinkled and contorted when dry, ovate to lanceolate, generally flaccid, rarely rigid, close and imbricate, sometimes distant, complanate or occasionally concave, non-decurrent, rarely with 1-2 cells decurrent, usually erect to erect-spreading but some species have wide-spreading to squarrose leaves. Leaf margins are mostly plane to erect or sometimes recurved at base, often serrulate near apex, commonly entire below. The costa is short and double, often indistinct, occasionally lacking.

Leaf Cells

The upper and median leaf cells are always smooth, flexuose, linear-fusiform and thin- to firm-walled. The alar cells are clearly differentiated, quadrate, rectangular or rarely transversely elongate. There usually are no pits in the cell

walls although occasionally some of the basal cells are pitted.

Asexual Reproduction

Only two species, *I. tenerum* and *I. subbrevisetum*, were observed with asexual reproductive bodies. The bodies, produced infrequently on the stems and branches, are uniseriate, often branched, filamentous, and multicellular with papillose cells.

Sexual Condition

The plants are mostly autoicous, rarely dioicous, and occasionally no sex organs occur on any of the plants in some collections. No sex organs or sporophytes have ever been found on plants of *I. acutifolium*.

Setae

The setae are yellowish to brown when developing, becoming reddish brown at maturity. They are smooth, straight to somewhat curved and usually slightly twisted.

Capsules

The capsules are brown to reddish brown and inclined to cernuous in all of the species except *I. jamaicense*, which usually has erect ones. They are mostly ovoid to ellipsoid, sometimes cylindric, rarely subglobose as in *I. subglobosum*, straight or curved, smooth except for a few wrinkles at the neck and usually contracted below the mouth when dry.

Opercula

The opercula vary from conic to short-rostrate in each species and they are usually much shorter than the urn.

Peristome

The peristome of *Isopterygium* is hypnaceous, i.e. diplolepidous. The exostome teeth are light- to dark-yellowish and range in length from 200-350 μm. The endostome segments are nearly as long as the exostome teeth. There are usually 1-3 cilia in all species except *I. jamaicense*, which has erect capsules without cilia like so many other hypnaceous mosses with erect capsules.

Calyptrae

The calyptrae are white to yellow, cucullate, smooth and naked. They usually cover most of the capsule.

Spores

The spores are green, yellow or yellowish brown, spherical to ovoid, ranging in size from 7-14 μm. They appear smooth or minutely papillose under the light microscope but viewed under higher magnifications with the scanning electron microscope they have gemmate ornamentation.

Generic Relationships

Despite the fact that *Isopterygiopsis* and *Pseudotaxiphyllum* have been recently segregated from *Isopterygium* they are not as closely related to it as other genera. The filamentous pseudoparaphyllia commonly present on the stems of *Isopterygium* will clearly differentiate the genus from both of these genera which have no pseudoparaphyllia. *Isopterygium* is further distinguished from *Isopterygiopsis* by the rhizoids that are smooth, arising below leaf insertion, the small and thick-walled cortical stem cells, the filamentous propagula with papillose cell walls, the leaf margins that are usually serrate at the apex and the lack of an annulus. In contrast, *Isopterygiopsis* has papillose rhizoids arising in the leaf axils, sometimes an outer layer of large, thin-walled stem cells, cylindrical or fusiform propagula with smooth walls, leaf margins that are usually entire at apex and a differentiated annulus. *Pseudotaxiphyllum* is further distinguished from *Isopterygium* by its smooth-walled propagula in the form of various types of branchlets, its usually dioicous plants and its differentiated annulus.

Ectropothecium Mitt. and *Syringothecium* Mitt., two genera that Mitten (1869) placed in the tribe

Stereodonteae, are probably the nearest relatives of *Isopterygium*. *Ectropothecium*, whith about 237 taxa (van der Wijk *et al*. 1962), is badly in need of revision; many of the species within it differ primarily from *Isopterygium* by the filamentous pseudoparaphyllia that are wider at the base, often 2-3 cells wide instead of 1 cell or rarely 2 cells wide. *Syringothecium*, which contains only two species, is very similar gametophytically to *Isopterygium* but both taxa differ from those of *Isopterygium* by possessing a row of inflated cells across their leaf bases and, more important, an erect, much longer peristome (see discussion in Excluded Taxa). *Vesicularia*, still another genus closely related to *Isopterygium*, differs by possessing filamentous pseudoparaphyllia like *Ectropothecium* and it is distinguished from both genera by the much shorter and wider leaf cells.

In summary, *Isopterygium* is distinguished by the ± complanate plants, smooth rhizoids arising below leaf insertion, filamentous, 3-6-celled pseudoparaphyllia, small and thick-walled cortical stem cells, usually serrate apical leaf margins, occasional presence on the stems of simple or branched, filamentous, uniseriate, multicellular propagula with papillose cells, usually autoicous sexual condition and capsules that lack an annulus.

ISOPTERYGIUM Mitt., J. Linn. Soc. Bot. 12: 21. 1869. Type. *Isopterygium tenerum* (Sw.) Mitt., J. Linn. Soc. Bot. 12: 499. 1869. (Lectotype selected by Iwatsuki & Crosby 1979).

Plants often ± complanate, small to medium-sized, in thin to dense, light- to yellow-green glossy mats. Stems creeping, simple or sparingly and irregularly branched, cortical cells small and thick-walled in cross-section, surrounding larger, thinner walled cells, central strand usually absent; rhizoids smooth, on ventral surface of stems and branches just below juncture of leaves; filamentous pseudoparaphyllia present, of 3-6 cells in 1 row or rarely 2 rows near base. Asexual reproductive bodies sometimes present on stems and branches, uniseriate, often branched, filamentous, multicellular bodies with papillose cells. Stem and branch leaves similar, rigid or flaccid, crowded and imbricate to remote, erect-spreading or squarrose, commonly complanate-foliate, sometimes contorted when dry, smooth, flat or somewhat concave, symmetric or asymmetric, non-decurrent or rarely with 1-2 cells decurrent, ovate or lanceolate, sometimes oblong, acute to acuminate; margins plane to erect, sometimes recurved at base, serrulate above the middle, mostly entire below, sometimes entire throughout; costa short and double, sometimes lacking; cells often flexuose, thin to firm-walled, linear-fusiform, smooth, with walls not pitted or occasionally those of basal cells pitted; alar cells usually clearly differentiated, quadrate to rectangular, rarely transversely elongate. Autoicous or rarely dioicous; perigonia scattered along the stems; perichaetia at base of stems, leaves oblong-lanceolate, gradually acuminate, margins plane. Setae smooth, elongate, straight to curved, usually twisted, yellow, brown or reddish brown; capsules inclined to cernuous, or sometimes erect, straight or curved when mature, brown to red-brown, cylindric, ellipsoid or ovoid, smooth or sometimes wrinkled at neck when dry, usually contracted below the mouth when dry; operculum conic to short-rostrate, shorter than the urn; annulus none; peristome double, exostome teeth cross-striolate below, papillose above, bordered, trabeculate at back; endostome with a high to low basal membrane, keeled segments, and cilia shorter than the segments and in groups of 1-3, sometimes absent. Spores spherical to ovoid, smooth or minutely papillose. Calyptra cucullate, smooth, naked.

Key to the Species of *Isopterygium*

1. Leaves narrowly lanceolate, mostly more than 3 times as long as broad, usually distant, wide-spreading to squarrose, straight and symmetric; West Indies, Costa Rica, Nicaragua, Panama, Venezuela, Surinam, French Guiana, Ecuador, Peru, Brazil.....8. *I. subbrevisetum*

1. Leaves ovate, ovate-lanceolate or oblong, mostly less than 3 times as long as broad, close or rarely distant, erect to squarrose, often curved and asymmetric.

2. Leaves with alar regions strongly differentiated, composed of quadrate to rectangular cells in several rows, 4-15 cells on margins.

3. Leaves short, 0.4-0.8 mm in length, acuminate; plant terrestrial; Brazil, Bolivia, Argentina .....4. *I. byssobolax*

3. Leaves long, 0.8-1.2 mm in length, acute; plantsaquatic; Venezuela, Guyana..... ..... 5. *I. acutifolium*

2. Leaves with alar regions weakly differentiated, only a small group of quadrate to rectangular cells present, 2-4 cells on margins.

4. Leaves 1-3 mm long; plants aquatic; Honduras, Guadeloupe, Venezuela, Brazil..... .....3. *I. affusum*

4. Leaves 0.7-1.5 mm long; plants terrestrial.

5. Capsules erect or rarely inclined, not or scarcely contracted below mouth when dry; Jamaica, Mexico, Guatemala.....6. *I. jamaicense*

5. Capsules inclined to horizontal, rarely erect, usually strongly contracted below mouth when dry.

6. Capsules subglobose, about as broad as long, not contracted below mouth when dry; Bolivia.....7. *I. subglobosum*

6. Capsules ovoid to ellipsoid, longer than broad, strongly contracted below mouth when dry.

7. Plants large, stems often 2-4 cm long; leaves 1.0-1.5 mm long; setae usually 2-3 cm long; asexual reproductive bodies lacking; West Indies, southern Mexico to Panama and from Colombia and Venezuela to northern Argentina .....2. *I. tenerifolium*

7. Plants small, stems seldom over 2 cm long; leaves 0.7-1.2 mm long; setae usually 0.5-1.2 cm long; asexual reproductive bodies sometimes present on stems, filamentous, simple or branched, multicellular, with papillose cells; West Indies, Mexico to northern Argentina and Uruguay.....1. *I. tenerum*

1. *Isopterygium tenerum* (Sw.) Mitt., J. Linn. Soc. London, Bot. 12: 499. 1869.

Hypnum tenerum Sw., Fl. Ind. Occ. 3: 1817. 1806; *Isothecium tenerum* (Sw.) Brid., Bryol. Univ. 2: 385. 1827. Type. Jamaica. *Swartz 2719* (holotype, S; isotypes, BM, C).

Hypnum micans Sw., Adnot. Bot. 175. 1829; *Rhynchostegium micans* (Sw.) Aust., Bot. Gaz. 1: 30. 1875; *Isopterygium micans* (Sw.) Kindb., Enum. Bryin. Exot. 21. 1888; *Plagiothecium micans* (Sw.) Par., Index Bryol. (Ed.l) 963. 1896.

Hypnum splendidulum Hornsch., Fl. Bras. l(2): 77. 1840; *Isopterygium splendidulum* (Hornsch.) Broth., Nat. Pfl. l(3): 1081. 1908.

Hypnum fulvum Hook. & Wils. *in* Drumm., Musci Amer. (Southern States) 110. 1841, hom. illeg.; *Plagiothecium fulvum* Jaeg. & Sauerb., Ber. St. Gall. Naturw. Ges. 1876-77: 450. 1878; *Isopterygium fulvum* (Jaeg. & Sauerb.) Kindb., Can. Rec. Sci. 6(2): 72. 1894; *Plagiothecium micans* var. *fulvum* (Jaeg. & Sauerb.) Par., Index Bryol. (Ed.1) 963. 1896.

Hypnum brachyneuron C. Müll., Bot. Zeit. 3: 109. 1845; *Isopterygium brachyneuron* (C. Müll.) Mitt., J. Linn. Soc. Bot.12: 498. 1869.

Hypnum curvicolle C. Müll., Syn. 2: 684. 1851, "*curvicollum*"; *Isopterygium curvicolle* (C. Müll.) Mitt., J. Linn. Soc. Bot. 12: 498. 1869; *Isopterygium curvicolle* var. *majus* Broth. *in* Bauer, Verh. Zool. Bot. Ges. Wien 55: 576, 578. 1905, Rev. Bryol. 32: 11. 1905, nom. nud.

Hypnum leucophyllum Hampe *in* C. Müll., Syn. 2: 280. 1851; *Isopterygium leucophyllum* (Hampe) Mitt., J. Linn. Soc. Bot. 12: 499. 1869.

Hypnum hospitans Hampe, Ann. Sci. Nat. Bot.

ser. 5,5: 313. 1866; *Isopterygium hospitans* (Hampe) Jaeg. & Sauerb., Ber. St. Gall. Naturw. Ges. 1876-77: 434. 1878.

Hypnum cordovense C. Müll., Linnaea 38: 652. 1874; *Isopterygium cordovense* (C. Müll.) Jaeg. & Sauerb., Ber. St. Gall. Naturw. Ges. 1876-77: 436. 1878.

Hypnum leptomiton C. Müll., Linnaea 38: 652. 1874; *Isopterygium leptomiton* (C. Müll.) Jaeg. & Sauerb., Ber. St. Gall. Naturw. Ges. 1876-77: 436. 1878.

Hypnum laxum Hampe, Vid. Medd. Naturh. For. Kjoebenh. ser. 3,6: 166. 1875, hom. illeg. non P. Beauv. 1805; *Ectropothecium laxum* Jaeg. & Sauerb., Ber. St. Gall. Naturw. Ges. 1877-78: 266. 1880; *Isopterygium laxum* (Jaeg. & Sauerb.) Broth., Bih. K. Svensk. Vet. Ak. Handl. 21 Afd. 3(3): 56. 1895.

Hypnum divaricatulum C. Müll. *ex* Hampe, Vid. Medd. Naturh. For. Kjoebenh. ser. 3,6: 167. 1875; *Isopterygium divaricatulum* (Hampe) Broth., Nat. Pfl. 1(3): 1081. 1908.

Hypnum lamprophyllum Hampe, Vid. Medd. Naturh. For. Kjoebenh. ser. 3,6: 167. 1875, hom. illeg. non (Mitt.) C. Müll. 1874 ; *Ectropothecium lamprophyllum* Jaeg. & Sauerb., Ber. St. Gall. Naturw. Ges. 1877-78: 266. 1880; *Isopterygium lamprophyllum* (Jaeg. & Sauerb.) Broth., Nat. Pfl. 1(3): 1081. 1908.

Ectropothecium clandestinum Ångstr., Oefv. K. Vet. Ak. Fohr. 33(4): 43. 1876; *Isopterygium clandestinum* (Ångstr.) Broth., Nat. Pfl. 1(3): 1081. 1908.

Isopterygium streptopodium Besch., Ann. Sci. Nat. Bot. ser. 6,3: 257. 1876.

Hypnum brachystelium Hampe, Vid. Medd. Naturh. For. Kjoebenh. ser. 4,1: 139. 1879; *Isopterygium brachystelium* (Hampe) Kindb., Enum. Bryin. Exot. 100. 1891.

Hypnum citrinum Hampe, Vid. Medd. Naturh. For. Kjoebenh. ser. 4,1: 142. 1879; *Isopterygium citrinum* (Hampe) Kindb., Enum. Bryin. Exot. 100. 1891.

Hypnum cacti C. Müll., Linnaea 42: 437. 1879; *Isopterygium cacti* (C. Müll.) Kindb., Enum. Bryin. Exot. 20. 1888.

Hypnum eutrypherum C. Müll., Linnaea 42: 497. 1879; *Isopterygium eutrypherum* (C. Müll.) Par., Ind. Bryol. 707. 1897.

Hypnum restitutum Hampe, Vid. Medd. Naturh. For. Kjoebenh. ser. 4,1: 141. 1879; *Isopterygium restitutum* (Hampe) Kindb., Enum. Bryin. Exot. 100. 1891.

Hypnum chlorosum Hampe, Flora 64: 414. 1881; *Isopterygium chlorosum* (Hampe) Par., Ind. Bryol. 706. 1897.

Isopterygium subtenerum Besch., J. de Bot. 5: 348. 1891.

Isopterygium guarapense Besch., J. de Bot. 5: 349. 1891.

Plagiothecium radicisetum C. Müll., Malpighia 10: 515. 1896; *Isopterygium radicisetum* (C. Müll.) Broth., Nat. Pfl. 1(3): 1082. 1908.

Taxicaulis adflatus C. Müll., Hedwigia 36: 115. 1897; *Isopterygium adflatum* (C. Müll.) Par., Ind. Bryol. Suppl. 217. 1900.

Taxicaulis cylindraceus C. Müll., Nuov. Giorn. Bot. Ital. n. ser. 4: 151. 1897; *Isoptergyium cylindraceum* (C. Müll.) Par., Ind. Bryol. Suppl. 218. 1900.

Taxicaulis trichopelma C. Müll., Bull. Herb. Boiss. 5: 210. 1897; *Isopterygium trichopelma* (C. Müll.) Par., Ind. Bryol. Suppl. 221. 1900.

Taxicaulis weigeltii C. Müll., Hedwigia 37: 252. 1898, "*weigelti*"; *Isopterygium weigeltii* (C. Müll.) Broth., Nat. Pfl. 1(3): 1081. 1908.

Taxicaulis rufisetulus C. Müll., Hedwigia 37: 253. 1898; *Isopterygium rufisetulum* (C. Müll.) Par., Ind. Bryol. Suppl. 220. 1900.

Taxicaulis araneosetus C. Müll., Hedwigia 37: 255. 1898; *Isopterygium araneosetum* (C. Müll.) Par., Ind. Bryol. Suppl. 218. 1900, "*araucosetum*".

Isopterygium callochlorum Broth., Bih. K. Svensk. Vet. Ak. Handl. 26 Afd. 3(7): 46. 1900.

Microthamnium angustirete Broth., Bih. K. Svensk. Vet. Ak. Handl. 26 Afd. 3(7): 48. 1900; *Isopterygium angustirete* (Broth.) Broth., Nat. Pfl. 1(3): 1082. 1908.

Plagiothecium bromeliophilum C. Müll., Hedwigia 40: 59. 1901; *Isopterygium bromeliophilum* (C. Müll.) Broth., Nat. Pfl. 1(3): 1082. 1908.

Plagiothecium aurantiacum C. Müll., Hedwigia 40: 60. 1901; *Isopterygium aurantiacum* (C. Müll.) Broth., Nat. Pfl. 1(3): 1082. 1908.

Plagiothecium flaviusculum C. Müll., Hedwigia 40: 59. 1901; *Isopterygium flaviusculum* (C. Müll.) Broth., Nat. Pfl. 1(3): 1082. 1908.

Taxicaulis bahiense C. Müll., Hedwigia 40: 59. 1901; *Isopterygium bahiense* (C. Müll.) Broth., Nat. Pfl. 1(3): 1081. 1908.

Taxicaulis afflictus C. Müll., Hedwigia 40: 68. 1901; *Isopterygium afflictum* (C. Müll.) Broth., Nat. Pfl. 1(3): 1083. 1908.

Taxicaulis ammophilus C. Müll., Hedwigia 40: 66. 1901; *Isopterygium ammophilum* (C. Müll.) Broth., Nat. Pfl. 1(3): 1081. 1908.

Taxicaulis fabroniiformis C. Müll., Hedwigia 40: 69. 1901; *Isopterygium fabroniiforme* (C. Müll.) Broth., Nat. Pfl. 1(3): 1083. 1908, "*fabroniaeforme*".

Plagiothecium pseudotenerum Broth. & Kindb. *ex* Kindb., Rev. Bryol. 28: 54. 1901; *Isopterygium pseudotenerum* (Broth. & Kindb.) Broth., Nat. Pfl. 1(3): 1082. 1908.

Isopterygium peruvianum Broth., Bot. Jahrb. 56(Beibl. 123): 21. 1920.

Isopterygium fernandezianum Broth. *in* Skotts., Nat. Hist. Juan Fernandez 2(12): 440. 1924.

Isopterygium fernandezianum var. *longisetum* Broth. *in* Skotts., Nat. Hist. Juan Fernandez 2(12): 440. 1924.

Isopterygium brachyneuroides Broth., Denkschr. Ak. Wiss. Wien Math. Nat. Kl. 83: 327. 1926.

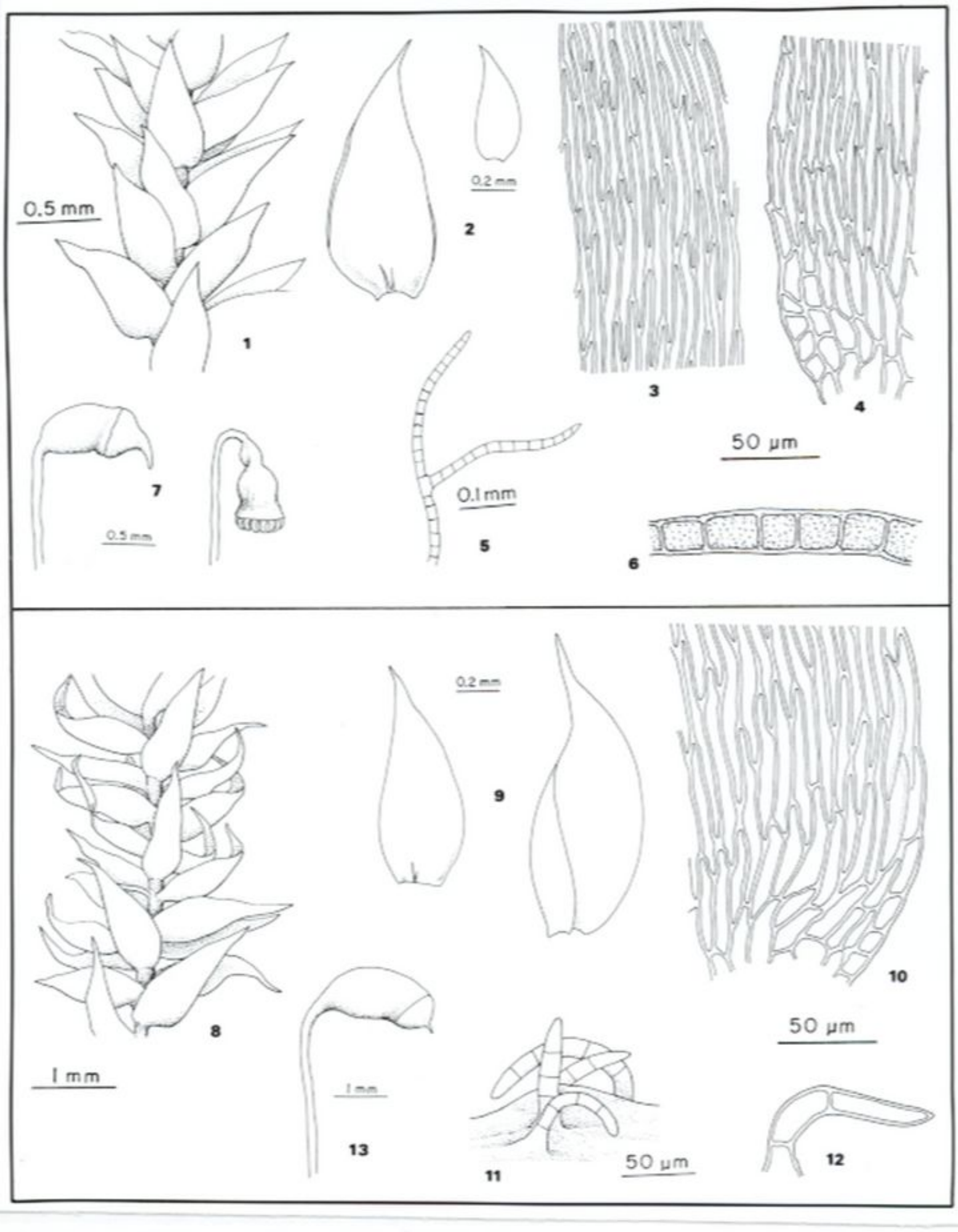
Isopterygium diminutivum Bartr., J. Washington Acad. Sci. 18: 581. 1928, "*dimunitivum*".

Plants white- to yellow-green, in thin to dense mats. Stems 1-2 cm long, rarely 3 cm, 0.5-1.5(3) mm wide, complanate-foliate, simple or irregularly branched. Asexual reproductive bodies sometimes present on stems, uniseriate, multicellular, simple or branched, often more than 0.5 mm long, green or brown, cells papillose. Leaves flaccid, close, complanate, erect-spreading, often secund at the tips, smooth, 0.7-1.2 mm long, 0.2-0.5 mm wide, ovate to lanceolate, often asymmetric, acuminate; margins plane, serrate to serrulate above the leaf middle, serrulate to entire below, rarely entire throughout; costa none or weak, short and double; cells smooth, 38-132 µm long, 5-12 µm wide; alar cells short-rectangular to quadrate or transversely elongate, in small groups. Autoicous. Setae yellow to reddish brown, (0.3)0.5-1.2(2.2) cm long. Capsules cernuous or rarely erect, curved or sometimes straight, 0.5-1.5 mm long, ovoid to ellipsoid, usually strongly contracted below the mouth when dry. Opercula conic-apiculate to obliquely short-rostrate. Peristome teeth up to 0.2 mm long. Spores 9-14 µm in diameter.

Illustrations: Crum and Anderson 1981 (Figs. 585 A-H, 586 A-B); Breen 1963 (Plate 87, figs. 1-7 as *I. micans*); Ireland 1969 (Plate 14-15); Ireland (in press) Moss Flora of Mexico; Ireland (in press) Flora Neotropica; Figs. 1-7.

Chromosome number: n=11+m (as *I. micans* (Sw.) Kindb., Al-Aish & Anderson 1960, 1961).

Distribution: An extremely common species occurring throughout the West Indies, and from Mexico to northern Argentina and Uruguay.



Figs. 1-7. *Isopterygium tenerum*. 1. Enlargement of portion of stem. 2. Leaves. 3. Median leaf cells. 4. Alar cells. 5. Asexual reproductive body. 6. Cells of asexual reproductive body. 7. Operculate and inoperculate capsules (dry).

Figs. 8-13. *Isopterygium tenerifolium*. 8. Enlargement of portion of stem. 9. Leaves. 10. Alar cells. 11. Pseudoparaphyllia around branch primordium. 12. Enlargement of pseudoparaphyllium. 13. Operculate capsule (wet).

Ecology: In forests on tree trunks, rotting logs and stumps, woody debris, humus, soil banks, and rock, especially sandstone and limestone; sometimes in swamps, humid grasslands and on river banks. Primarily at low elevations from sea level to 500 m but known to occur up to 3200 m.

Representative specimens examined.

MEXICO. Colima: Laguna María, Parque Nacional El Jabali, *Arreguin 790e* (MEXU). **Quintana Roo:** Laguna Cieга, Isla de Cozumel, 5 m, ca. 20° 36' N, 86° 44' W, *Delgadillo 4402* (MEXU, MICH, MO). **San Luis Potosí:** W of Xilitla, 1035 m, *Sharp 5935* (CANM, MEXU, MICH, TENN).

GUATEMALA. Quezaltenango: Vicinity of Fuentes Georginas, slopes of Volcán de Zunil, 2500-2800 m, *Standley 85946* (F, FH, MICH, NY).

BELIZE. El Cayo: San Agustín, *Mains 4084* (F, FH, MICH, NY).

HONDURAS. Atlántida: Lancetilla Valley, near Tela, 20-600 m, *Standley 55803* (F, FH, NY, US).

NICARAGUA. Sierra de Managua, 600-900 m, *Garnier 715* (NY).

COSTA RICA. Limón: Near Carmen Station on Indiana Branch, ca. 30 m, *Standley & Valerio 48390* (FH, US).

PANAMA. Bocas del Toro: Cerro Colorado, 6.9 km above Chami Camp, 1700 m, *Allen 5335* (MO).

BERMUDA. Paget Marsh, *Britton 1855* (MICH, MO, NY, TENN).

BAHAMAS. Andros Is.: Coppice, near Nicholl's Town, *Small & Carter 8968* (NY, US). **Great Bahama I.:** *Britton & Millspaugh 2628* (NY). **New Providence I.:** Prospect Ridge, *Degener 19095* (NY).

CUBA. Santiago: Slopes and summit of El Yunque, near Baracoa, 305-610 m, *Pollard & Palmer 110* (BM, NY, US).

JAMAICA. Portland: Murdock's Gap, 1740 m, *Crosby 3536* (CANM, MEXU, MO, NY).

HAITI. Département du Nord, vicinity of Dondon, ca. 400 m, *Leonard 8578* (CANM).

DOMINICAN REPUBLIC. Prov. El Seibo, 19 km N of Hato Mayor on road to El Valle, 300 m, *Mejía et al. 10259* (MO, NY).

PUERTO RICO. Río Sabana, Sierra de Luquillo, S from Luquillo, *Steere 5172* (MICH, MO).

VIRGIN ISLANDS. St. Thomas: Slopes of St. Peter Mt., just off Crown Mt. Rd., 425 m, *Buck 3280* (NY).

WINDWARD ISLANDS. Guadeloupe: Rivière Pérou, *Le Gallo 811, 814, 815, 819, 820, 823* (CANM). **Dominica:** Morne Micotrin, *Elliott 1129c* (BM). **Martinique:** Rivière de Tivoli, 320 m, *Stehlé 4039* (NY). **St. Lucia:** Between Castries and Dennery, *Hegewald 9607* (NY). **St. Vincent:** Morn Garn, 460 m, *Elliott 56b* (BM). **Grenada:** St. George's, 26 Jun 1906, *Broadway* (NY).

COLOMBIA. Meta: Outskirts of Villavicencio, 500 m, *Schultes 11097* (H, TENN, US), *11110* (BM, CANM, COL, F, MICH, MO, NY).

VENEZUELA. Amazonas: Dept. Río Negro, along Río Mawarinuma, just outside Cañón Grande, vicinity of Neblina base camp, ca. 140 m, *Buck 11227, 11352* (NY).

TRINIDAD. Vicinity of Tabaquite, *Britton 2615* (FH, NY, US).

GUYANA. Demerara-Mahaica Region, along Linden-Soesdyke Hwy., ca. 1.6 km E of Soesdyke, 1-50 m, *Pipoly 9286A, 9295* (NY).

SURINAM. Dist. Nickerie, Kabalebo Dam project, 0-50 m, *Florschütz-de Waard & Zielman 5496, 5687, 5712* (U).

ECUADOR. Azuay: Gualaquiza, *Allioni 8300, 8362, 8379* (H). Galapagos Is., Isla Santa Cruz, trail from Bella Vista to Media Luna, 550 m, *Sipman M-234* (U).

PERU. Loreto: Iquitos, ca. 100 m, *Killip & Smith 26942* (CANM, NY).

BRAZIL. Acre: 15 km E of Rio Branco along road to Abuna, *Reese & McPherson 13195* (CANM, NY). **Amazonas:** Estrada Manaus-Itacoatiara, km 26, reserva florestal Ducke, *Lisbôa 57, 63, 70* (MG).

BOLIVIA. La Paz: Prov. Nor Yungas, 'Alto Coro Coro', 7 km N of Caranavi, 15° 46' S, 67° 32' W, *Lewis 84-066* (LPB).

CHILE. Juan Fernández Is., Masatierra, Valle Colonial, 435 m, *Skottsberg & Skottsberg 484* (NY).

PARAGUAY. Amambay: Parque Nacional Cerro Corá, trail up Cerro Muralla, ca. 300 m, ca. 22°40' S, 56°00' W, *Buck 12518* (NY).

ARGENTINA. Lago Encondido, *Matteri 799* (BA).

URUGUAY. Canelones, Banado del Negro, cerca de Airoyo Pando, *Castellanos 8582* (FH).

Isopterygium tenerum is the most common species of *Isopterygium* in Latin America. It is also the most variable and its polymorphism undoubtedly accounts for the large number of taxa that have been placed in synonymy. A total of 45 taxa are recognized as synonyms of *I. tenerum* in the present treatment. Many of the taxa were described as new on the basis of differences in the length and shape of their stem leaves. However, a study of scores of *I. tenerum* specimens from Latin America indicates that these characters are extremely variable and they are therefore unreliable criteria when delimiting taxa of *Isopterygium* using only these two features.

Redfearn (1956) reached a similar conclusion after a biometric analysis of the stem leaf variation of subspecific taxa in the *P. micans* (Sw.) Par. (= *I. tenerum*) complex in the southeastern United States.

Isopterygium tenerum in its typical form is best distinguished by the usually complanate, medium-sized plants with stems 1-2 cm long, 0.5-1.5 mm wide, leaves ovate-lanceolate, asymmetric, acuminate, close, erect-spreading, 0.7-1.2 mm long, alar cells in small groups of short-rectangular to quadrate or transversely elongate cells, asexual reproductive bodies sometimes present on stems, filamentous, multicellular, the cells papillose, setae 0.5-1.2 cm long, rarely up to 2.2 cm, and capsules ovoid to ellipsoid, inclined to horizontal, usually strongly contracted below the mouth when dry, 0.5-1.5 mm long.

2. *Isopterygium tenerifolium* Mitt., J. Linn. Soc. Bot. 12: 499. 1869. Type. Brazil. Amazon River, *Spruce 1060* (holotype, NY; isotype, BM).

Plagiothecium inordinatum Mitt. *ex* Spruce, Cat. Musc. Amaz. And. 16. 1867. nom. nud.

Ectropothecium longisetum Schimp. *ex* Besch., Ann. Sci. Nat. Bot. ser. 6,3: 258. 1876; *Isopterygium longisetum* (Schimp. *ex* Besch.) Broth., Nat. Pfl. 1(3): 1082. 1908, hom. illeg., non Brotherus 1895. *Isopterygium altisetum* Crum & Steere, Bryologist 59: 254. 1956.

Plagiothecium villae-ricae Besch., Mem. Soc. Sci. Nat. Cherbourg 21: 271. 1877.

Isopterygium longisetum Broth., Bih. K. Svensk. Vet. Ak. Handl. 21 Afd. 3(3): 55. 1895.

Taxicaulis stigmocarpus C. Müll., Nuov. Giorn. Bot. Ital. n. ser. 4: 150. 1897; *Isopterygium stigmocarpum* (C. Müll.) Par., Ind. Bryol. Suppl. 220. 1900.

Taxicaulis excelsipes C. Müll., Hedwigia 37: 253. 1898; *Isopterygium excelsipes* (C. Müll.) Par., Ind. Bryol. Suppl. 219. 1900.

Plagiothecium meteoriaceum C. Müll., Bull. Herb. Boiss. 6: 120. 1898; *Isopterygium meteoriaceum* (C. Müll.) Par., Ind. Bryol. Suppl. 220. 1900.

Plagiothecium proximum C. Müll., Hedwigia 38(Beibl.): 59. 1899. nom. nud.

Plagiothecium paludigenum C. Müll., Hedwigia 40: 58. 1901; *Isopterygium paludigenum* (C. Müll.) Broth., Nat. Pfl. 1(3): 1082. 1908.

Plagiothecium lonchopelmatum C. Müll., Hedwigia 40: 59. 1901; *Isopterygium lonchopelmatum* (C. Müll.) Broth., Nat. Pfl. 1(3): 1082. 1908.

Plagiothecium restingae C. Müll., Hedwigia 40: 60. 1901; *Isopterygium restingae* (C. Müll.) Broth., Nat. Pfl. 1(3): 1082. 1908.

Plagiothecium restingae var. *tenue* C. Müll., Hedwigia 40: 60. 1901.

Plagiothecium jamaicense C. Müll., Hedwigia 40: 61. 1901.

Isopterygium fecundum Ren. & Card., Bull. Soc. R. Bot. Belg. 41(1): 140. 1905.

Isopterygium manaosense Broth., Hedwigia 45: 286. 1906.

Isopterygium vagans Herz., Biblioth. Bot. 87: 152. 1916.

Plants yellow-green to green, in thin, loose mats. Stems up to 4 cm long, 2-3 mm wide, complanate-foliate, simple or irregularly and freely branched. Asexual reproductive bodies lacking. Leaves flaccid, close, complanate, wide-spreading to squarrose, smooth, usually wrinkled and contorted when dry, 1.0-1.5 mm long, 0.4-0.7 mm wide, ovate-lanceolate to ovate, often curved and asymmetric, acuminate; margins plane to erect throughout, serrate to serrulate above, serrulate below; costa none or weak, short and double; cells smooth, 71-141 µm long, 5-7 µm wide; alar cells short-rectangular to quadrate, in small groups with 1-2 cells on margins. Autobrown to reddish brown, (1.5)2-3(4) cm long.. Capsules horizon-

tal to pendulous, sometimes nearly erect, 1.0-1.5 mm long, ovoid to ellipsoid, contracted below the mouth when dry. Opercula obliquely short-rostrate. Peristome teeth up to 0.2 mm long. Spores 9-14 μm in diameter.

Illustrations: Ireland (in press) Flora Neotropica; Figs. 8-13.

Chromosome number: unreported.

Distribution: West Indies, southern Mexico to Panama, and from
Colombia and Venezuela to northern Argentina.

Ecology: On tree trunks, rotten stumps, woody debris and humus in forests, sometimes on soil banks and wet cliffs along rivers and near waterfalls, rarely in moist grasslands. At low to high elevations from 200-3000 m.

Representative specimens examined.

MEXICO. Chiapas: 9 km S de Finca Liquidambar, municipio Angel Albino Corzo, 15° 42' N, 92° 45' W, *Delgadillo 4676, 4678, 4679b, 4726, 4728a* (MEXU); *Cárdenas 4163, 4189* (MEXU).
HONDURAS. El Paraiso: Between Las Mesas and Ojo de Agua, 700 m, *Morton 6981, 6982* (US).
COSTA RICA. Limón: Ca. 2 km S and 1 km E of Río Colorado, *Stevens et al. 25048* (MO).
PANAMA. Bocas del Toro: Vicinity of Fortuna Dam, 4.5 km along pipeline road leaving Chiriqui Grande road at Continental Divide, 850-950 m, *Allen 5635* (MO). Barro Colorado I., Canal Zone, Jan-Feb 1938, *Willis s.n.* (MICH).
CUBA. San Mateo, near Pinar del Río, *Wright 160* (CANM, FH, MICH, NY, TENN).
JAMAICA. Clarendon: Mason River Savanna, 4.4 km NW of Kellits, 700 m, *Crosby 3118* (NY).
DOMINICAN REPUBLIC. Peravia, La Nevera area, 47 km S of Constanza, 2070-2100 m, *Buck 5247* (NY).
PUERTO RICO. Cerro de la Punta, Cordillera Central, S of Jayuya, *Steere 6212* (MICH, MO, NY, US), *6238* (MICH, MO).
WINDWARD ISLANDS. Guadeloupe: Without locality, *Duss 124* (H, NY), *1045, 1046, 1092, 1260* (NY). **Dominica:** Grand Souffriere, on lip of crater, *Elliott 1841, 1843* (BM). **Martinique:** Without locality, *Duss 1* (H, NY), *25, 332* (NY).
COLOMBIA. Santander: Vicinity of Las Vegas, 2600-3000 m, *Killip & Smith 16026* (NY).
VENEZUELA. Bolívar: Distrito Roscio, 13 km al Noreste de Santa Elena de Uairén, 900 m, *Steyermark & Liesner 127566* (MO). **Tachira:** 12 km SW of Punta de Piedra, towards Sacramento, 175 m, *Steyermark & Rabe 96615* (US).
GUYANA. Without locality, *Parker s.n.* (NY).
SURINAM. Sabanpassie, *Teunissen & Wildschut 11931* (U).
ECUADOR. Oriente: Without locality, 1800 m, Jun 1910, *Allioni s.n.* (H).
BRAZIL. Bahia: Between Ibirapitanga and Ubaitaba, 200 m, *Schäfer-Verwimp & Verwimp 8753* (NY). **Pará:** Ponta Grossa, Rio Tapajas, *Swallen 6936* (FH, US). **Santa Catarina:** Tubarao, *Ule 982* (H). **Sao Paulo:** Near Cerqueira-Cesar, 500 m, Kryptogamae exsiccatae *2898, Schiffner* (H, M, US).
BOLIVIA. Santa Cruz: Prov. Chiquitos, 'Cerro Tataraqui', 13 km NE of Roboré, 18° 16' S, 59° 39' W, *Lewis* 85-1307 (LPB).
PARAGUAY. Santo Antonio, Colonia "Elis", *Lindman B231* (NY).
ARGENTINA. Posados, Misiones, *Eckman 2096* (FH).

Isopterygium tenerifolium is best recognized by the large plants, stems up to 4 cm long, 2-3 mm wide, leaves ovate-lanceolate to ovate, often curved and asymmetric, acuminate, flaccid, close, complanate, usually wrinkled and contorted when dry, 1.0-1.5 mm long, with poorly developed alar cells, 1-2 short-rectangular to quadrate cells on the margins, setae, 2-3 cm long, rarely up to 4 cm, and capsules ovoid to ellipsoid, horizontal to pendulous, contracted below the mouth when dry, 1.0-1.5 mm long.

The species often has been confused with many other Latin American *Isopterygium* species, especially large forms of *I. tenerum* ("*fulvum*" form). Fortunately, both species usually produce sporophytes and the long setae of *I. tenerifolium*, longer than any of the other Latin American species of *Isopterygium*, will distinguish it from *I. tenerum* as well as the others.

3. *Isopterygium affusum* Mitt., J. Linn. Soc. Bot. 12: 499. 1869. Type. Brazil. Taruma River, *Spruce 1059* (lectotype selected by Z. Iwatsuki in 1966, NY; isolectotype, BM); Province Ceara, Sierra de Araripe, *Gardner 106c* (isosyntype, BM).

Isopterygium herminieri Schimp. *ex* Besch., Ann. Sci. Nat. Bot. ser. 6,3: 256. 1876.

Ectropothecium submersum Broth., Bih. K. Svensk. Vet. Ak. Handl. 26 Afd. 3(7): 48. 1900; *Isopterygium submersum* (Broth.) Broth., Nat. Pfl. 1(3): 1081. 1908.

Plagiothecium fontigenum C. Müll., Hedwigia 40: 58. 1901; *Isopterygium fontigenum* (C. Müll.) Buck & Irel., Flora Neotropica, Monograph 50: 19. 1989.

Isopterygium aquaticum Robins., Bryologist 67: 453. 1964, hom. illeg., non Dixon 1922; *Isopterygium irelandii* Robins., Bryologist 70: 43. 1967.

Plants yellow-green to green, in thin, loose masses. Stems up to 10 cm long, 1.5-3.5 mm wide, complanate-foliate, simple or irregularly branched. Asexual reproductive bodies lacking. Leaves flaccid, close, complanate, erect-spreading, smooth, usually wrinkled and contorted when dry, 1-3 mm long, 0.4-1.0 mm wide, ovate-lanceolate to ovate, symmetric or often asymmetric, acuminate to long-acuminate; margins plane, serrulate above, entire below; costa none or weak, short and double; cells smooth, 66-118 µm long, 5-7 µm wide; alar cells weakly differentiated, rectangular or rarely quadrate, in small groups with 1-2 cells on margins. Autoicous or rarely dioicous. Setae brown to reddish brown, 1.5-2.2 cm long. Capsules inclined, 1.0-1.2 mm long, ovoid to ellipsoid, somewhat contracted below the mouth when dry. Opercula obliquely short-rostrate. Peristome teeth up to 0.2 mm long. Spores immature.

Illustrations: Robinson 1964 (Figs. 33-36); Ireland (in press) Flora Neotropica; Figs. 14-17.

Chromosome number: unreported.

Distribution: Honduras, Guadeloupe, Venezuela and Brazil.

Ecology: An aquatic species on rock in and beside rivers and streams, near waterfalls, or occasionally at bases of tufts of grasses and sedges in marshes. Occurring at altitudes of 430-1350 m.

Representative specimens examined. **HONDURAS. Morazán:** El Quebracho, above El Zamorano, ca. 950 m, *Standley 353* (F); region of Agua Amarilla, above El Zamorano, ca. 780 m, *Standley & Williams 13* (F), 900-1100 m, *Standley et al. 5047* (BM, F), *5044*, *5050* (F); near Joya Grande, on road from El Zamorano to Suyapa, 1200-1350 m, *Standley & Molina R. 4511* (F).
WINDWARD ISLANDS. Guadeloupe: No other locality data (known only from type collection of *I. herminieri*).
VENEZUELA. Bolívar: Morichal cercano al conuco de Odremán, Santa Elena, Gran Sabana, *Tamayo 3068* (FH, US).
BRAZIL. Amazonas: Taruma Alta, 5 km N of Manaus-Itacoatiara road, near Manaus, *Griffin 283-A* (CANM, F, MEXU, MO, NY, SP); between Manaus & Sao Gabriel, along shores of Río Curicuriari & Igarapé Branco (Río Cariua) from the Río Curicuriari to Cachoeira de Bôto (Cachoeira Piraiauara), *Buck 2549* (CANM). **Santa Catarina:** Serra Geral, *Ule 1197* (H). **Goiás:** Region of the Chapada dos Veadeiros, 4 km N of Veadeiros, *Dawson 14745* (CANM). **Minas Geraes:** Between Serro & Datas, Diamantina, *Frahm 1421, 1499* (MO); National Park Serra de Itatiaia, 1950 m, *Schäfer-Verwimp & Verwimp 9571* (NY). **Sao Paulo:** Icem County, *Vital DV-1826* (CANM). **Mato Grosso:** Serra do Roncador, ca. 86 km N of Xavantina, 550 m, *Irwin et al. 16370* (NY). **Pará:** Serra do Cachimbo, Base Aérea do Cachimbo and vicinity, along bank of Río Braco Norte, ca. 20 km N of border of Mato Grosso, 430-480 m, *Reese 16169* (MICH, NY, US), *16193* (MICH), *16197*, *16418* (MICH, NY).

The aquatic habit will immediately indicate the identity of this species and distinguish it from the other Latin American taxa, except *Isopterygium acutifolium*, which are terrestrial. The important morphological features are the large plants, stems to 10 cm long, 1.5-3.5 mm wide, leaves ovate-lanceolate to ovate, symmetric to asymmetric, acuminate, flaccid, close, erect-spreading, strongly wrinkled and contorted when dry, 1-3 mm long, alar regions weakly differentiated, 1-2 rectangular or rarely quadrate cells on margins, setae 1.5-2.2 cm long, capsules rarely produced, ovoid to ellipsoid, inclined, contracted below the mouth when dry, 1.0-1.2 mm long.

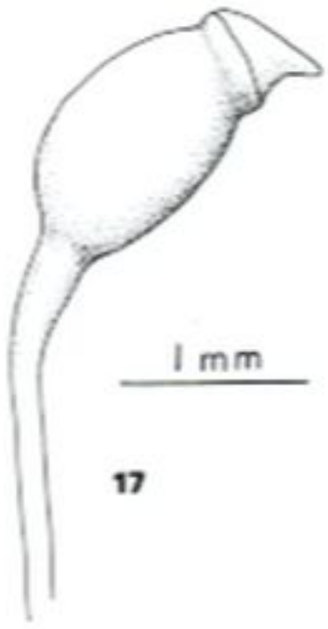
4. *Isopterygium byssobolax* (C. Müll.) Par., Ind. Bryol. Suppl. 218. 1900.

14

1 mm

0.5 mm

15



1 mm

17

16

50 µm

18

0.5 mm

19

0.2 mm

0.5 mm

21

20

50 µm

Figs. 14-17. *Isopterygium affusum*. 14. Enlargement of portion of stem. 15. Leaves. 16. Alar cells. 17. Operculate capsule (wet).

Figs. 18-21. *Isopterygium byssobolax*. 18. Enlargement of portion of stem. 19. Leaves. 20. Alar cells. 21. Inoperculate capsule.

Taxicaulis byssobolax C. Müll., Hedwigia 36: 114. 1897. Type. Argentina. Tucumanensis, Siambon near Tucuman, Sierra de Tucuman, 1873, *Lorentz s.n.* (lectotype, JE); Cuesto de Siambon, *Lorentz s.n.* (isosyntype, JE).

Taxicaulis pyrrhopus C. Müll., Hedwigia 36: 116. 1897; *Isopterygium pyrrhopum* (C. Müll.) Par., Ind. Bryol. Suppl. 220. 1900.

Taxicaulis saprophilus C. Müll., Hedwigia 36: 115. 1897; *Isopterygium saprophilum* (C. Müll.) Par., Ind. Bryol. Suppl. 220. 1900.

Plants light green to yellowish green, in dense mats. Stems up to 1.3 cm long, 0.5-1.0 mm wide, simple or irregularly and freely branched. Asexual reproductive bodies lacking. Leaves somewhat rigid, close, concave, erect to slightly spreading at tips, smooth, somewhat contorted when dry, 0.4-0.8 mm long, 0.2-0.3 mm wide, ovate to ovate-lanceolate, symmetric, acuminate; margins erect, entire to minutely serrulate; costa none or weak, short and double; cells smooth, 28-52 µm long, 5-7 µm wide; alar cells strongly differentiated, short-rectangular to quadrate or transversely elongate, in 2-4 rows with 4-10 cells on margins. Autoicous. Setae yellow to reddish brown, 0.6-1.0 cm long. Capsules inclined to horizontal, 0.5-1.0 mm long, ovoid to ellipsoid, contracted below the mouth when dry. Opercula short-rostrate. Peristome teeth up to 0.2 mm long. Spores 7-9 µm in diameter.

Illustrations: Ireland (in press) Flora Neotropica; Figs. 18-21.

Chromosome number: unreported.

Distribution: Brazil, Bolivia and Argentina.

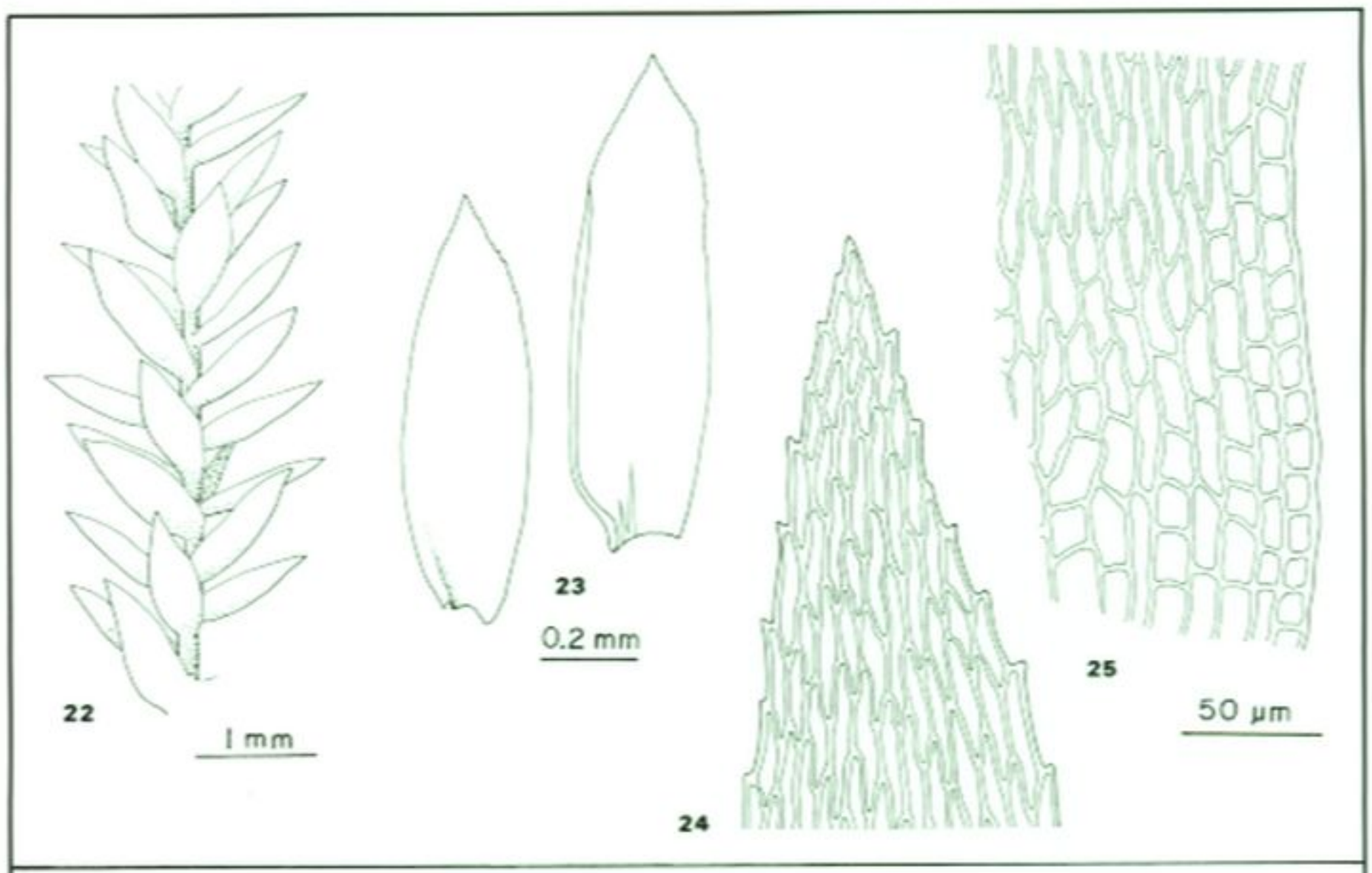
Ecology: Usually in forests on rotten wood and tree bases, sometimes on soil and rock. At altitudes of 30-1180 m.

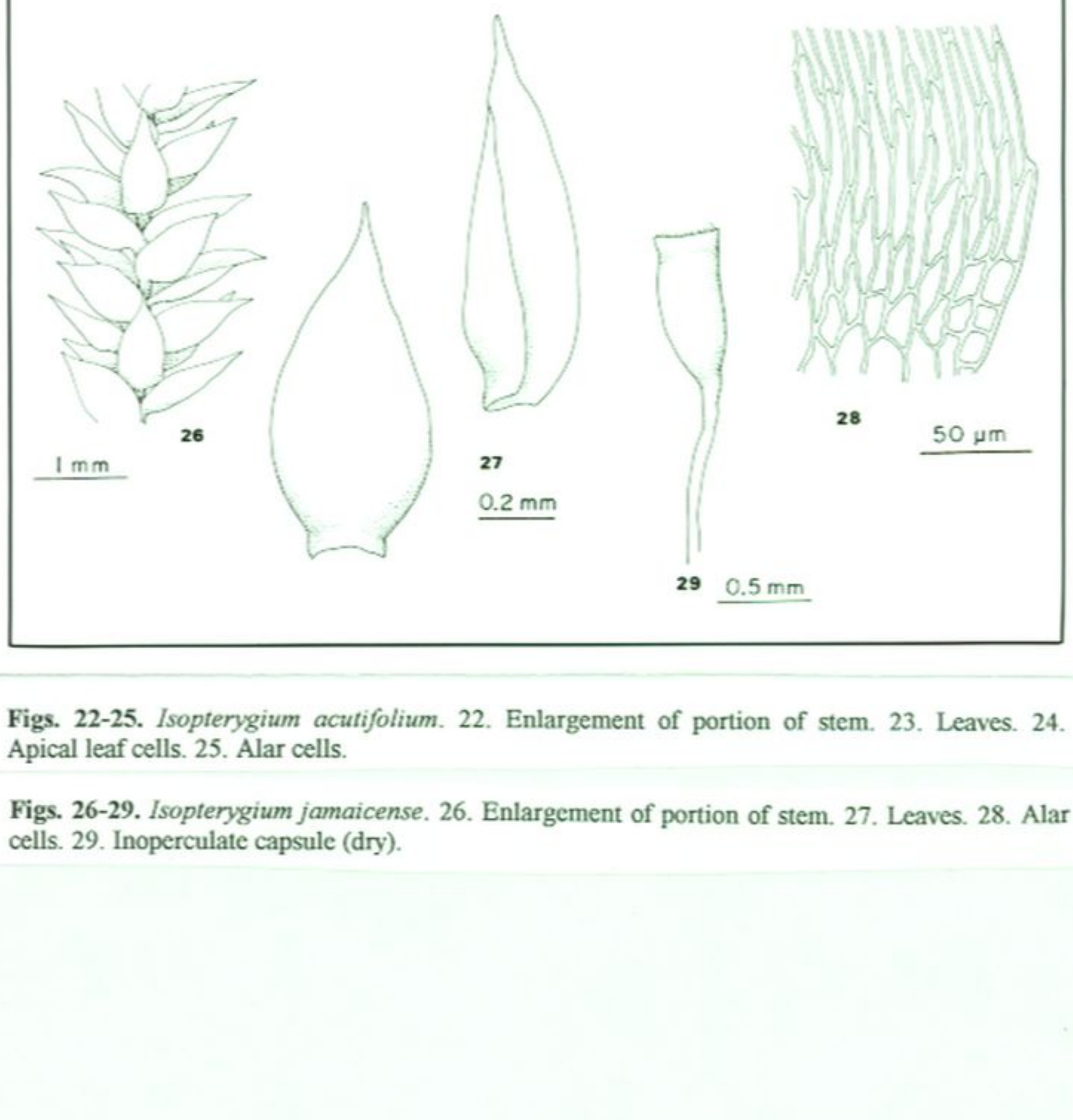
Representative specimens examined. **BRAZIL. Espírito Santo:** Domingos Martins, Reserva Florestal Pedra Azul, 1180 m, *Schäfer-Verwimp & Verwimp 10078* (CANM). **Mato Grosso:** Palmeiras, Serra do Chapada, *Lindman B413* (BM). **Rondônia:** Ridges of Serra dos Pacaás Novos, along Río Pacaás Novos, ca. 400 m, *Reese 13550, 13553* (NY). **Santa Catarina:** Munic. de Lajes, 27° 48' S, 50° 21' W, *Vital 9397* (CANM, SP). **Sao Paulo:** Itapecirica, near Barra Mansa, ca. 1000 m, *Schiffner 1572* (BM).
BOLIVIA. Chuquisaca: Prov. Luis Calvo, "Inca Huasi 2", W slope of Serranía Inca Huasi, 7 km NNE of Muyupampa (Vaca Guzmán), 19° 50' S, 63° 43' W, *Lewis 84-1050* (LPB). **Cochabamba:** Prov. Chapare, "Puerto San Francisco", between Puerto San Francisco and the alligator ranch near Río Salbasuma, 16° 41'S, 65° 10' W, *Lewis 83-1346* (LPB). **Santa Cruz:** Prov. Chiquitos, "Río Natividad", 17 km 15 S of W from San José de Chiquitos, 17° 53' S, 60° 53' W, *Lewis 85-1139* (LPB). **Tarija:** Prov. Arce, along trail from Communidad Salado to Cambari, 3.5 km N of YPFB Campamento Conchas and 53 km N of Bermejo, 22° 16' S, 64° 24' W, *Lewis 84-2442, 84-2448* (LPB); Prov. Arce, slope of Cerro Nogal, parallel to and 0.5 km N or Quebrada Nogal, 2-5 km NW of Communidad La Mamora, 22° 09' S, 64° 41' W, *Lewis 84-2169* (LPB).
ARGENTINA. **Tucumán:** Quebrada de Lules, *Garolera 6971* (FH). **Jujuy:** Arroyo de los Matos ad Sierra Santa Bárbara, *Fries 43* (H).

Isopterygium byssobolax is readily recognized because it is the smallest of all the Latin American species. The small stems reach only 1.3 cm long, 0.5-1.0 mm wide, the minute leaves are ovate to ovate-lanceolate, symmetric, acuminate, rigid, close, concave, less than 1 mm long, with distinct alar regions of short-rectangular to quadrate or transversely elongate cells in 2-4 rows with 4-10 cells on margins, setae 0.6-1.0 cm long, capsules ovoid to ellipsoid, contracted below the mouth when dry, 0.5-1.0 mm long.

5. *Isopterygium acutifolium* Irel., Bryologist 93: 343. 1990 Type. Venezuela. Bolivar, Meseta de Jáua, NNE of Mission of Campamento Sanidad of the Kanarakuni R., *Steyermark 97784* (holotype, US).

Plants light green to yellowish green, in thin mats. Stems up to 2.5 cm long, 1-2 mm wide, simple or sparingly and irregularly branched. Asexual reproductive bodies lacking. Leaves somewhat rigid, distant, flat to slightly concave, erect-spreading, smooth, scarcely contorted when





Figs. 22-25. *Isopterygium acutifolium*. 22. Enlargement of portion of stem. 23. Leaves. 24. Apical leaf cells. 25. Alar cells.

Figs. 26-29. *Isopterygium jamaicense*. 26. Enlargement of portion of stem. 27. Leaves. 28. Alar cells. 29. Inoperculate capsule (dry).

dry, 0.8-1.2 mm long, 0.4-0.5 mm wide, ovate-lanceolate or oblong, symmetric to somewhat asymmetric, acute; margins erect, serrulate from apex to leaf middle or just below; costa none or weak, short and double; cells smooth, 70-103 µm long, 7-9 µm wide; alar cells strongly differentiated, quadrate to rectangular, in several rows with 4-15 cells on margins. Sex organs and sporophytes unknown.

Illustrations: Ireland 1990 (Figs. 1-9); Ireland (in press) Flora Neotropica; Figs. 22-25.

Chromosome number: unreported.

Distribution: Known only from the type locality in Venezuela and from one locality in Guyana.

Ecology: Attached to rocks near waterfalls and in running water along rapids of rivers. Apparently at low altitudes, ca. 400 m.

Specimens examined.

VENEZUELA. Known only from type locality.

GUYANA. First falls of Essequibo River, *Richards 359* (NY).

Only known from sterile plants but easily distinguished from the other Latin American species by the acute leaves that have prominent alar regions composed of several rows of quadrate to rectangular cells with 4-15 cells on the margins. The other species have acumimate leaves and, except for *Isopterygium byssobolax*, they have only a few differentiated cells in the alar regions. *Isopterygium byssobolax* has about half the number of quadrate to rectangular alar cells that *I. acutifolium* possesses. The aquatic habit is also a clue to the identity of *I. acutifolium* since *I. affusum* is the only other aquatic species in Latin America. *Isopterygium tenerum* sometimes occurs in swamps or on river banks but it has never been found on rocks in rivers.

6. *Isopterygium jamaicense* (Bartr.) Buck, Brittonia 36: 88. 1984.

Platygyriella jamaicensis Bartr., J. Washington Acad. Sci. 26: 14. 1936. Type. Jamaica. Newmarket, *Orcutt 7263* (holotype, FH; isotype, CANM).

Plants white- to yellow-green, in thin to dense mats. Stems up to 2 cm long, 1-2 mm wide, complanate-foliate, simple or irregularly branched. Asexual reproductive bodies lacking. Leaves flaccid, close, complanate, erect to erect-spreading, smooth, 0.7-1.5 mm long, 0.3-0.5 mm wide, ovate to ovate-lanceolate, usually symmetric, acuminate; margins plane, entire or serrulate nearly to the base; costa none or rarely weak, short and double; cells smooth, 52-85 µm long, 5-9 µm wide; alar cells rectangular to quadrate, in small groups, sometimes inflated at the margins. Autoicous. Setae yellow to reddish brown, 0.5-0.8 cm long. Capsules erect to somewhat inclined, 0.5-1.3 mm long, straight, cylindric to somewhat ovoid, not or slightly contracted below the mouth when dry. Opercula short-rostrate. Peristome teeth up to 0.3 mm long, endostome segments linear, cilia lacking. Spores 14-24 µm in diameter.

Illustrations: Ireland (in press) Moss Flora of Mexico (as *I. miradoricum*); Ireland (in press) Flora Neotropica; Figs. 26-29.

Chromosome number: unreported.

Distribution: Mexico, Guatemala and Jamaica.

Ecology: In humid forests on bamboo stems and on moist soil. Occurring at low altitudes from near sea level to 350 m.

Specimens examined.

MEXICO. Oaxaca: Tuxtepec, El Cerro de Palacios, NE side of Chiltepec, *Santos 3854* (CANM, F, MICH, TENN). **Puebla:** Río Tonto, Paseo Asihualt, 150 m, *Sharp 1326a* (CANM). Tabasco, *Gilly & Hernández 307* (CANM, MICH).

GUATEMALA. Alta Verapaz, Cubilquitz, 350 m, *Türckheim 6938* (BM, FH, H). Vicinity of Puerto Barrios, near sea level, *Maxon & Hay 3072, 3076, 3078* (US).

JAMAICA. Portland: Soyo Falls, 1.3 km SW of Reach, 120 m, *Proctor 37208* (NY); 11 km NW of Muirton, John Crow Mts., 350 m, *Buck 5662* (M,).

This species is easily distinguished with sporophytes but impossible to distinguish from others,

like *Isopterygium tenerum* or *I. tenerifolium*, when sterile. It is the only Latin American species with a usually cylindric, erect to inclined capsule that is not or little contracted under the mouth when dry. The gametophyte is very similiar to *I. tenerum* except that the leaves are nearly always symmetric and no asexual reproductive bodies like those of that ubiquitous species have ever been seen.

The name *Isopterygium miradoricum* (C. Müll.) Jaeg. & Sauerb., an older species described in 1874 from Mirador, Mexico, has previously been used for plants that fit the description and type of *I. jamaicense* (Ireland 1984). However, since the type of *I. miradoricum* could not be located it seems best to use the name of a species whose type could be found. My use of *I. miradoricum* was based mainly on herbarium specimens that were named by various bryologists rather than on the description of the species. The type description states that the capsules are inclined to nodding which does not fit the capsules in the specimens that I examined. If the type of *I. miradoricum* should be found and the plants are identical to *I. jamaicense*, the former name, of course, has priority over the latter.

Pterogonidium pulchellum (Hook.) C. Müll. of the Sematophyllaceae is often confused with *Isopterygium jamaicense*. The gametophytes of the two are strikingly similiar except *Pterogonidium* is smaller and the leaves are seldom spread as much as *I. jamaicense*. Fortunately, *Pterogonidium* usually produces sporophytes and the erect capsules have a single peristome instead of a double one like species of *Isopterygium*.

7. *Isopterygium subglobosum* Herz., Biblioth. Bot. 87: 151. 1916. Type. Bolivia. Santa Rosa del Chapare, *Herzog 2738* (holotype, JE; isotypes, H, M).

Plants light green to yellowish green, in thin to dense mats. Stems up to 2.5 cm long, 1.0-1.5 mm wide, complanate-foliate, simple or irregularly and freely branched. Asexual reproductive bodies lacking. Leaves flaccid, close, concave, widespreading to squarrose, smooth, somewhat contorted when dry, 0.7-1.0 mm long, 0.3-0.5 mm wide, ovate to ovate-lanceolate, often curved and asymmetric, short to long-acuminate; margins erect, serrulate above, entire or nearly so below; costa none; cells smooth, 52-108 µm long, 7-9 µm wide; alar cells rectangular, in small groups with 1-2 cells on margins. Autoicous. Setae yellowish red to reddish, 1.4-2.2 cm long. Capsules inclined, 0.5-1.2 mm long, subglobose, not contracted below the mouth when dry. Opercula high-conic to short-rostrate. Peristome teeth up to 0.3 mm long. Spores 9-12 µm in diameter.

Illustrations: Ireland (in press) Flora Neotropica; Figs. 30-33.

Chromosome number: unreported.

Distribution: Known only from type locality in Bolivia.

Ecology: Occurring on decaying leaves at margin of creek at ca. 1700 m altitude.

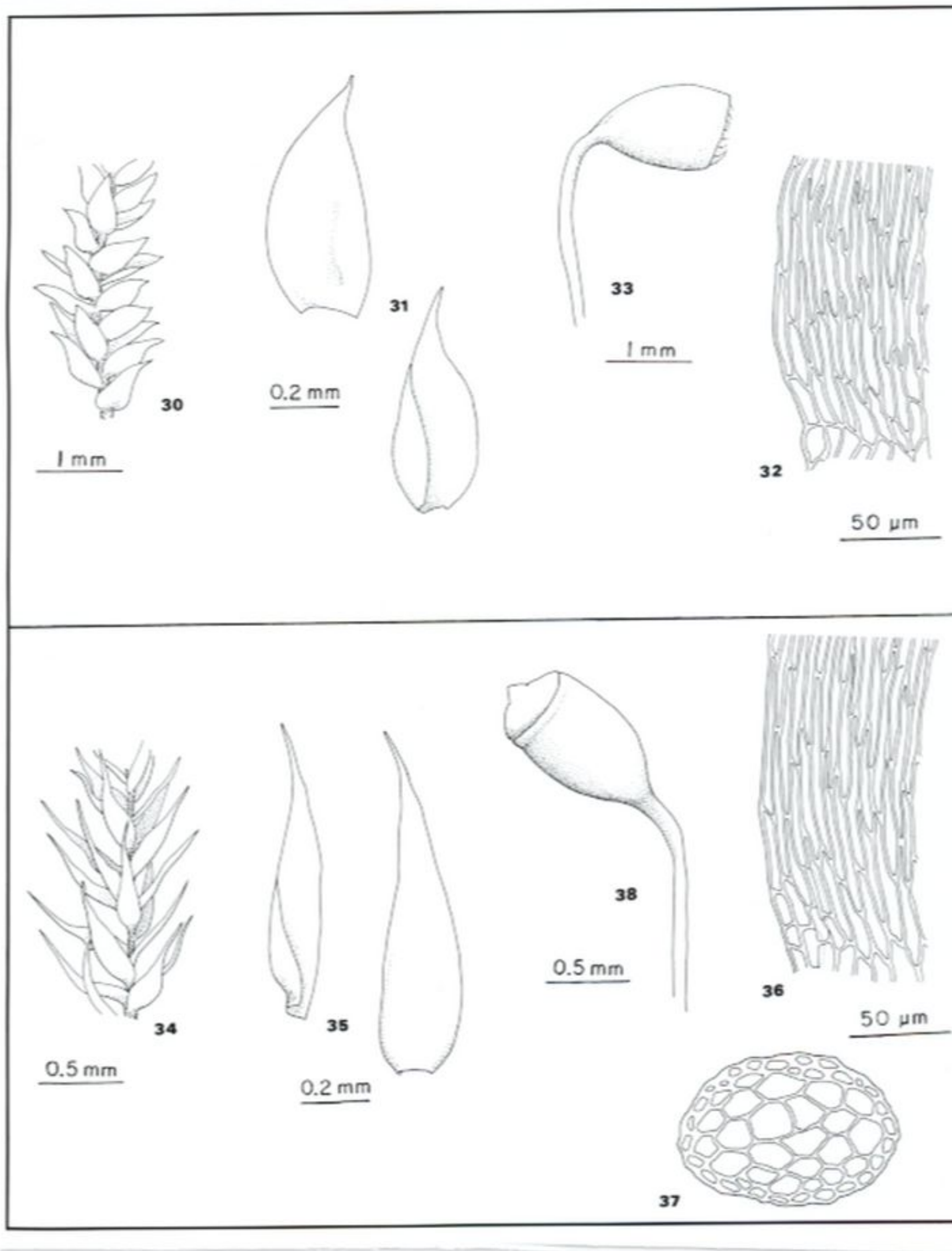
Specimens examined. Only the type seen.

This species, like the previous one, is impossible to distinguish from several of the other Latin American species when capsules are not present. The subglobose capsules that are not contracted under the mouth when dry are very distinctive but this may possibly represent an environmental response with no genetic basis. However, I have elected to retain *Isopterygium subglobosum* as a separate species until more collecting is done, especially in Bolivia where the only collection was made. The gametophytes of this species are very similiar to *I. tenerum*.

8. *Isopterygium subbrevisetum* (Hampe) Broth., Nat. Pfl. 1(3): 1081. 1908.

Hypnum subbrevisetum Hampe, Vid. Medd. Naturh. For. Kjoebenh. ser. 3,6: 165. 1875. Type. Brazil. Vicinity of Rio de Janeiro, *Glaziou 6356* (holotype, BM; isotype, H).

Taxicaulis subtenerrimus C. Müll., Hedwigia 37: 253. 1895; *Isopterygium subtenerrimum* (C.



Figs. 30-33. *Isoptergyium subglobosum*. 30. Enlargement of portion of stem. 31. Leaves. 32. Alar cells. 33. Inoperculate capsule (dry).

Figs. 34-38. *Isopterygium subbrevisetum*. 34. Enlargement of portion of stem. 35. Leaves. 36. Alar cells. 37. Cross-section of stem. 38. Operculate capsule (dry).

Müll.) Par., Ind. Bryol. Suppl. 221. 1900.

Isopterygium pusillum Ren. & Card., Bull. Soc. R. Bot. Belg. 41(1): 107. 1905.

Isopterygium tenerrimum Ren. & Card., Bull. Soc. R. Bot. Belg. 41(1): 107. 1905. nom. nud.

Plants light green to yellowish green, in thin to dense mats. Stems up to 0.8 cm long, 1.0-1.7 mm wide, irregularly and freely branched. Asexual reproductive bodies rarely present on stems, uniseriate, multicellular, simple or branched, green or brown, cells papillose. Leaves somewhat rigid, distant, somewhat concave, wide-spreading to squarrose, smooth, scarcely changed when dry, 0.5-1.0 mm long, 0.2-0.3 mm wide, lanceolate, symmetric, acuminate; margins plane, often erect below, entire to minutely serrulate; costa none or sometimes weak, short and double; cells smooth, 66-99 µm long, 5-7 µm wide; alar cells quadrate to short-rectangular, in small groups with 2-4 cells on margins. Autoicous. Setae yellow to orange, 0.5-1.0 cm long. Capsules inclined, 0.5-1.0 mm long, ovoid to ellipsoid, contracted below the mouth when dry. Opercula short-rostrate. Peristome teeth up to 0.2 mm long. Spores 9-14 µm in diameter.

Illustrations: Ireland (in press) Flora Neotropica; Figs. 34-38.

Chromosome number: unreported.

Distribution: West Indies, Costa Rica, Nicaragua, Panama, Venezuela, Surinam, French Guiana, Ecuador, Peru and Brazil.

Ecology: On tree trunks, stumps, rotten logs, humus, earth banks and occasionally limestone and serpentine rock in humid or wet forests. Occurring from 30-1940 m altitude.

Representative specimens examined.

NICARAGUA. Sandy Bay, 11 Dec. 1920, *Hamilton s.n.* (NY).

COSTA RICA. Alajuela: San Pedro de San Ramón, *Brenes 19, 20* (NY), *99* (FH, NY). **Heredia:** Finca La Selva, ca. 11 km S of Puerto Viejo, *Koch 4938* (MICH). **Limón:** Along Río Tortuguero, ca. 3 km SW of village of Tortuguero, *Steere CR-180, CR-195* (NY).

PANAMA. Cocle: Near El Valle de Anton, ca. 550 m, *Brako 8457* (NY). **Panamá:** Isla de Barro Colorado, *Arrocha 204* (NY), *204a* (PMA). **San Blas:** 23 km from Interamerican Hwy. on El Llano-Carti Road, *Allen 4960* (H, MO, NY), *4968* (MEXU, MO).

CUBA. Habana: Vicinity of Santiago de las Vegas, *Baker 691* (NY). **Las Villas:** Santa Clara, Sierra de Cantu, *León & Clement 5476* (MICH, US). **Oriente:** Sierra Maestra, Gran Piedra, near Santiago de Cuba, *Imshaug 25063* (CANM, MICH). **Santiago:** Slopes and summit of El Yunque, near Baracoa, 305-610 m, *Pollard & Palmer 104* (MO); 1-2 km W of La Gran Piedra, *Shaw 5261* (NY).

JAMAICA. Manchester: Marshall's Pen, 4.8 km WNW of Mandeville, 700 m, *Crosby 13816* (NY). **Portland:** E slope of John Crow Mts., ca. 2.4 km SW of Ecclesdown, 460 m, *Webster 5179* (CANM). **St. Ann:** Reynolds Mines area, near Lydford, *Howard & Proctor 14032* (CANM). **St. Andrew:** Summit of Coopers Hill, 775 m, *Farr 1441* (CANM). **ST. THOMAS:** Mountain trail between House Hill and Cuna Cuna Gap, 550-725 m, *Maxon 8901* (BM). **Trelawny:** Windsor estate, ca. 120 m, *Powell 335* (CANM).

HAITI. Canape Verte, above Port-au-Prince, *Mackaness 285* (MICH). Dept. de la Grand'anse, Massif de la Hotte, along small stream entering Rivière Glace at jct. of road from Beaumont to Camp Perrin, 41 km S of Roseaux, 710 m, *Buck 9060* (NY). Dept. de Nord, vicinity of Pilate, ca. 325 m, *Leonard 9594* (CANM, FH, US). Dept. de l'Ouest, above road NW of Foret des Pins, *Imshaug & Wetmore 22888* (CANM, MSC).

DOMINICAN REPUBLIC. Prov. Independencia, Sierra de Baoruco, 30.5 km S of Puerto Escondito, 1940 m, *Buck 14661* (NY). Prov. Santo Domingo, vicinity of Colonia Ramfis, 400-500 m, *Allard 16290* (NY, US). Prov. Pedernales, Las Abejas, ca. 40 km N along road from Cabo Rojo from jct. of road from Oviedo to Pedernales, 1190 m, *Reese 14959* (NY). Prov. La Vega, La Culata, 9 km NNW of Constanza, 1280 m, *Buck 5356* (NY). Prov. Dajabon, Cañada Tirolis, 1 km S of Villa Anacaona, 400 m, *Buck 4837* (NY).

PUERTO RICO. Sierra de Yabucoa, 500 m, *Britton et al. 6313* (NY). Ponce District, above Villalba, Doña Juana Recreation Area, 800-1000 m, *Buck 15984* (NY). Near Mayagüez, *Heller 4495* (F, MICH). Santa Rosa, Jayuya, *Pagán 299* (MICH, MO). Above Toro Negro Reservoir, S of Jayuya, *Steere 6878* (MICH, MO). Toro Negro Unit, Río Doña Juana, N of Villalba, *Steere 6015* (MICH, NY, US).

LEEWARD ISLANDS. Montserrat: Chauers Mtn., 610-760 m, *Shafer 806* (CANM, NY).

WINDWARD ISLANDS. Martinique: Bois de la Capote, *Stehle 4002* (NY). **Grenada:** Grand Etang, 760 m, *Howard 264* (FH).

VENEZUELA. Bolivar: Cerro Sarisariñama, Sima Mayor, 1020 m, *Buck & Brewer 15602A, 15619B* (NY).
TRINIDAD. Caura R. Valley, *Britton et al. 1224* (NY).
TOBAGO. Murray's Land, Cardiff Road, *Broadway 4292* (CANM).
SURINAM. Brokopondo: Brownsberg, near trail to Witti Creek, ca. 500 m, *Florschütz-de Waard & Zielman 5036A* (U).
FRENCH GUIANA. NE of Saül, summit S of Pio Matecho, 13 km N of Saut Nais, 590 m, *Cremers 6291* (U).
ECUADOR. Galápagos Is., Isla Santa Cruz, around Media Luna, 600-650 m, *Gradstein & Weber M-37* (F); Isabela, S slope of Volcán Alcedo, *van der Werff 1477* (U).
PERU. Santa Elena, upper Amazon, Tingo María, *Morrow 9584* (FH).
BRAZIL. Amazonas: Along the Río Negro, along BR 307, N from Sao Gabriel de Cachoeira to Cucuí, at Km 41, *Buck 2598* (NY). **Bahia:** Serra da Agua de Rega, ca. 24 km N of Seabra, road to Agua de Rega, 1000 m, *Irwin et al. 31095* (CANM). **Minas Geraes:** Vicosa, *Mexia 4499-a* (FH). **Rio de Janeiro:** Petropolis, Pedreira da Quitandinha, *Bandeira 191* (NY). **Santa Catarina:** Without locality, *Ule 970* (H). **Sao Paulo:** Sierra de Sao Pedro, Sao Pedro, 680 m, *Schäfer-Verwimp & Verwimp 9526* (NY).

The general aspect of this species is striking because of its lanceolate, slightly concave, rigid, distant, wide-spreading to squarrose leaves. The distinct leaves and the phyllotaxy will immediately identify *Isopterygium subbrevisetum* from the other Latin American species. The plants are otherwise most similar to *I. tenerum* except the leaves are somewhat narrower (0.2-0.3 mm wide) and shorter (0.5-1.0 mm long).

The leaf morphology and the phyllotaxy that sets this species apart from all the other *Isopterygium* taxa may not seem very important until one considers the North American plants. Among the hundreds of North American plants of *Isopterygium* that I studied (Ireland 1969) none of them approached the distinctive leaf morphology and the phyllotaxy of *I. subbrevisetum*.

EXCLUDED TAXA

Buck (1989) recently made *Syringothecium*, which was described by Mitten (1869) at the same time as *Isopterygium* and placed in the same tribe Stereodonteae, a synonym of *Isopterygium*. Mitten described the new genus primarily on the basis of the endostome that was longer than the exostome. Buck did not think that was a good generic distinction and since he could find no gametophytic differences he transferred two of the species contained in the genus into *Isopterygium*, namely *I. sprucei* (Mitt.) Buck and *I. brasiliense* (Broth.) Buck. The only other species in the genus, *S. nemodontium* Herz., was considered a synonym of *I. sprucei*. After examining the type of the genus *Syringothecium*, *S. sprucei* Mitt. (Ecuador, Andes Quitenses, Montana de Canelos, *Spruce 1517*, holotype, NY), as well as *S. brasiliense* Broth. (Brazil, Paraná, Serra do Mar, Ypirango, *Dusen 3895*, slide of lectotype, NY), I believe the genus should remain distinct from *Isopterygium*. Therefore, I have excluded the two species that Buck recently transferred into *Isopterygium*, i.e. *I. sprucei* and *I. brasiliense*, and I have left them in the genus *Syringothecium*.

The primary reason for recognizing *Syringothecium* is because of the long, 450-600 µm, narrow peristome teeth that are more or less erect when dry. In *Isopterygium*, on the other hand, the plants have short, 200-350 µm, broad teeth that are incurved when dry. The peristome distinction (i.e., the endostome that is longer than the exostome) that influenced Mitten to describe *Syringothecium* is also valid. However, other genera, even *Isopterygium*, have this feature although not to the same degree as *Syringothecium* whose endostome segments are often 100 µm longer than the exostome teeth.

The gametophytes of *Isopterygium* and *Syringothecium* are similar except plants of the latter sometimes have a basal row of large, somewhat swollen cells compared to the smaller, slightly enlarged but seldom swollen cells of the former. This feature may have been the reason that Fleischer (1923) and later others like Brotherus (1925) placed *Syringothecium* in the Sematophyllaceae since many of its taxa have somewhat similar bubble-like basal cells.

Because of the differences between *Syringothecium* and *Isopterygium*, especially in the peristome, I have elected to exclude the two species *S.*

sprucei Mitt. and *S. brasiliense* Broth. from the genus *Isopterygium*.

NOMINA DUBIA

The status of the following Latin American taxa must remain unknown until their types can be found and examined.

Isopterygium brevisetum (Hornsch.) Broth., Nat. Pfl. 1(3): 1081. 1908; *Hypnum brevisetum* Hornsch., Fl. Bras. 1(2): 78. 1840. Type. Brazil. Near Rio de Janeiro, July & August, *Merkel s.n.* Type apparently not in BM.

Isopterygium chrismarii (C. Müll.) Mitt., J. Linn. Soc. Bot. 12: 500. 1869; *Hypnum chrismarii* C. Müll., Syn. 2: 682. 1851. Type. Mexico. Michoacán, Cerro San Andrés, March 1849, *Chrismar s.n.*

Isopterygium exiguum Kindb., Enum. Bryin. Exot. 100. 1891; *Hypnum exiguum* Geheeb & Hampe *in* Hampe, Vid. Medd. Naturh. For. Kjoebenh. ser. 4,1: 140. 1879, hom. illeg. Type. Brazil. Near Apiahy, June 1877, *Puiggari s.n.* Type apparently not in BM.

Isopterygium exile (C. Müll.) Par., Ind. Bryol. Suppl. 219. 1900; *Taxicaulis exilis* C. Müll., Hedwigia 36: 116. 1897. Type. Paraguay. *Balansa 3619.*

Isopterygium fruticola (C. Müll.) Par., Ind. Bryol. Suppl. 219. 1900; *Taxicaulis fruticola* C. Müll., Hedwigia 37: 252. 1898, "*fruticolus*". Type. Surinam. Near Paramaribo, August 1844, *Kegel s.n.*

Isopterygium gracillimum (Hornsch.) Broth., Nat. Pfl. 1(3): 1081. 1908; *Hypnum gracillimum* Hornsch., Fl. Bras. 1(2): 78. 1840. Type. Brazil. Province Minarum, collector unknown. Type apparently not in BM.

Isopterygium hookeriophilum (C. Müll.) Broth., Nat. Pfl. 1(3): 1083. 1908; *Taxicaulis hookeriophilus* C. Müll., Hedwigia 40: 67. 1901. Type. Brazil. Sao Paulo: 1891, *Wohltmann s.n.*

Isopterygium microplumosum (C. Müll.) Broth., Nat. Pfl. 1(3): 1083. 1908; *Taxicaulis microplumosus* C. Müll., Hedwigia 40: 68. 1901. Type. Brazil. Minas Gerais: Serra Ouro Preto, *Ule 1486.*

Isopterygium miradoricum (C. Müll.) Jaeg. & Sauerb., Ber. St. Gall. Naturw. Ges. 1876-77: 436. 1878; *Hypnum miradoricum* C. Müll., Linnaea 38: 650. 1874. Type. Mexico. Mirador, April 1873, *Sartorius s.n.*

Isopterygium pseudosubulatum (C. Müll.) Par., Ind. Bryol. Suppl. 220. 1900; *Taxicaulis pseudosubulatus* C. Müll., Flora 83: 340. 1897. Type. Venezuela. *Goebel s.n.*

Isopterygium pygmaeocarpum (C. Müll.) Broth., Nat. Pfl. 1(3): 1081. 1908; *Taxicaulis pygmaeocarpus* C. Müll., Hedwigia 40: 66. 1901. Type. Brazil. Santa Catarina: Tubarao, *Ule 973.*

Isopterygium sapricola (C. Müll.) Broth., Nat. Pfl. 1(3): 1083. 1908; *Taxicaulis sapricola* C. Müll., Hedwigia 40: 67. 1901. Type. Brazil. Rio de Janeiro: Monte Corcovado, *Ule 165.*

Taxicaulis sapricola var. *minor* C. Müll., Hedwigia 40: 68. 1901. Type. Brazil. Rio de Janeiro: Monte Corcovado, *Ule 1722.*

Isopterygium subcurvicolle (C. Müll.) Par., Ind. Bryol. ed. 2,3: 125. 1905, "subcurvicollum"; *Taxicaulis subcurvicollis* C. Müll., Hedwigia 40: 65. 1901. Type. Brazil. Santa Catarina: April 1888, *Ule s.n.*; Tubarao, *Ule 640, 783*; Serra Geral, *Ule 1202.*

Isopterygium subsplendidulum (C. Müll.) Par., Ind. Bryol. Suppl. 221. 1900; *Taxicaulis subsplendidulus* C. Müll., Bull. Herb. Boiss. 5: 210. 1897. Type. Guatemala. Mazatenango, *Bernoulli & Cario 75, 84.*

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Results of a lichenological and bryological exploration of Cerro Guaiquinima (Guayana Highland, Venezuela)

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Abstract: 214 Lichen and 38 bryophyte species are reported from Cerro Guaiquinima, a sandstone table mountain in southeastern Venezuela, thus far almost unexplored for these groups and apparently undisturbed by man. Slightly over half of these species have also been reported from the north slope of Mount Roraima and surroundings, a nearby area with similar edaphic and climatological conditions. Altitudinal differences in the flora are probably largely dependent on differences in vegetation structure: the closed forests at the foot harbour more Thelotremataceae, whereas in the open vegetation of the rocky plains on the summit more Cladoniaceae and Trypetheliaceae are found. On the highest site bryophytes are more frequent. First descriptions are given for nine lichens and one moss: *Buellia bellardii* Sipman, *Hypotrachyna adaffinis* Sipman, *Myriotrema flavolucens* Sipman, *Myriotrema squamuloides* Sipman, *Ocellularia croceoisidiata* Sipman, *Ocellularia glaucoglyphica* Sipman, *Thelotrema carneoradians* Sipman, *Thelotrema guaiquinimae* Sipman, *Sphagnum sipmanii* Crum and *Ocellularia sinuosa* Sipman (in appendix, from Colombia). *Myriotrema guianense* is reduced to synonymy of *Myriotrema columellatum* (A. Zahlbr.) Sipman, comb. nov.

Resumen: Se comunica la presencia de 214 liquenes y 38 briófitos en el Cerro Guaiquinima, una meseta de arenisca en el SE de Venezuela. Hasta la fecha la flora de líquenes y briófitos de esta área, que parece nunca haber sufrido alguna influencia humana, era prácticamente desconocida. Un poco más que la mitad de esta flora también ha sido encontrada en la región del Monte Roraima, un área vecina muy similar. Es probable que las diferencias altitudinales de la flora dependen principalmente de las diferencias en la estructura de la vegetación: en los bosques cerrados en la base del Cerro hay más Thelotremataceae, mientras que en la sabana rocosa de la cumbre se encuentran más Cladoniaceae y Trypetheliaceae. En el sitio más alto ocurren más briófitos. Se presentan las primeras descripciones para nueve líquenes y un musgo: *Buellia bellardii* Sipman, *Hypotrachyna adaffinis* Sipman, *Myriotrema flavolucens* Sipman, *Myriotrema squamuloides* Sipman, *Ocellularia croceoisidiata* Sipman, *Ocellularia glaucoglyphica* Sipman, *Thelotrema carneoradians* Sipman, *Thelotrema guaiquinimae* Sipman, *Sphagnum sipmanii* Crum y *Ocellularia sinuosa* Sipman (en el apéndice, de Colombia). Además *Myriotrema guianense* esta incluida en *Myriotrema columellatum* (A. Zahlbr.) Sipman comb. nov.

Guayana Highland is the term often used in botanical literature for a number of isolated mountains in southeastern Venezuela, adjacent Brazil and Guyana with extensive rocky plains on their summits raising to about 1000-3000 m. They are mainly composed of sandstone (Roraima Sandstone), and many of them are of a very pronounced table shape, probably due to the presence of more resistant quartzitic layers. Owing to the very poor mineral content of the sandstone, most of the Highland has infertile, acid soils on which only a sparse, discontinuous vegetation occurs. The prevailing humid tropical climate frequently leads to bog-formation. The mountains emerge from extensive lowlands that hardly ever reach 500 m elevation, and their sides are often formed by vertical cliffs several hundred meters high. They thus constitute rather isolated habitats. Botanical exploration revealed the presence of a high degree of endemism in the phanerogam flora of the mountain summits (Maguire 1970). As an explanation it was supposed that during Pleistocene periods of drought the high table mountains constituted humid refugia that allowed for the survival of an ancient flora. Successive explorations, however, revealed that the local element in the flora is not restricted to the mountain tops and that there are strong relations between the mountain flora and the lowland flora of the area (Steyermark 1979, Huber 1988).

So far the lichen and bryophyte floras of the area have received little attention. The only paper dealing explicitly with lichens of the area concerns Cladoniaceae (Ahti 1987). It reports the presence of a surprisingly rich local element in this family, comprising a.o. *Cladina densissima* Ahti (Ahti 1984), *Cladonia steyermarkii* Ahti, *C. vareschii* Ahti (Ahti 1986), *Cladina argentea* Ahti (Ahti 1986a), *C. guianensis* Stenroos (Stenroos 1989), *C. sufflata* Ahti and *C. variegata* Ahti (Ahti 1990). The endemic species are not restricted to the mountain summits, however, but spread over the surrounding lowlands as well: Most endemic taxa are found on the table tops and in the surrounding white-sand savannas. Thus the view of Steyermark and Huber is confirmed.

For bryophytes more literature is available. An inventory of the slopes and surroundings of Mount Roraima is presented by Gradstein & Florschütz-de Waard (1989), who record 300 taxa, including 11 new species. Robinson (1986) discusses the endemic element of the Highland, and Schuster (1990) discusses the origins of hepatic flora. Gradstein et al. (1990) mention a Guayana Highlands element in a discussion of the bryophyte diversity in the Guianas.

As to the lichen and bryophyte flora of Cerro Guaiquinima, a short and probably incomplete literature search revealed only two reported species: *Cladonia pulviniformis* and *C. variegata* (Ahti 1990).

Material and methods

An international scientific expedition to Cerro Guaiquinima, organized in 1990 by the Fundacion para el Desarrollo de las Ciencias Físicas, Matemáticas y Naturales (FUDECI) in Caracas, Venezuela, provided a good opportunity for an investigation of the lichen flora of one of the table mountains. Facilities were made available which allowed for an investigation of the lichen and bryophyte flora in a range of different habitats and elevations.

Cerro Guaiquinima is a sandstone table mountain situated on the East bank of the Río Paragua in Estado Bolivar, Venezuela, in the western part of the Guayana Highland. It is one of the largest tepuis and at the same time one of the lowest. Its summit plain, which comprises about 1600 km², ranges in elevation from 800 m in the central part to c. 1600 m on the western rim. It is connected fairly well with the surrounding lowlands by a river canyon, which leads from the central part to the surrounding lowlands at c. 300 m. For a more detailed description see Steyermark and Dunkerville (1980).

During the expedition 7 numbered camps were made available, one at the southern foot of the mountain and 6 spread over the tablelands on top. The following 5 have been visited:

Camp 2: Situated near the NE edge of the summit plateau, c. 5°54' N, 63°27' W, c. 1100-1200 m. The area consists of rather dry and exposed rocky tableland with denudated rock flats, scarcely vegetated sand flats, boggy herb

vegetation and scrub. In a narrow valley up to c. 15 m tall forest occurs. Observation period: 7-10 February 1990.

Camp 3: Situated in the central part of the summit plateau, at the Río Carapó, c. 5°49' N, 63°32' W, c. 800 m. The area consists of a very rugged slope south of the river, with stunted forest in clefts between boulders, tall cliffs and rock flats, and some low, only periodically boggy vegetation on the rock flats. Observation period: 11-13 February 1990.

Camp 4: Situated in the central part of the summit plateau, c. 5°40' N, 63°34' W, c. 950-1000 m. The camp is situated in wet tableland largely covered with boggy *Stegolepis* vegetation and scattered scrub in fissures. On an adjacent rocky slope towards the upper part of Río Carapó stunted mossy forest was available. Observation period: 4-6 February 1990.

Camp 5: Situated in the highest part of the mountain, near the western rim of the summit plateau, c. 5°48' N, 63°40' W, c. 1500 m. The area consists largely of blanket bog with *Stegolepis*, which covers all gentle slopes. It is interrupted by some scattered rock outcrops, a small stream valley and mossy dwarf forest mainly on steeper slopes. Observation period: 13-15 February 1990.

Camp 7: Situated at the southern foot of the mountain, at the confluence of the rivers Carapó and Lima, c. 5°35' N, 63°32' W, c. 320-350 m. The area is completely covered by c. 15 m tall, light forest on poor soil, on both sides of the Carapó. A few rock outcrops were encountered on the river shore. Observation period: 31 January - 3 February, 16 February 1990.

Camp 8: The surroundings of Canaima, c. 6°15' N, 62°52' W, c. 600 m. This was not a official expedition camp. The area visited includes forest on a slope along the river, near the waterfall and the rocky plateau with scattered scrub, above the slope. Observation period: 30 January, 19 February 1990.

The collected samples were studied with the usual optical equipment (compound microscope, dissecting microscope) and chemical spot tests (described by e.g. White & James (1985). A number of samples were analyzed by thin-layer chromatography, following the usual standardized procedures (White & James 1985). Most samples were run with solvent system A only; for the distinction between fumarprotocetraric acid, protocetraric acid and the "cinchonarum" unknown, solvent system G (Culberson et al. 1981) was used; for the distinction between lecanoric and gyrophoric acid solvent system C. All plates were developed by sulphuric acid treatment. SEM-observations of air-dried specimens were made for the preparation of some illustrations.

Results

During the fieldwork 1002 samples of lichens and 106 samples of bryophytes were taken. They are deposited in VEN, with an almost complete set of duplicates in B. The lichen samples represent 214 identified species, of which 7 are described here for the first time, while about 370 samples are still unidentified. The bryophytes comprise 38 identified species, of which one is described as new, while 45 specimens remain unidentified.

The observed taxa are presented in the following, taxonomically arranged list, with indications of ecology and distribution, available samples (coll. Sipman) and sampling sites, and occasional annotations. For the lichens the taxonomical arrangement of Sipman & Aptroot (1992) is followed, for the bryophytes Gradstein & Florschütz-de Waard (1989). For chromatographed specimens the TLC results are included.

Lichenes

ASCOMYCETES

ARTHONIALES

Arthoniaceae

Arthonia accolens Stirt. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27279.

Arthonia aciniformis Stirt. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27279b.

Arthonia mira R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27278.

Arthonia trilocularis Müll. Arg. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27279c.

Cryptothecia candida (Kremp.) R. Sant. - Folii-

vegetation and scrub. In a narrow valley up to c. 15 m tall forest occurs. Observation period: 7-10 February 1990.

Camp 3: Situated in the central part of the summit plateau, at the Río Carapó, c. 5°49' N, 63°32' W, c. 800 m. The area consists of a very rugged slope south of the river, with stunted forest in clefts between boulders, tall cliffs and rock flats, and some low, only periodically boggy vegetation on the rock flats. Observation period: 11-13 February 1990.

Camp 4: Situated in the central part of the summit plateau, c. 5°40' N, 63°34' W, c. 950-1000 m. The camp is situated in wet tableland largely covered with boggy *Stegolepis* vegetation and scattered scrub in fissures. On an adjacent rocky slope towards the upper part of Río Carapó stunted mossy forest was available. Observation period: 4-6 February 1990.

Camp 5: Situated in the highest part of the mountain, near the western rim of the summit plateau, c. 5°48' N, 63°40' W, c. 1500 m. The area consists largely of blanket bog with *Stegolepis*, which covers all gentle slopes. It is interrupted by some scattered rock outcrops, a small stream valley and mossy dwarf forest mainly on steeper slopes. Observation period: 13-15 February 1990.

Camp 7: Situated at the southern foot of the mountain, at the confluence of the rivers Carapó and Lima, c. 5°35' N, 63°32' W, c. 320-350 m. The area is completely covered by c. 15 m tall, light forest on poor soil, on both sides of the Carapó. A few rock outcrops were encountered on the river shore. Observation period: 31 January - 3 February, 16 February 1990.

Camp 8: The surroundings of Canaima, c. 6°15' N, 62°52' W, c. 600 m. This was not a official expedition camp. The area visited includes forest on a slope along the river, near the waterfall and the rocky plateau with scattered scrub, above the slope. Observation period: 30 January, 19 February 1990.

The collected samples were studied with the usual optical equipment (compound microscope, dissecting microscope) and chemical spot tests (described by e.g. White & James (1985). A number of samples were analyzed by thin-layer chromatography, following the usual standardized procedures (White & James 1985). Most samples were run with solvent system A only; for the distinction between fumarprotocetraric acid, protocetraric acid and the "cinchonarum" unknown, solvent system G (Culberson et al. 1981) was used; for the distinction between lecanoric and gyrophoric acid solvent system C. All plates were developed by sulphuric acid treatment. SEM-observations of air-dried specimens were made for the preparation of some illustrations.

Results

During the fieldwork 1002 samples of lichens and 106 samples of bryophytes were taken. They are deposited in VEN, with an almost complete set of duplicates in B. The lichen samples represent 214 identified species, of which 7 are described here for the first time, while about 370 samples are still unidentified. The bryophytes comprise 38 identified species, of which one is described as new, while 45 specimens remain unidentified.

The observed taxa are presented in the following, taxonomically arranged list, with indications of ecology and distribution, available samples (coll. Sipman) and sampling sites, and occasional annotations. For the lichens the taxonomical arrangement of Sipman & Aptroot (1992) is followed, for the bryophytes Gradstein & Florschütz-de Waard (1989). For chromatographed specimens the TLC results are included.

Lichenes

ASCOMYCETES

ARTHONIALES

Arthoniaceae

Arthonia accolens Stirt. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27279.

Arthonia aciniformis Stirt. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27279b.

Arthonia mira R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27278.

Arthonia trilocularis Müll. Arg. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27279c.

Cryptothecia candida (Kremp.) R. Sant. - Folii-

colous in undergrowth of forest, c. 320 m. Camp 7: 26426.

Cryptothecia rubrocincta (Ehrenb.) Thor - In scrub on exposed ridge and in mossy forest along streamlet, c. 1250-1500 m. Camp 2: 26775; camp 5: 27185.

In addition, 6 unidentified specimens, belonging to *Arthonia* and *Stirtonia*.

Opegraphaceae

"*Chiodecton*" *myrtillicola* Fée - On twigs of shrub at margin of stunted mossy forest in *Stegolepis* bog, c. 1500 m. Camp 5: 27233. This species is not included in the genus *Chiodecton* anymore in a recent revision (Thor 1990) and its correct position is uncertain.

Chiodecton sphaerale Ach. - In scrub on sandstone plateau or in clefts, c. 800-1000 m. Camp 3: 27058; camp 4: 26575.

Mazosia bambusae (Vainio) R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27312.

Mazosia dispersa (Hedrick) R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27334.

Mazosia melanophthalma (Müll. Arg.) R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27309.

Mazosia pilosa Kalb & Vezda - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27310. The density of the hairs is very variable, very evident on some specimens, and scarce and restricted to small parts of the thallus on others.

Mazosia praemorsa (Stirt.) R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27311.

Mazosia rotula (Mont.) Mass. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27314.

Mazosia rubropunctata R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27313.

Mazosia tumidula (Stirt.) Müll. Arg. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27315.

In addition, 26 unidentified specimens, provisionally placed in the genera *Chiodecton*, *Enterographa*, *Helminthocarpon*, *Melaspilea*, *Opegrapha* and *Schismatomma*.

CALICIALES

Caliciaceae

Tylophoron protrudens Nyl. - Epiphyte in 15 m tall or lower forest, c. 320-800 m. Camp 3: 26982, 26987 (anamorph); camp 7: 26307.

Coniocybaceae

Chaenotheca brunneola (Ach.) Müll. Arg. - In c. 15 m tall forest, c. 320 m. Camp 7: 26434.

DOTHIDEALES

Arthopyreniaceae

3 unidentified specimens, probably in the genera *Arthopyrenia* and *Mycomicrothelia*.

GRAPHIDALES

Graphidaceae

Graphina marcescens (Fée) Müll. Arg. - Epiphyte in c. 15 m tall forest and in low, mossy forest, c. 320-1100 m. Camp 2: 26859, 26884; camp 7: 26405.

Graphis grammitis Fée - Epiphyte in c. 15 m tall forest, c. 350 m. Camp 7: 26363.

Phaeographis exaltata (Mont. & v.d. Bosch) Müll. Arg. - Epiphytic on smooth bark in mossy stunted forest, c. 1500 m. Camp 5: 27159, 27182, 27221.

In addition, 20 unidentified specimens of *Graphina*, 43 of *Graphis*, 5 of *Phaeographina* and 6 of *Phaeographis*. This family forms the main gap in the knowledge of the lichen flora.

Thelotremataceae

Chroodiscus coccineus (Leight.) Müll. Arg. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27298.

Myriotrema calvescens (Fée) Hale - Epiphyte, mostly on treetrunks, in mostly well-developed forest, c. 320-1500 m. Camp 2: 26862; camp 5: 27158a, 27206, 27220; camp 7: 26413, 26482. TLC: psoromic acid.

Myriotrema clandestinum (Fée) Hale - Epiphyte in stunted, more or less mossy forest, c. 950-1250 m. Camp 2: 26784, 26856; camp 4: 26663. TLC: psoromic acid and un-

known substances.

Myriotrema columellatum (Zahlbr.) Sipman, *comb. nov.* Basionym: *Ocellularia columellata* A. Zahlbruckner 1909, Denkschr. math.-naturw. Kl. K. Akad. Wiss. Wien 83: 117. *syn.*: *Myriotrema guianense* Sipman, Tropical Bryology 5: 83 - Epiphyte in understorey of c. 15 m tall forest, c. 320-600 m. Camp 7: 26374, 26436, 26468; camp 8: 27275. TLC: psoromic acid. After finishing the treatment of Roraima lichens (Sipman & Aptroot 1992) the author had the opportunity to investigate the probable type of *Ocellularia columellata* Zahlbr., preserved in W. This specimen bears the locality information mentioned by Redinger (1936: 58) but lacks any original notes by Zahlbruckner. Since no other specimen seems to be present in W, it might well be the holotype, and otherwise should be considered as lectotype. The specimen appeared to contain psoromic acid (annotation of TLC-result by Hale 1972), and its spores have the same shape and iodine-reaction as *M. guianense*. Consequently it falls within the morphological range of variation of the latter, and this has to be reduced into synonymy. As explained by Sipman & Aptroot (1992), the reason to include the species in *Myriotrema* lays in its close similarity with *M. wrightii* and *M. subwrightii*.

Myriotrema concretum (Fée) Hale - Epiphyte in stunted forest, c. 1200-1500 m. Camp 2: 26854; camp 5: 27209. TLC: psoromic acid and unknown substances.

Myriotrema congestum (Hale) Hale - Epiphyte in understorey of c. 15 m tall forest and in stunted, more or less mossy forest, and on quartzite outcrops in scrub, c. 320-1200 m. Camp 2: 26709, 26865, 26903; camp 4: 26593, 26681; camp 7: 26443, 26479. TLC: hypoprotocetraric acid, sometimes with additional traces, in saxicolous specimens (26593, 26709) with lichexanthone.

Myriotrema flavolucens Sipman, *sp. nov.*
Fig. 1.
Type: Venezuela, Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 2, near NE edge of upper plateau, coord. c. 5°54' N, 63°27' W, alt. c. 1200 m, rocky sandstone area with scattered scrub, 9 February 1990, H. Sipman 26822 (VEN holotypus, B).

Diagnosis: Thallus corticola, epiphloeodes, 10 cm diametro vulgo superans, pallide flavocinereus, laevis, opacus, continuus, lichexanthonum continens. Apothecia immersa vel paululo emersa, frequentia, margine non carbonaceo plano, columella absenti, c. 0.3 mm diam., poro a circula excipulari nigra constricta; hymenium 75-80 µm altum, hyalinum; sporae hyalinae, transversaliter 5-(3-6-)septatae, octonae, I+ purpureae, c. 18-25 x 7-8 µm.

Thallus corticolous, epiphloeodal, up to at least 10 cm diam., pale yellow-grey, smooth but slightly mealy, dull, continuous, without vegetative propagules, c. 60-80 µm thick; cortical layer of loose hyphae c. 40 µm thick, filled with small crystals (lichexanthone); TLC: lichexanthone only; algae subglobose, c. 6 µm diam.; medulla with or without groups of large crystals. Apothecia immersed or very slightly emergent, in the upper tree bark layer, frequent, single, without carbonized margin or columella, round, c. 0.3 mm diam., pore filled by blackish excipular material, rim same as the thallus; excipulum browned, multi-layered, without periphyses; hymenium c. 75-80 µm high, clear; paraphyses not thickened at apex; spores hyaline, transversely 5(3-6)-septate, 8 per ascus, I+ purplish, 18-25 x 7-8 µm.

Myriotrema flavolucens agrees with e.g. *M. squamuloides* (see below) in apothecium structure, therefore it has been included in *Myriotrema*. It differs by the spore pigmentation and I-reaction, and by its thallus structure and chemistry. The nature of the crystals in the cortical layer was determined as lichexanthone by dissolving the crystals with acetone: the residue fluoresces UV+ yellow. Few Thelotremataceae seem to have lichexanthone as only substance, none very similar to *M. flavolucens*.

Distribution and ecology: So far known from three collections from the tableland on Cerro Guaiquinima, Guyana Highlands, Venezuela. It

grows on twigs or somewhat thicker trunklets of shrubs in humid savannah vegetation on very oligotrophic sandstone flats at 1000-1500 m alt.

Additional material: Camp 4: 26571; Camp 5: 27235.

Myriotrema insigne (Zahlbr.) Hale - Epiphyte in stunted, mossy forest, c. 950 m. Camp 4: 26631. TLC: psoromic acid, unknown substance.

Myriotrema myrioporoides (Müll. Arg.) Hale - Epiphyte in c. 15 m tall forest, c. 320 m. Camp 7: 26462. TLC: hypoprotocetraric acid.

Myriotrema neofrondosum Sipman - Epiphyte in stunted forest, c. 1200 m. Camp 2: 26855. TLC: hypoprotocetraric acid, div. unknown substances.

Myriotrema squamuloides Sipman, *sp. nov.* Fig. 2.

Type: Venezuela, Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 7, at confluence of rivers Carapo and Lima, coord. c. 5°35' N, 63°32' W, alt. c. 320 m, c. 15 m tall, light forest on poor soil on W-bank of Carapo, 3 February 1990, H. Sipman 26477 (VEN holotypus, B).

Diagnosis: Thallus corticola, epiphloeodes, 10 cm diametro vulgo superans, olivaceocinereus ad olivaceoviridis, rugulosus vel subsquamoso-areolatus, opacus, minute reticulatofissus, acidum lichenicum ignotum continens. Apothecia immersa, frequentia, singula vel bina vel terna, margine non carbonaceo plano, columella absenti, c. 0.2 mm diam., poro a circula excipulari fusca constricta; hymenium c. 60 µm altum, hyalinum; sporae fuscae, transversaliter 5-septatae, octonae, I-negativae, c. 12-20 x 6-7 µm.

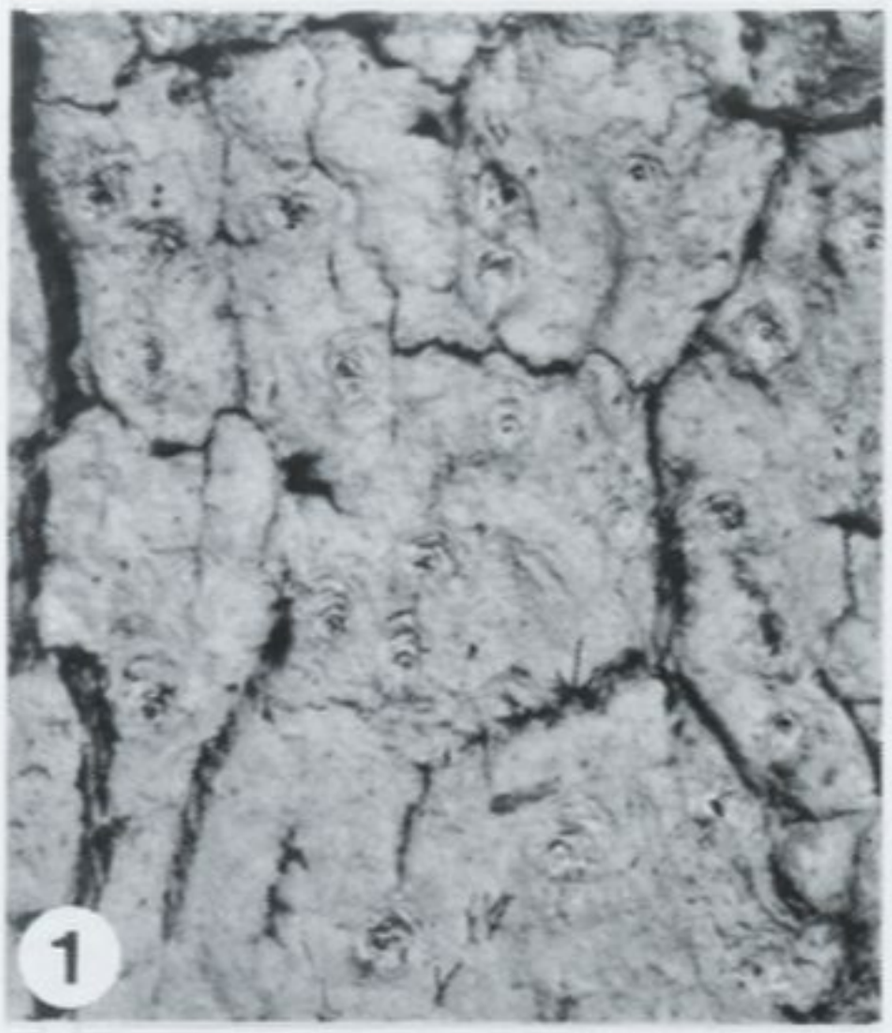
Thallus corticolous, epiphloeodal, up to at least 10 cm diam., olivaceous green-grey, rugulose to subsquamulose-areolated, dull, minutely reticulate-cracked, without vegetative propagules, c. 50-100 µm thick; cortical layer composed of densely agglutinated hyphae, c. 15 µm thick, in the depressions between the areoles much thinner, internally splitting (cf. Hale 1981: 236, fig. 4d); areoles c. 0.2 mm diam., usually with convex surface, with thickened cortex, in part geotropically directed and subsquamulose, especially near the apothecia; TLC: unknown substance (spot in Rf class 1-2 with solvent system A, pale greenish after charring); algal cells subglobose, c. 6 µm diam.; medulla without crystals. Apothecia immersed in the thallus, frequent, single or in small groups of 2-3, without carbonized margin or columella, round, c. 0.2 mm diam., with pale brownish excipular ring usually filling most of the pore, surrounded by geotropically oriented thallus areoles; excipulum without periphyses; hymenium c. 60 µm high, clear; paraphyses not thickened at apex; spores brown, transversely 5-septate, 8 per ascus, I-negative, when young slightly I+ purplish, 12-20 x 6-7 µm.

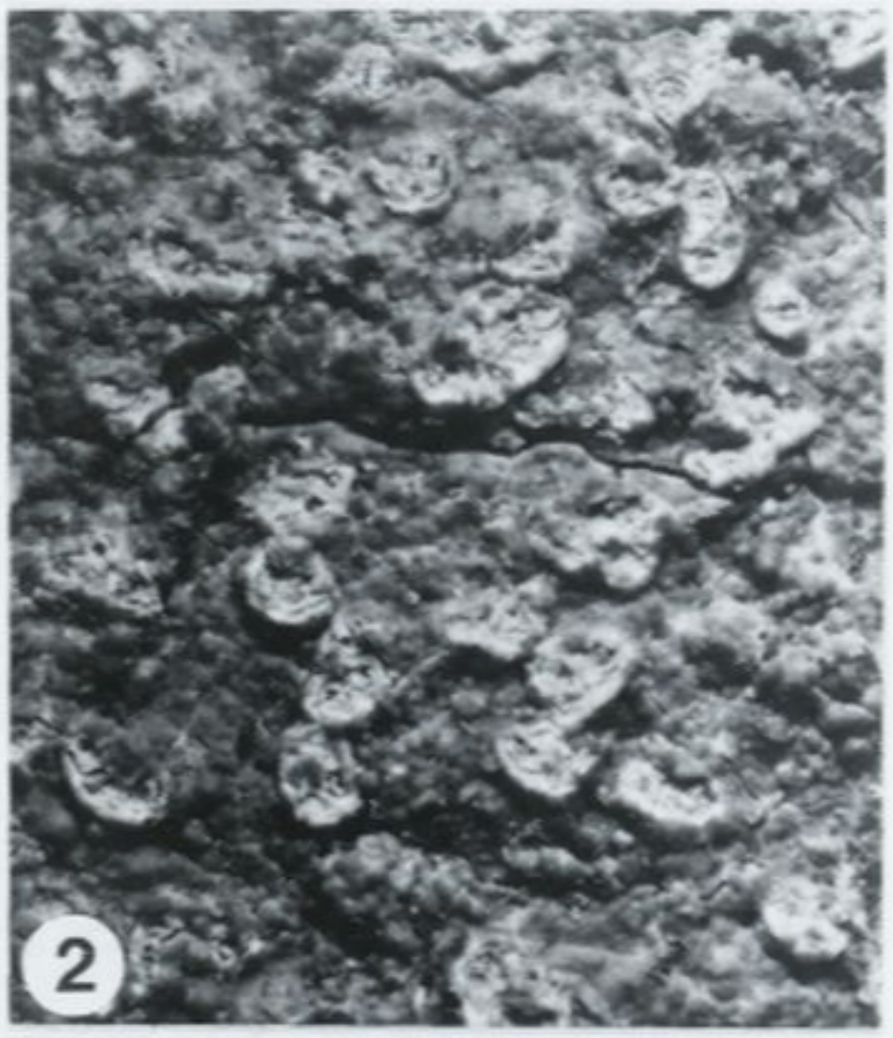
This new species seems to be a close relative of *M. subdactyliferum* Sipman as shown by its apothecium structure and spores. The subsquamulose thallus is not known from other members of the family, and together with the chemistry it makes the species well characterized. The unknown substance gives a greenish spot in class 1-2 with solvent system A and sulphuric acid-treatment.

Distribution and ecology: A rather common component of the lichen flora on smooth thin treetrunks on low forest on poor soil at the foot of Cerro Guaiquinima; also found in a similar situation at the foot of Cerro La Neblina. Both localities are in southern Venezuela, their elevation ranges from c. 140-320 m.

Additional specimens: Camp 7: 26460, 26483a. VENEZUELA, Depto. Río Negro, Cerro de la Neblina, along Río Mawarinuma, just outside Cañon Grande, 21 February 1984, W. R. Buck 11047 (NY), pr. p. (main part is *Thelotrema sinuosa*, see below).

Myriotrema subwrightii (Hale) Hale - Epiphyte in understorey of c. 15 m tall, more or less mossy forest, c. 320-1100 m. Camp 2: 26900; camp 7: 26373, 26414. TLC: psoromic acid with traces of stictic acid agg. (a.o. hypostictic acid?)





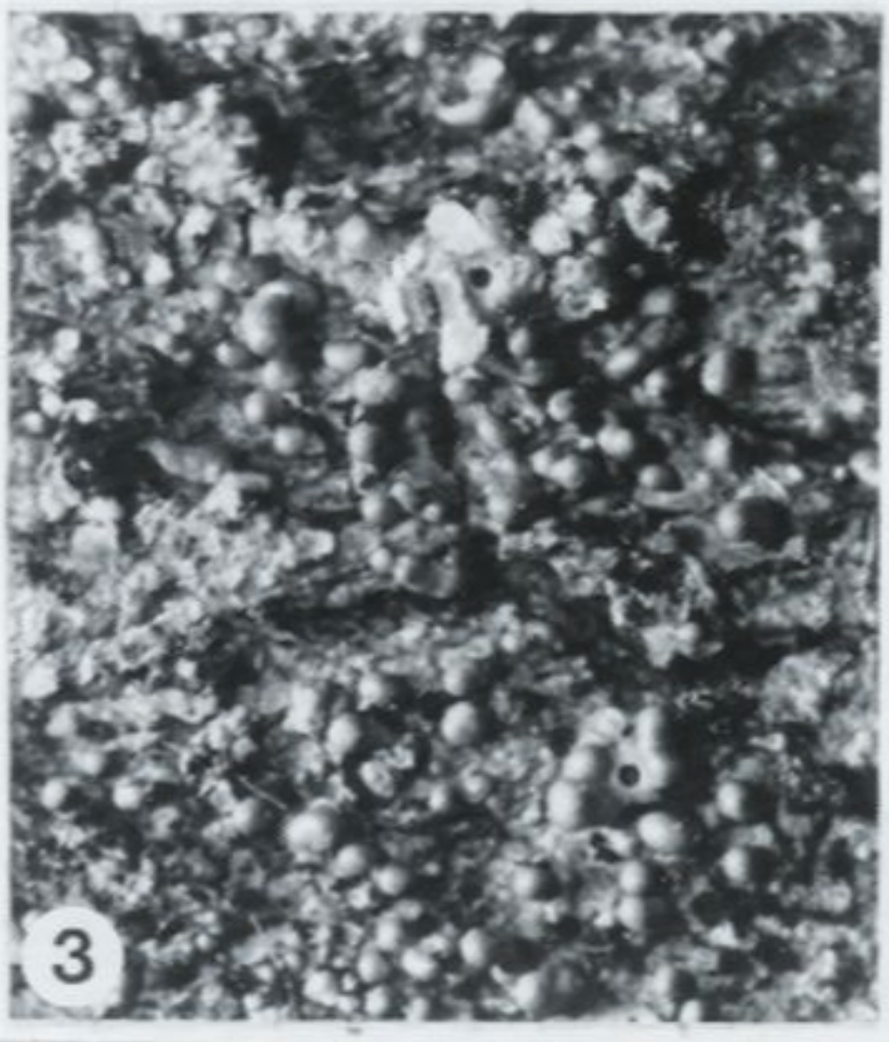


Fig. 1-4. New Thelotremataceae. 1. *Myriotrema flavolucens*, habitus of type. 2. *M. squamuloides*, habitus of type. 3. *Ocellularia croceoisidiata*, habitus of type. 4. *Ocellularia glaucoglyphica*, habitus (Sipman 26352). All same magnification, scale = 1 mm.

Nadvornikia hawaiensis (Tuck.) Tibell - Epiphyte in scrub on sandstone plateau and in mossy stunted forest on rocky slope, c. 950-1000 m. Camp 4: 26623, 26688.

Ocellularia amplior (Nyl.) Redgr. - Epiphyte in stunted forest on and in clefts of sandstone plates, c. 800-1100 m. Camp 2: 26864, 26870; camp 3: 26939, 26955; camp 4: 26684. TLC: protocetraric acid

Ocellularia astrolucens Sipman - Epiphyte in stunted forest on rocky slope, c. 800 m. Camp 3: 26951. TLC: lichexanthone.

Ocellularia auberiana (Mont.) Hale - Epiphyte in understorey of c. 15 m tall forest, c. 320-600 m. Camp 7: 26312, 26315, 26321, 26335, 26356, 26361, 26362, 26376, 26456, 26459; camp 8: 27275a. TLC: psoromic acid with several unknown substances, usually in traces.

Ocellularia aurata (Tuck.) Hale - Epiphyte in scrub on exposed ridge, c. 1250 m. Camp 2: 26757. TLC: protocetraric acid, pigment.

Ocellularia cavata (Ach.) Müll. Arg. - Epiphyte in scrub and stunted forest, c. 800-1500 m. With yellow pigment: Camp 2: 26828, 26832; camp 3: 26946, 26954, 27027, 27044, 27049; camp 4: 26579, 26585; camp 5: 27161, 27196, 27242. TLC: "cinchonarum unknown". Three specimens deviate by the presence of a red rather than a yellowish pigment: 26579, 27161 and 27242. This pigment makes them resemble *O. gracilis* Müll. Arg., which differs by the presence of hypoprotocetraric acid rather than the "cinchonarum" unknown substance. Since the pigment seems the only difference with typical *O. cavata*, and the specimens show the same ecological preferences, they have been included in *O. cavata*

Ocellularia comparabilis (Kremp.) Müll. Arg. - Epiphyte in understorey of c. 15 m tall forest, c. 320-1100 m. Camp 2: 26863; camp 7: 26304, 26311, 26401. TLC: psoromic acid, unknown traces.

Ocellularia croceoisidiata Sipman, *sp. nov.*
Fig. 3.
Type: Venezuela, Estado Bolivar, Cerro Guaiquinima, in central part of upper plateau, along Rio Carapo (near camp 3-nuevo), coord. c. 5°49' N, 63°32' W, alt. c. 800 m, rocky slope with low forest in deep clefts and along the river, 11 February 1990, H. Sipman 26948 (VEN holotype, B).

Diagnosis: Thallus corticola, epiphlocodes, ad 8 cm diametro, croceocinereus, laevis, opacus, continuus, isidiosus, acidum lichenicum ignotum "cinchonarum" continens. Apothecia ascidioidea, emergentia, basi constricta, medulla ochracea, frequentia, c. 1 mm diam., margine carbonaceo, columella carbonacea rotunda c. 0.2 mm lata, nigra vel laeviter alboprninosa, poro c. 0.15 mm diam. albomarginato; hymenium c. 170 µm altum, hyalinum; sporae hyalinae, transversaliter 11-15-septatae, octonae, I+ purpureae, c. 35-50 x 8 µm.

Thallus corticolous, epiphlocodal, up to at least 8 cm diam., brownish grey, smooth, dull, continuous, isidiate, c. 40 µm thick; cortical layer composed of weakly agglutinated hyphae, c. 8 µm thick; TLC: cinchonarum unknown and pigment; algal cells subglobose, c. 6 µm diam., medulla in part endophlocodal; isidia cylindrical with irregular shallow constrictions, c. 0.15 mm wide, to c. 0.5 mm long, glossy, with yellow medulla. Apothecia ascidioid, emergent, basally constricted, with yellow medulla, rather frequent, single, with carbonized excipular margin and columella, round, c. 1 mm diam.; pore c. 0.15 mm wide, often showing a blackish columella top, with whitish rim; excipulum carbonized, especially in its upper part, without periphyses; columella carbonized, c. 0.2 mm wide, with rounded, black, scarcely pruinose top; hymenium c. 80 µm high, clear; paraphyses not thickened at apex; spores hyaline, transversely 11-15-septate, 8 per ascus, I+ purplish, c. 35-50 x 8 µm.

Both isidia and the "cinchonarum" unknown substance are rather unusual characters in Thelotremataceae, and therefore the combination is sufficient to distinguish *Ocellularia croceoisidiata* from other members of its genus. In addition the yellow-pigmented medulla of isidia and apothecial warts makes it a conspicuous spe-

cies. The chemistry and apothecium structure relate it most closely to *Ocellularia cavata*. The latter also has a yellow medullary pigment, and could be considered as its "parent species".

Distribution and ecology: Known only from the type, from a thin tree trunk in stunted forest on a steep rocky slope along a river in the very oligotrophic sandstone tableland of Cerro Guaiquinima, Venezuela, at c. 800 m. alt.

Ocellularia glaucoglyphica Sipman, *sp. nov.*
Fig. 4.
Type: Venezuela, Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 7, at confluence of rivers Carapo and Lima, coord. c. 5°35' N, 63°32' W, alt. c. 320 m, c. 15 m tall, light forest on poor soil on E-bank of Carapo, 31 January 1990, H. Sipman 26325 (VEN holotypus, B).

Diagnosis: Thallus corticola, epiphloeodes, 10 cm diametro vulgo superans, glaucoviridis, laevis, opacus, partim pruinosus, continuus, sine acidos lichenicos. Apothecia immersa vel paulo emersa, frequentia, margine carbonaceo, columella lata carbonacea rotunda vel elongata vel stellatim divisa, albopruinosa, margine alba vulgo plana vel leviter elevata, 0.3-0.5 x 0.5-1 mm diam.; hymenium 80-125 µm altum, hyalinum; sporae fuscae, transversaliter 3-septatae, octonae, I-negativae, c. 14-16 x 6-8 µm.

Thallus corticolous, epiphloeodal, to over 10 cm diam., pale glaucous green, in part glaucous-white pruinose, smooth, dull, continuous, without vegetative propagules, c. (20-)50-80 µm thick; no distinct cortex; TLC: no lichen substances found; algal cells subglobose, c. 6-9 µm diam.; medulla with scattered large crystals. Apothecia immersed or slightly emergent, frequent, with carbonized margin and wide, often elongated columella, rounded or often becoming elongated, sometimes stellate-branched, 0.3-0.5 x 0.5-1 mm; columella wide and filling the pore, with flat, white-pruinose top which often becomes greenish by acquiring an algal layer; margin white-rimmed, flat or slightly raised, occasionally strongly raised to recurved and exposing a blackish inner side; hymenium 80-125 µm high, clear; spores brown, transversely 3-septate, 8 per ascus, I-negative except when very young, c. 14-16 x 6-8 µm.

Ocellularia glaucoglyphica seems to be closest to *O. glyphica* (Nyl.) Hale by the structure of its apothecia and its spores. It differs from this species by its dull, pruinose thallus and the absence of lichen substances. The Guyana specimen is somewhat deviant because of its erect to recurved apothecial margin and slightly warty spores when ripe.

Distribution and ecology: Most specimens are from Cerro Guaiquinima, a very limited area in the Guayana Highland, and the only specimen from outside this spot is slightly deviating. Therefore it is unclear whether the species is restricted to the Guayana Highland or is more widespread. It has been found on rather shady treetrunks in virgin forest, at (10-)c. 300 m. alt.

Additional specimens: Camp 7: 26326, 26352, 26464. GUYANA, East Demerara District, Timehri, 2 February 1985, H. Sipman & A. Aptroot 17989 (B).

Ocellularia latilabra (Tuck.) Müll. Arg. - Epiphyte in understorey of c. 15 m tall forest, c. 350 m. Camp 7: 26372. TLC: psoromic acid, unknown traces. The specimen is very similar to material in G.

Ocellularia lepadinoides (Leight.) A. Zahlbr. - Epiphyte in understorey of 5-15 m tall forest, c. 320-800 m. Camp 3: 26938, 26964; camp 7: 26323, 26389, 26404, 26470. TLC: protocetraric acid.

Ocellularia metaphorica (Nyl.) Hale - Epiphyte in mossy forest in narrow valley, c. 1100 m. Camp 2: 26877, 26892. TLC: no substances detected. The specimens fit the description by Hale (1978: 53) quite well, but lichexanthone is absent.

Ocellularia nigropuncta Hale - Epiphyte on smooth bark of trunklets in stunted mossy forest on steep slope, c. 1500 m. Camp 5: 27158, 27199, 27210. TLC: protocetraric acid. The material fits the description of this hitherto Caribbean species (Hale 1974: 22) quite well. The black rim of the apothecium pores develops when the thallus cover

wears off from the carbonized excipulum margin. It is not yet present in young apothecia.

Ocellularia papillata (Leight.) A. Zahlbr. - Epiphyte in understorey of c. 15 m tall forest, c. 320-350 m. Camp 7: 26302, 26319, 26350, 26358, 26392, 26395, 26407, 26418, 26428, 26455. TLC: no substances detected.

Ocellularia perforata (Leight.) Müll. Arg. - Epiphyte in understorey of 10-15 m tall, more or less mossy forest, c. 350-1100 m. Camp 2: 26868; camp 7: 26342, 26369, 26371, 26445, 26457, 26475. TLC: protocetraric acid or cinchonarum unknown. Five specimens deviate by the presence of the "cinchonarum" unknown substance instead of protocetraric acid. Since they do not differ otherwise, they have been treated as a chemical strain.

Ocellularia recondita (Stirt.) A. Zahlbr. - Epiphyte in understorey of c. 15 m tall forest, c. 320-350 m. Camp 7: 26308, 26368. TLC: unknown substance resembling salazinic acid.

Ocellularia rhodostroma (Mont.) A. Zahlbr. - Epiphyte in c. 10 m tall mossy forest in narrow valley, c. 1100 m. Camp 2: 26878. TLC: no substances detected.

Ocellularia tenuis (Hale) Hale - On decaying mossy logs in c. 10 m tall mossy forest in narrow valley, c. 1100 m. Camp 2: 26909, 26927. TLC: no substances detected.

Ocellularia xanthostroma (Nyl.) Müll. Arg. - Epiphyte in c. 15 m tall forest, c. 320 m. Camp 7: 26292, 26386. TLC: no substances detected. The material fits the description by Hale (1978: 34) quite well, except that the spores are considerably larger: 220-250 x 20 µm, c. 50-celled. This difference might be explained by the way in which the spores were investigated (if material allows), viz. by soaking a whole apothecium. In this way the chance to find fully developed spores is larger than by investigation of a section only. The iodine-reaction of the spores is purplish, and the medullary pigment shows the K+ dark violet reaction typical for anthraquinones.

Thelotrema albomaculatum Sipman - Epiphyte on usually thin and smooth treetrunks in understorey of c. 15 m tall forest, c. 320-350 m. Camp 7: 26305, 26313, 26367, 26423, 26446, 26448, 26463. TLC: unknown substance resembling salazinic acid.

Thelotrema alborosellum (Nyl.) Tuck. - Epiphyte on twig in scrub on sandstone tableland, c. 1000 m. Camp 4: 26685. TLC: no substances detected.

Thelotrema carneoradians Sipman, *sp. nov.*
Fig. 5, 6.

Type: Venezuela, Estado Bolivar, Cerro Guaiquinima, surroundings of Camp 7, at confluence of rivers Carapo and Lima, coord. c. 5°35' N, 63°32' W, alt. c. 350 m. c. 15 m tall, light forest on poor soil on W-bank of Carapo, 1 February 1990, H. Sipman 26355 (VEN holotypus, B).

Diagnosis: Thallus corticola, epiphloeodes, 10 cm diametro vulgo superans, cinereoviridis, laevis, nitidiusculus, continuus, sine acidos lichenicos. Apothecia chroodiscoidea, sessilia, frequentia, margine non carbonaceo, stellato-recurvato, disco carneorufo, columella absenti, c. 1.5-2.5 mm diam.; hymenium c. 55-70 µm altum, hyalinum; paraphyses apicibus incrassatis verruculosis; sporae hyalinae, transversaliter 3-septatae, octonae, leptodermaticae, I-negativae, c. 10-14 x 4 µm.

Thallus corticolous, epiphloeodal, to over 10 cm diam., greyish green, smooth, slightly glossy, continuous, without vegetative propagules, 30-50 µm thick; cortical layer composed of conglutinated hyphae, c. 5 µm thick; TLC: no recognizable quantities of lichen substances found; algae subglobose, c. 7-10 µm diam., concentrated in a c. 20 µm thick layer under the cortical layer; medulla without crystals, 5-20 µm thick, rather compact. Apothecia chroodiscoid, sessile, frequent, single, without carbonization, without columella, wide-stellate with few radii (usually 2-5), c. 1.5-2.5 mm diam.; margin erect to recurved, thin, laciniate, concolorous with the thallus on the outside and with the disc on the inside, internally slightly brownish by included bark cell remains, on the inside with short, to 5 µm long periphyses with verrucose tips (like paraphyses); disc reddish carneous, dull, slight-

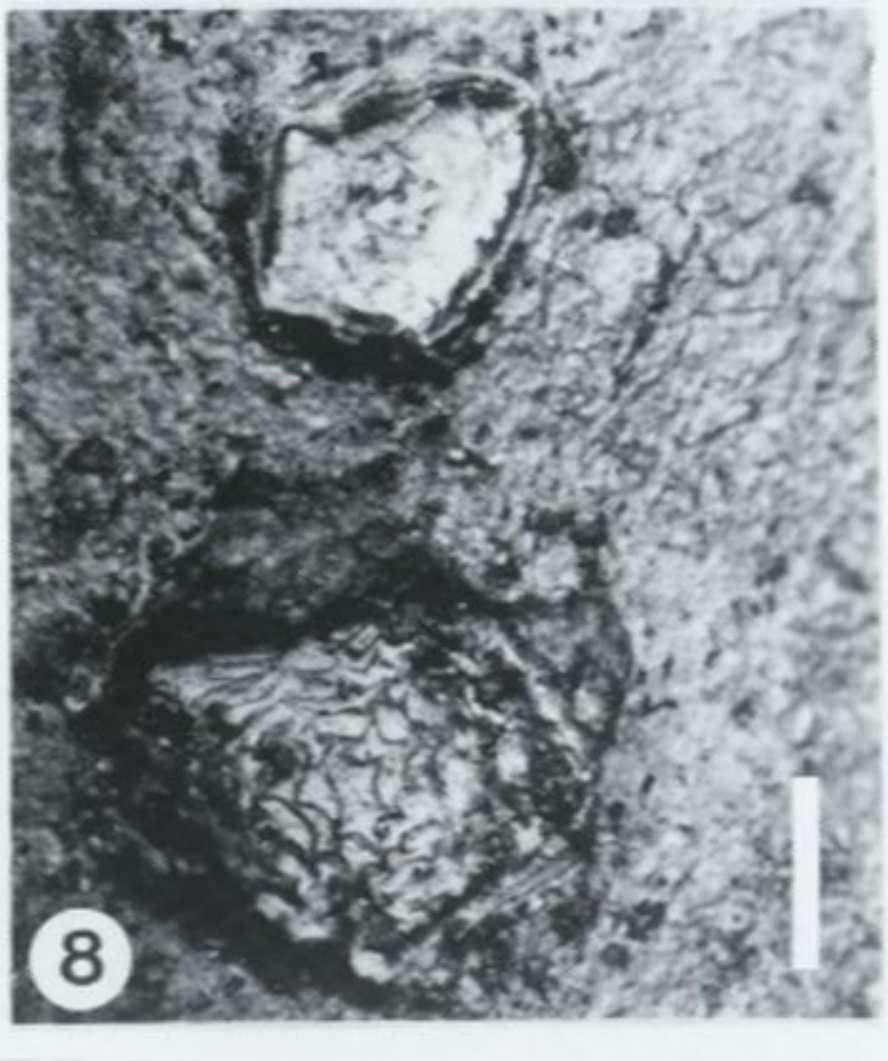


Fig. 5-8. New Thelotremataceae. 5. *Thelotrema carneoradians*, habitus of type. 6. *T. carneoradians*, SEM photograph of hymenium surface, showing the verruculose paraphyse tips. 7. *Thelotrema guaiquinimae*, habitus (Sipman 26904). 8. *Ocellularia sinuosa*, habitus (Buck 11453). All, except 6, same magnification as fig. 1-4, scale = 1 mm.

ly white-pruinose; hymenium c. 55-70 µm high, clear; paraphyses c. 1.5 µm thick, at tips swollen to 2 µm, exserting about 2 µm above the hymenial gelatin and verrucose by c. 0.5 µm diam. granules; spores hyaline, transversely 3-septate, with thin wall and septa, 8 per ascus, I-negative, c. 10-14 x 4 µm.

The closest relative of *Thelotrema carneoradians* seems to be *T. alborosellum* (Nyl.) Tuck. It differs by the more rounded apothecia with paler and smaller disc, and by the paler, less differentiated thallus.

The type specimen contains numerous glossy, cylindrical isidia, which are grouped together mainly on bark cracks. No young isidia have been observed which develop on thallus evidently belonging to *Thelotrema carneoradians*. Therefore it is concluded that the isidia belong to a different lichen which has become almost completely overgrown by the *Thelotrema*.

The verrucose paraphyse and periphyse tips are a feature not frequently observed. It reminds of the genus *Acanthotheciopsis*, a genus included in the Graphidaceae because of its lirelliform ascocarps (Zahlbruckner 1926: 117). This genus appears to have several characters in common with the chroodiscoid species of *Thelotrema*: presence of periphyses; I-negative, hyaline spores. It is perhaps better included in the Thelotremataceae.

Distribution and ecology: Known from a single collection from the base of Cerro Guaiquinima, Venezuela, on a smooth palm stem in low forest, alt c. 350 m.

Thelotrema guaiquinimae Sipman *sp. nov.*
Fig. 7.
Type: Venezuela, Estado Bolivar, Cerro Guaiquinima, near NE edge of upper plateau (near camp 2), coord. c. 5°54' N, 63°27' W, alt. c. 1200 m, low, well-lit forest on slope of narrow valley, 9 February 1990, H. Sipman 26849 (VEN holotype, B).

Diagnosis: Thallus muscicola vel corticola, epiphloeodes, 10 cm diametro vulgo superans, pallide viridocinereus, laevis vel rugulosus, opacus, continuus, acidos lichenicos sticticum et consticticum continens. Apothecia valde emergentia, subcylindrica, frequentia, c. 0.4 mm diametro, margine non carbonaceo, apice plano vel radiatim furcato, periphysis proviso, columella absenti, poro c. 0.1 mm lato paulo impresso; hymenium 160-170 µm altum, hyalinum; sporae cinereae, muriformes, c. 11 x 2-septatae, quaternae ad octonae, I-negativae, c. 30-60 x 12-14 µm.

Thallus muscicolous or corticolous, up to at least 10 cm diam., pale greenish grey, smooth or rugulose, dull, continuous, without vegetative propagules, c. 80 µm thick; cortical layer composed of strongly agglutinated hyphae, c. 10 µm thick; TLC: stictic and constictic acids; algal cells subglobose, c. 8 µm diam.; medulla in part between the bryophyte leaves, filled with minute crystals. Apothecia strongly emergent, subcylindrical, basally slightly constricted, plentiful, single, uncarbonized, without columella, round, c. 0.4 mm diam., on top rather flat and often radiately grooved; pore c. 0.1 mm wide, slightly impressed; excipulum pale brown, c. 25 µm thick both laterally and below the hymenium, with c. 8 µm long periphyses, laterally not separating from the thalline margin; hymenium 160-170 µm high, clear; paraphyses not thickened at apex, not exserted above the hymenial gelatin; spores grey, muriform, c. 11 x 2-septate, 4-8 per ascus, I-negative, 30-60 x 12-14 µm.

The new species resembles *T. lepadinum* (Ach.) Ach. by its apothecium anatomy, but is rather different by its spores, chemistry and apothecium shape. It is perhaps closest to *T. monosporum* Nyl., which differs by larger spores, thallus anatomy, apothecium shape and chemistry (cf. Hale 1981: 260). In muscicolous apothecia the margin contains remains of bryophyte leaves, showing that the apothecia develop immersed in the substrate, as usual in the family.

Distribution and ecology: Known from two collections on the humid sandstone tableland of Cerro Guaiquinima, Guyana highlands, Venezuela, where it was found on soft, moss-covered rotten logs in low forest in a sheltered valley at

1100-1200 m alt.

Additional material: Camp 2: 26904.

In addition, 34 unidentified specimens of *Myriotrema*, 22 of *Ocellularia* and 38 of *Thelotrema*.

GYALECTALES

Gyalectaceae

Coenogonium leprieurii (Mont.) Nyl. - Epiphyte in c. 15 m tall forest, c. 320 m. Camp 7: 26432.

Coenogonium linkii Ehrenb. - Epiphyte in c. 15 m tall forest, c. 320 m. Camp 7: 26447.

Dimerella epiphylla (Müll. Arg.) R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27304.

Dimerella hypophylla Vezda - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27302.

In addition, 4 unidentified specimens of *Coenogonium* and *Dimerella*.

LECANORALES

Acarosporaceae

Biatorella conspersa (Fée) Vainio - Epiphyte in stunted mossy forest on rocky slope, c. 1000 m. Camp 4: 26591.

Biatorella wrightii (Tuck.) A. Zahlbr. - Epiphyte in stunted mossy forest on rocky slope, c. 950 m. Camp 4: 26641, 26647.

Bacidiaceae

Bacidia brasiliensis (Müll. Arg.) Vainio - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27303.

Bacidia psychotriae (Müll. Arg.) A. Zahlbr. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27286.

Bacidina apiahica (Müll. Arg.) Vezda - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27284.

Biatora pyrrhomelaena Tuck. - Trunk epiphyte in c. 15 m tall forest, rarely in stunted forest, c. 320-1500 m. Camp 2: 26880; camp 5: 27178; camp 7: 26351, 26431.

Crocynia gossypina (Sw.) Mass. - Trunk epiphyte in c. 15 tall forest, c. 320 m. Camp 7: 26469, 26481.

Crocynia pyxinoides Nyl. - Epiphyte, mostly on canopy branches, in c. 15 tall forest and in stunted forest, c. 320-1000 m. Camp 3: 26966; camp 4: 26562; camp 7: 26387, 26400 (c. apoth.).

Eschatogonia prolifera (Mont.) R. Sant. - Trunk epiphyte in c. 15 m tall forest, c. 350 m. Camp 7: 26337.

"Lecidea" leucophyllina Nyl. - Epiphyte on branches in stunted forest, c. 950-1100 m. Camp 2: 26888; camp 4: 26613.

Phyllopsora buettneri (Müll. Arg.) A. Zahlbr. var. *glauca* (Bouly de Lesd.) Brako - Epiphyte in more or less mossy forest, c. 350-1100 m. Camp 2: 26894, 26907; camp 4: 26642, 26662; camp 7: 26365.

Phyllopsora corallina (Eschw.) Müll. Arg. - Epiphyte in stunted forest on tableland, 800-1000 m. Camp 3: 26967; camp 4: 26636, 26699.

Phyllopsora parvifolia (Pers.) Müll. Arg. var. *breviuscula* (Nyl.) Brako - Epiphyte in scrub on tableland, c. 1000 m. Camp 4: 26694.

Physcidia squamulosa Tuck. - Epiphyte in scrub and stunted forest, c. 800-1000 m. Camp 3: 26963; camp 4: 26561, 26592, 26672.

Physcidia wrightii Tuck. - Epiphyte in understorey of tall forest and in stunted forest, c. 320-1250 m. Camp 2: 26797, 26876; camp 4: 26664; camp 7: 26402, 26410.

Tephromela atra (Huds.) Haf. - Epiphyte in low forest and scrub, c. 950-1500 m. Camp 2: 26816, 26930; camp 4: 26632; camp 5: 27241.

Cladoniaceae

Cladia aggregata (Sw.) Nyl. - On soil in rocky slope with exposed rock flats and scrub, c. 800 m. Camp 3: 27070.

Cladina argentea Ahti - Terrestrial on shallow soil on sandstone rock flats in clearings, or in low scrub on blanket bog, c. 1000-1500 m. Camp 2: 26712; camp 4: 26509; camp 5: 27125, 27125a. TLC: atranorin, fumarprotocetraric acid (nr. 26509, 27125a)

Cladina confusa (Sant.) Follm. & Ahti - Terrestrial on shallow soil on sandstone rock flats in clearings, or in low scrub on blanket bog, c. 800-1500 m. Camp 2: 26719; camp 3: 27000, 27063; camp 4: 26492, 26515; camp

5: 27140. TLC: usnic, perlatolic acids; nrs. 26492, 26515 lack usnic acid.

Cladina dendroides (des Abb.) Ahti - Terrestrial on shallow soil on sandstone rock flats in clearings or in low scrub on blanket bog, c. 800-1500 m. Camp 2: 26721; camp 3: 26991; camp 4: 26502, 26510, 26573; camp 5: 27123, 27138. TLC: atranorin, fumarprotocetraric acids; nr. 26510 appeared to have a trace of usnic acid.

Cladina densissima Ahti - Terrestrial in low scrub on blanket bog, or on shallow sandy soil on rock flats in clearings in scrub, c. 1200-1500 m. Camp 2: 26718; camp 5: 27116, 27128, 27131. TLC: usnic, fumarprotocetraric acids

Cladina sprucei (Ahti) Ahti - Terrestrial on shallow soil on sandstone rock flats in clearings, or in low scrub on blanket bog, c. 650-1500 m. Camp 2: 26712a; camp 3: 26992; camp 4: 26491, 26517a, 26584, 26671; camp 5: 27126, 27139; camp 8: 27257, 27268. TLC: atranorin, fumarprotocetraric acid (nr. 26584, 26671)

Cladonia carassensis Vainio - Terrestrial in blanket bog with low scrub and rock outcrops, c. 1500 m. Camp 5: 27101. TLC: thamnolic acid

Cladonia ceratophylla (Sw.) Spreng. - Terrestrial in mossy forest in narrow valley, c. 1100 m. Camp 2: 26919.

Cladonia corallifera (Kunze) Nyl. - On thin, usually humous soil on sandstone plates in clearings, sometimes in low scrub on blanket bog, c. 650-1500 m. Camp 2: 26707; camp 4: 26489a, 26552; camp 5: 27133a; camp 8: 27259.

Cladonia crispatula (Nyl.) Ahti - On thin soil on sandstone plates in clearings, c. 650-1250 m. Camp 2: 26769; camp 8: 27268a.

Cladonia didyma (Fée) Vainio - Terrestrial on thin soil on sandstone flats in clearings, or in low scrub on blanket bog, c. 1000-1500 m. Camp 4: 26489; camp 5: 27106, 27132.

Cladonia furfuracea Vainio - Terrestrial on litter on sandstone rock plate on clearing, c. 800 m. Camp 3: 27079.

Cladonia guianensis Stenr. - Terrestrial on litter on sandstone plates in clearings or in bog, c. 800-1500 m. Camp 2: 26758; camp 3: 27053; camp 4: 26503, 26700; camp 5: 27100, 27114, 27133, 27247.

Cladonia peltastica (Nyl.) Müll. Arg. - On thin soil layers on sandstone plates in clearings, or on blanket bog, c. 650-1500 m. Camp 2: 26732; camp 3: 26993, 26999, 27001, 27002, 27003, 27066; camp 4: 26488, 26490, 26536, 26680; camp 5: 27096, 27127; camp 8: 27255, 27262, 27263, 27267. TLC (8 strains found): (1)thamnolic acid, unknown spot resembling merochlorophaeic acid (26732, 26999, 26488, 26536, 26680, 27096); (2) thamnolic acid only (26490, 27127); (3) thamnolic, homosekikaic acids (27066, 27267); (4) usnic, homosekikaic, thamnolic acids (26993, 27003); (5) usnic, squamatic, ?barbatic acids (27001); (6) usnic, squamatic acids (27002, 27255, 27263); (7) usnic, fumarprotocetraric acids (27262). The chemical variation does not seem to be correlated with morphology or ecology.

Cladonia pityrophylla Nyl. - On thin soil on sandstone plates in clearings, c. 650-800 m. Camp 3: 27080; camp 8: 27268c. TLC: fumarprotocetraric acid

Cladonia pulviniformis Ahti - Terrestrial on thin, sandy soil on sandstone plates in clearings or in low scrub on blanket bog, c. 800-1500 m. Camp 2: 26717, 26737; camp 3: 26995; camp 4: 26495, 26519; camp 5: 27124, 27142.

Cladonia secundana Nyl. - Terrestrial on thin, usually humous, soil on sandstone plates in clearings, also found in low scrub in bog and on decaying tree trunk in forest, c. 320-1500 m. Camp 2: 26706, 26780; camp 3: 26990; camp 5: 27107, 27217; camp 7: 26421; camp 8: 27260.

Cladonia signata Vainio - Terrestrial on thin, sandy soil on sandstone plates in clearings or in low scrub on blanket bog, c. 800-1500 m. Camp 3: 26994, 27068; camp 4: 26506; camp 5: 27117. TLC: homosekikaic, fumarprotocetraric acids; nr. 26994 without homosekikaic acid.

Cladonia sphacelata Vainio - Terrestrial in stunted forest on rocky places, c. 650-1500 m. Camp 2: 26890; camp 3: 27065; camp 4: 26487; camp 5: 27102; camp 8: 27256.

Cladonia spinea Ahti - Terrestrial on thin soil on sandstone plates in clearings, c. 650-1000

m. Camp 3: 26998, 26999a, 27062; camp 4: 26517, 26521; camp 8: 27261. TLC (3 strains): (1) usnic, squamatic acids (26998, 26999a, 26517, 27261); (2) usnic, barbatic acids (26521); (3) usnic, thamnolic acids (27062).

Cladonia steyermarkii Ahti - On thin soil cover on sandstone plates in clearings. Camp 2: 26722, 26735, 26806. Camp 4: 26511, 26512, 26518, 26580. TLC (3 strains): (1) usnic, squamatic acids (26722); (2) usnic acid (26511, 26512, 26518, 26580, 26735); (3) usnic, thamnolic acids (26806). Four specimens of strain 2 (26511, 26512, 26518, 26580) gave an unidentified weak additional spot.

Cladonia subradiata (Vainio) Scriba - Terrestrial on litter on sandstone plate in half-shade , c. 800 m. Camp 3: 27081.

Cladonia sufflata Ahti - Terrestrial in low scrub on bog, c. 1000-1500 m. Camp 4: 26516; camp 5: 27120, 27121, 27136, 27141. TLC: usnic, thamnolic acids; nr. 27120 and 27136 without usnic acid.

Cladonia vareschii Ahti - Terrestrial on thin soil on sandstone plates in clearings, or in low scrub on blanket bog, c. 800-1500 m. Camp 2: 26714, 26716, 26773a; camp 3: 27061; camp 4: 26516a, 26582; camp 5: 27108, 27110, 27112, 27129, 27135, 27137. TLC (2 strains): (1) usnic, trace of barbatic, thamnolic acids (26714, 26516a, 27129, 27135); (2) usnic, thamnolic acids (26716, 26773a, 27061, 26582, 27108, 27110, 27112, 27137). Specimen 27129 has a larger amount of barbatic acid; specimen 27061 shows a trace of thamnolic acid only.

Cladonia variegata Ahti - Terrestrial on thin soil on sandstone plates in clearings or in low scrub on bog, c. 650-1500 m. Camp 2: 26726; camp 4: 26496, 26520, 26522a, 26691; camp 5: 27118, 27130, 27134; camp 8: 27268b.

In addition, 10 unidentified specimens belonging to a *Cladia* species under study by Ahti (pers. comm.), 5 of *Cladina* and 12 of *Cladonia*.

Coccocarpiaceae

Coccocarpia domingensis Vainio - Epiphyte on twigs or branches in stunted, often mossy forest, c. 800-1500 m. Camp 2: 26842; camp 3: 27078a; camp 4: 26590, 26667; camp 5: 27163, 27244.

Coccocarpia erythrocardia (Müll. Arg.) Arvids. - Epiphyte on branches in stunted forest, c. 950-1250 m. Camp 2: 26804; camp 4: 26629a, 26646, 26648.

Coccocarpia erythroxyli (Spreng.) Swinsc. & Krog - Epiphyte on branches in forest canopy or in stunted forest, c. 320-800 m. Camp 3: 26941; camp 7: 26295.

Coccocarpia imbricascens Nyl. - Epiphyte on branches in stunted, usually mossy, forest, c. 800-1100 m. Camp 2: 26861; camp 3: 26949, 27004; camp 4: 26599, 26665.

Coccocarpia palmicola (Spreng.) Arvids. & Gallow. - Epiphyte on canopy branches in forest or in stunted, often mossy, forest, c. 320-1500 m. Camp 3: 26979, 27014; camp 5: 27164; camp 7: 26291, 26327; camp 8: 27269.

Coccocarpia pellita (Ach.) Müll. Arg. - Epiphyte on branches in stunted forest, c. 1000-1500 m. Camp 4: 26698; camp 5: 27191.

In addition, 14 unidentified specimens of *Coccocarpia*.

Collemataceae

Leptogium burgessii (L.) Mont. - Epiphyte on branches in stunted, mossy forest, c. 950 m. Camp 4: 26589.

Lecanoraceae

Pyrrhospora russula (Ach.) Hafellner - Epiphytic or epilithic in scrub, c. 800-1250 m. Camp 2: 26703, 26810, 26742; camp 3: 27073. TLC: fumarprotocetraric acid and lichexanthone, (26810, 26703). Basionym: *Lecidea russula* Ach., Methodus Lichenum, p. 61, Stockholm 1803. The inclusion of this species in *Pyrrhospora* is a logical consequence of the extension of the genus by Rambold (1989) to include *P. sanguinolenta* (Kremp.) Rambold & Haf. Saxicolous (nr. 26703 tested) and corticolous (nr. 26810 tested) plants appear to agree in chemistry, indicating that they belong to a single species.

"Lecideaceae" (in the old sense; new position

to be determined)

"*Lecidea*" *granifera* (Ach.) Vainio - Epiphyte in understorey of c. 15 m tall forest, c. 320-350 m. Camp 7: 26340, 26346, 26406, 27250.

Lobariaceae

Sticta fuliginosa (Dicks.) Ach. - Epiphyte in low, mossy forest on rocky slope, c. 950 m. Camp 4: 26612.

Sticta weigelii (Isert) Ach. - Epiphyte in low or stunted, more or less mossy forest, c. 800-1100 m. Camp 2: 26917; camp 3: 27041; camp 4: 26615.

In addition, 5 unidentified specimens, belonging to the genera *Dendriscocaulon*, *Lobaria* and *Sticta*.

Megalosporaceae

Megalospora tuberculosa (Fée) Sipman - Epiphyte of canopy branches in c. 15 m tall forest, and of stunted forest, c. 320-1500 m. Camp 2: 26771, 26771a; Camp 3: 26944, 27008 (with apothecium primordia only); camp 4: 26549, 26555, 26616; camp 5: 27234; camp 7: 26297. Specimens 26771 and 26771a deviate by the presence of isidia. Since they differ in no other way and grow under similar conditions as non-isidiate specimens, the presence of isidia does not seem to indicate a different species in this case. Isidia were not known before from this species, but have been encountered in e.g. *M. sulphurata* Meyen as inconstant feature (Sipman 1983).

Pannariaceae

Erioderma sorediatum Gallow. & Jörg. - On branchlets in canopy of stunted mossy forest, c. 1500 m. Camp 5: 27173.

Erioderma verruculosum Vainio - Epiphyte in shrub on exposed ridge and on twigs at margin of stunted mossy forest, c. 1250-1500 m. Camp 2: 26798; camp 5: 27237a.

Erioderma wrightii Tuck. - Epiphyte in scrub on exposed ridge, c. 1250 m. Camp 2: 26796.

In addition, 2 specimens belonging in the genus *Leioderma*, but too scrappy for identification.

Parmeliaceae

Bulbothrix apophysata (Hale & Kurok.) Hale - On scattered shrubs on sandstone plateau and on twigs at margin of mossy forest, c. 800-1500 m. Camp 3: 27036a; camp 4: 26563; camp 5: 27245g. TLC: atranorin, lobaric acid.

Bulbothrix atrichella (Nyl.) Hale - In stunted, interrupted forest on rocky slope, c. 800 m. Camp 3: 27035. TLC: atranorin, gyrophoric acid.

Bulbothrix laevigatula (Nyl.) Hale - In forest along streamlet, c. 1500 m. Camp 5: 27162. TLC: atranorin, lecanoric acid.

Canoparmelia cinerascens (Lynge) Elix & Hale - On scattered shrubs on dry sandstone plateau, c. 650 m. Camp 8: 27255a. TLC: atranorin, norstictic, connorstictic acids.

Canoparmelia cryptochlorophaea (Hale) Elix & Hale - Sandstone plateau with *Stegolepis* bog and scattered shrubs, c. 1000 m. Camp 4: 26690. TLC: atranorin, cryptochlorophaeic acid, unkn.

Hypotrachyna adaffinis Sipman, *sp. nov.*
Fig. 9.

Type: Venezuela, Estado Bolivar, Cerro Guaiquinima, surroundings of camp 2, near NE edge of upper plateau, coord. c. 5°54' N, 63°27' W, alt. c. 1250 m, rocky area with scrub on exposed ridge, 8 February 1990, H. Sipman 26792b (VEN holotype, B)

Diagnosis: Thallus foliaceus, corticola, adnatus, c. 2-3 cm latus, pallide flavocinereus, laciniatus; laciniae sublineares, dichotomoramosae, c. 0.4-0.6 mm latae, internodiis c. 0.4-0.8 mm longae, latere superiori planae vel leviter convexae, emaculatae, soraliis capitatis superficialibus vel in apicibus lobulis abbreviatis, latere inferiori rhizinis vulgo singulariter furcatae; substantias chimicas lichexanthonum et acidum echinocarpicum continens.

Thallus closely adnate on bark, c. 2-3 cm wide, pale yellowish grey; lobes sublinear, dichotomously branched, c. 0.4-0.6 mm wide, with c. 0.4-0.8 mm long internodes; upper surface plane or slightly convex, emaculate, continuous, in older parts slightly rugulose and cracked, sorediate; soralia capitate and much swollen, to 2

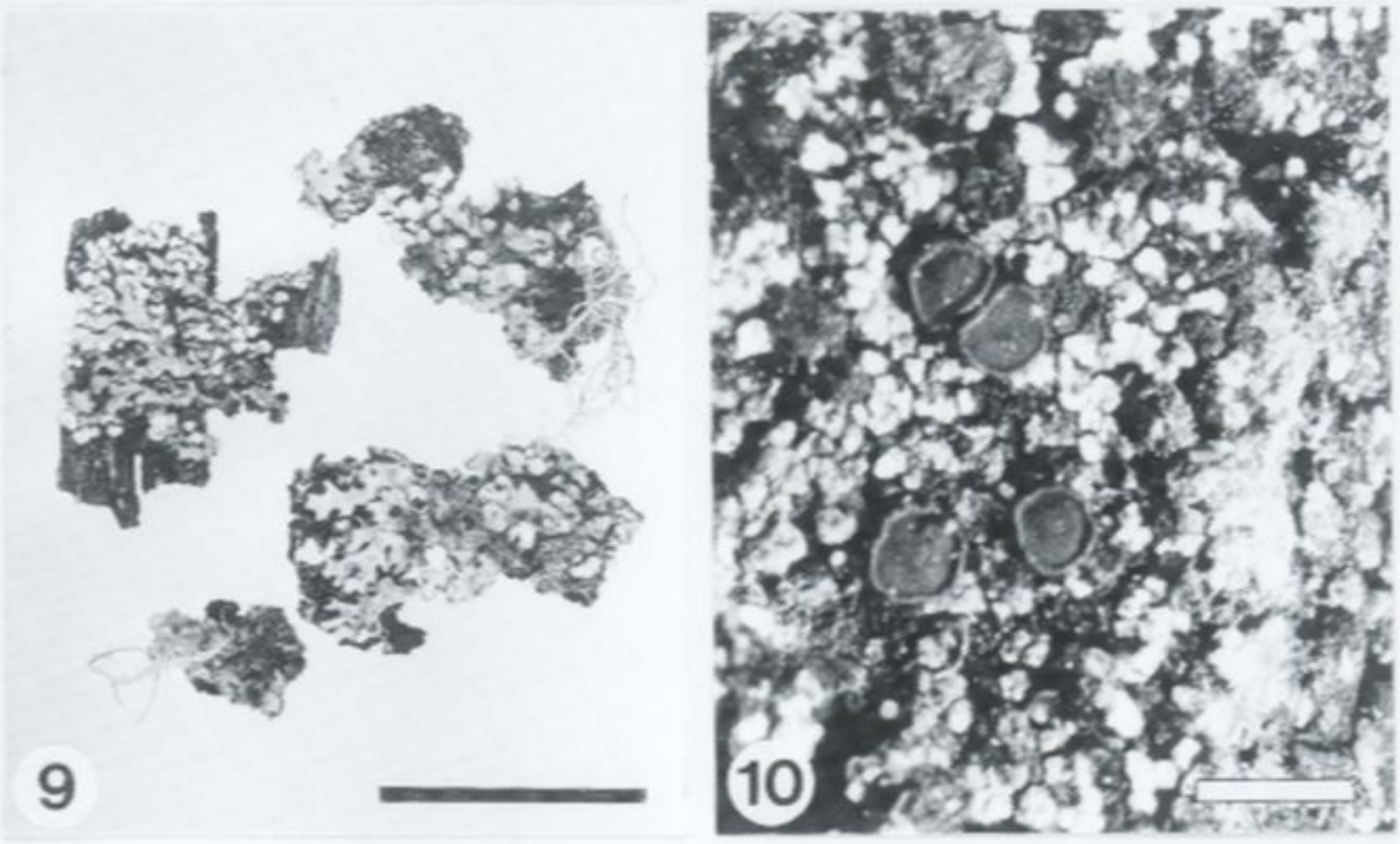


Fig. 9-10. New lichen taxa. 9. *Hypotrachyna adaffinis*, habitus of type. 10. *Buellia bellardii*, habitus of type. Scale = 1 mm.

mm wide, superficial and subterminal on short branchlets, with farinose soredia; lower side moderately rhizinate, the rhizines mostly only once branched, often projecting along the margins. Apothecia evidently uncommon, not investigated. TLC: lichexanthone (in the cortex) and echinocarpic acid.

The species shows a close similarity with *H. subaffinis* (Zahlbr.) Hale by its small size, its capitate soralia, and the presence of echinocarpic acid (Hale 1975). The principal, conspicuous difference is in the cortical substance, lichexanthone in *H. adaffinis*, usnic acid in *H. subaffinis*. Very similar plants have been found in the Dominican Republic, which differ by the presence of barbatic acid or other, not identified substances instead of echinocarpic acid.

Distribution and ecology: Known so far from single specimens from the Guayana Highland in Venezuela and from the Dominican Republic. It was found on bark in light forest at c. 1100-1250 m alt.

Additional material: DOMINICAN REPUBLIC, Prov. Independencia, Sierra de Boaruco, c. 9.5 km S of Puerto Esconcito, 1085 m, 24 January 1987, R. C. Harris 20389 (NY).

Hypotrachyna consimilis (Vainio) Hale - Scrub on exposed ridge, c. 1250 m. Camp 2: 26790b. TLC: atranorin, protocetraric acid.

Hypotrachyna costaricensis (Nyl.) Hale - Epiphyte on branches of isolated shrubs on sandstone plateau or in stunted forest along stream. Camp 4: 26689; camp 5: 27183. TLC: atranorin, protolichesterinic? acid

Hypotrachyna dactylifera (Vainio) Hale - Epiphyte in stunted forest, c. 950-1250 m. Camp 2: 26792a; camp 4: 26594. TLC: atranorin, several unidentified spots.

Hypotrachyna degelii (Hale) Hale - Epiphyte in stunted forest in clefts between sandstone rocks, c. 800 m. Camp 3: 26984, 27050. TLC: atranorin, alectoronic, a-collatolic acid.

Hypotrachyna flavida (Zahlbr.) Hale - On sandstone outcrops among scrub, c. 1250 m. Camp 2: 26770, 26789.

Hypotrachyna imbricatula (Zahlbr.) Hale - Epiphyte on canopy branches in 15 m tall forest and in stunted forest and scrub, c. 320-1500 m. Camp 2: 26713, 26790; camp 3: 27077; camp 4: 26576; camp 5: 27245h; camp 7: 26290.

Hypotrachyna microblasta (Vainio) Hale - Epiphyte on branches of stunted forest and scrub, c. 800-1500 m. Camp 2: 26791, 26805; camp 3: 27039; camp 4: 26609, 26643; camp 5: 27184, 27190. TLC: usnic, norstictic, galbinic, salazinic acids.

Hypotrachyna osseoalba (Vainio) Park & Hale - Epiphyte in scrub on sandstone plateaus, in mossy forest on branchlets at the margin, c. 1000-1500 m. Camp 4: 26542, 26566; camp 5: 27245j. TLC (nr. 26542, 26566): lichexanthone, several unidentified spots, probably including lividic and lobaric acids.

Hypotrachyna pseudosinuosa (Asah.) Hale - Epiphyte on branches of stunted forest, in mossy forest on twigs, c. 1250-1500 m. Camp 2: 26792; camp 5: 27245.

Parmelinopsis horrescens (Tayl.) Elix & Hale - Epiphyte in stunted forest, c. 800-1500 m. Camp 2: 26790a; camp 3: 27051; camp 5: 27169.

Parmotrema aurantiacoparvum Sipman - Epiphyte in stunted, mossy forest on rocky slope, c. 950 m. Camp 4: 26651a.

Parmotrema conformatum (Vainio) Hale - Epiphyte in stunted forest, c. 1250-1500 m. Camp 2: 26754; camp 5: 27189, 27223.

Parmotrema cristiferum (Tayl.) Hale - Epiphyte in canopy of c. 15 m tall forest and in stunted forest, sometimes epilithic on sandstone outcrop, c. 320-1000 m. Camp 3: 27019, 27026; camp 4: 26583; camp 7: 26294.

Parmotrema dilatatum (Vainio) Hale - Epiphyte in scrub, sometimes on soil at tree base or on mossy rock, c. 650-1250 m. Camp 2: 26807; camp 3: 26977, 26985; camp 4: 26604; camp 8: 27266.

Parmotrema guyanum Hale - Epiphyte in scrub, c. 1000 m. Camp 4: 26554.

Parmotrema madagascariaceum (Hue) Hale - Epiphyte in scrub on exposed ridge, c. 1250 m. Camp 2: 26761.

Parmotrema mellisii (Dodge) Hale - Epiphyte in stunted forest, c. 1000-1500 m. Camp 2: 26781, 26785; camp 4: 26572; camp 5: 27174.

Parmotrema peralbidum (Hale) Hale - In stunted forest along streamlet, c. 1500 m. Camp 5: 27165.

Parmotrema sulphuratum (Nees) Hale - Epiphyte in low, mossy forest on rocky slope, c. 950 m. Camp 4: 26611.

Parmotrema verrucisetosum Sipman - Epiphyte in low, mossy forest on rocky slope, c. 950 m. Camp 4: 26595.

Pseudoparmelia sphaerospora (Nyl.) Hale - Epiphyte in stunted forest, c. 600-1500 m. Camp 2: 26753, 26786, 26851; camp 5: 27230; camp 8: 27271.

Relicina abstrusa (Vainio) Hale - Epiphyte in low forest and scrub, c. 800-1200 m. Camp 2: 26723; camp 3: 27034a; camp 4: 26632a, 26640.

Usnea aspera (Eschw.) Vainio - On exposed sandstone rock outcrop in open spot in rock savannah, c. 1200 m. Camp 2: 26710, 26765. TLC: usnic, norstictic, with or without protocetraric acids.

Usnea baileyi (Stirt.) A. Zahlbr. - Epiphyte on isolated shrubs on sandstone plateaus, c. 650-1500 m. Camp 2: 26760, 26768c; camp 5: 27109b; camp 8: 27258c.

Xanthoparmelia neopropaguloides Hale - On quartzite outcrop in scrub, c. 1000 m. Camp 4: 26498.

In addition, 27 unidentified specimens, half of which belong to the genus *Usnea*.

Physciaceae

Buellia aptrootii Sipman - On rock outcrop and on twigs in scrub on sandstone plateau, c. 1200 m. Camp 2: 26734, 26936.

Buellia bellardii Sipman, *sp. nov.*
Fig. 10.

Type: Venezuela, Estado Bolivar, Cerro Guaiquinima, near West end of upper plateau (near camp 5), coord. c. 5°48' N, 63°40' W, alt. c. 1500 m, blanket bog with *Stegolepis* on gentle slopes, with scattered rock outcrops and mossy dwarf forest, on twigs at forest margin, 15 February 1990, H. Sipman 27243 (VEN holotype, B).

Diagnosis: Thallus corticola, c. 1-2 cm diametro, pallide cinereus, areolatus, hypothallo nigro, areolis dispersis vel centralibus contiguis, 0.2-0.5 mm latis, c. 80 µm crassis, rotundis vel maioribus crenulatis, superficie leviter convexis vel undulatis, nitidis, acidum lobaricum continentia, hinc inde agglomerationibus substantiae rubrae (an acidum chiodectonicum?) in medulla. Apothecia sessilia, basi constricta, c. 0.3-0.6(-0.9) mm diametro, disco nigro, opaco, vulgo plano vel concavo, margine tenui, nigro, prominente, flexuoso; raro apotheciis paulo albopruinosis; epithecium fuscum; hymenium 40-70 µm crassum vulgo hyalinum; hypothecium excipulumque atrofuscum, nonnumquam substantia rubra in parte medullare excipuli; sporae fuscae, octonae, uniseptatae, 10-11 x 5 µm.

Thallus epiphytic, c. 1-2 cm diam., pale grey, areolate, with black hypothallus; areoles c. 0.2-0.5 mm wide, round, the larger ones crenulate, sessile to almost peltate, in the centre of the thallus more or less contiguous to coalescing, near the margin more dispersed, with smooth, slightly glossy, slightly convex or undulate upper surface, c. 80 µm thick; medulla to c. 30 µm thick, whitish, or thicker and bright red through masses of a K+ purplish pigment (anthraquinone?). Chemistry: lobaric acid (TLC), anthraquinone? Apothecia sessile, with strongly constricted base, c. 0.3-0.6(-0.9) mm diam., with black, sometimes slightly white-pruinose, dull, mostly flat or slightly concave disc, and rather thin, prominent, black, glossy, sometimes slightly white-pruinose, often flexuous margin; epithecium brown; hymenium 40-70 µm thick, clear, sometimes inspersed; hypothecium and excipulum dark brown, sometimes with large masses of red substance in the medullary exciple; these masses K+ purplish, dissolving in thin KOH-solution, probably the same anthraquinone as in the thallus. Ascospores dark brown, ellipsoid, rather wide at the poles, uniseptate, thinwalled, 8/ascus, 10-11 x 5 µm. Pycnidia not observed.

This species is conspicuous by its well-delimited, almost peltate areoles and the presence of a red pigment in parts of the thallus and sometimes also in the apothecial margin. The pigment has the same colour as that in *B. aptrootii* Sipman and *B. coccinea* (Fée) Aptroot, which is supposed to be chiodectonic acid (Aptroot 1988: 11). The former species differs in its thallus shape and the presence of a xanthone in the medulla instead of lobaric acid. The second differs by its granular thallus and the absence of lobaric acid.

It is unclear what defines the spots where the red pigment is accumulated in the medulla. Sometimes such spots are recognizable as swellings. The fact that the red pigment is sometimes found in the excipulum, suggests that the accumulation spots in the medulla may be apothecium initials.

The Colombian specimen is somewhat deviant because of its slightly pruinose apothecia and inspersed hymenium. The Venezuelan samples lack these characters.

The name is given in honour of Dr. Eugenio de Bellard-Pietri, organizer of the expedition to Cerro Guaiquinima, during which the species was detected. His efforts to make the expedition successful are gratefully acknowledged.

Distribution and ecology: Known so far from sandstone tableland in the Amazon basin in Colombia and in the Venezuelan part of the Guayana Highland. It has been found on twigs and branches of isolated trees on strongly leached sandstone tableland at 350-1500 m.

Additional material: camp 2: 26815, 26823. COLOMBIA, Comisaría Amazonas, Araracuara, tableland on S-side of river Caquetá W of Puerto Santander, opposite airstrip of Araracuara, alt. 350 m, 30 October 1988, H. Sipman & J. Duivenvoorden 27855 (ARA, B).

Buellia coccinea (Fée) Aptroot - On scattered shrubs in open, more or less boggy vegetation on sandstone plateau, c. 1000-1200 m. Camp 2: 26935; camp 4: 26541, 26570.

Buellia epimarta Malme - In stunted forest in clefts in rocky slope, c. 800 m. Camp 3: 27073a.

Heterodermia casarettiana (Mass.) Trev. - Scrub on sandstone plateau, c. 800-15000 m. Camp 2: 26729; camp 3: 27036b; camp 4: 26682; camp 5: 27211.

Heterodermia flabellata (Fée) Awas. - Epiphyte in scrub and stunted mossy forest on sandstone plateau, c. 650-950 m. Camp 3: 27071; camp 4: 26603, 26610; camp 8: 27255b, 27264.

Heterodermia galactophylla (Tuck.) Trev. - Epiphyte on branches in stunted forest and on twigs at margin of stunted mossy forest, c. 800-1500 m. Camp 3: 27023a; camp 5: 27245f.

Heterodermia hypoleuca (Ach.) Trev. - Epiphyte in stunted mossy forest, c. 950 m. Camp 4: 26586.

Heterodermia obscurata (Nyl.) Trev. - Stunted forest in clefts among sandstone rocks, c. 800 m. Camp 3: 27036.

Heterodermia speciosa (Wulf.) Trev. - Stunted forest on sandstone flats or in clefts, c. 800-1250 m. Camp 2: 26795; camp 3: 27023, 27076a. TLC: atranorin, zeorin.

Heterodermia squamulosa (Degel.) Culb. - Scrub and mossy stunted forest on rocky soil, c. 1000-1100 m. Camp 2: 26905; camp 4: 26692.

Pyxine obscurascens Malme - On sandstone outcrops in open spots, 600- 1250 m. Camp 2: 26762; camp 8: 27254a. TLC: atranorin, terpenoid.

Pilocarpaceae

Badimia dimidiata (Bab.) Vezda - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27288.

Byssoloma aeruginascens Vezda - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27289.

Byssoloma amazonicum Kalb & Vezda - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27292.

Byssoloma leucoblepharum (Nyl.) R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27290.

Byssoloma subdiscordans (Nyl.) P. James - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27291.

Fellhanera rhapidophylli (Rehm) Vezda - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27306.

Placynthiaceae

Polychidium dendriscum (Nyl.) Henssen - Twig epiphyte at margin of mossy forest, c. 1500 m. Camp 5: 27245i.

Ramalinaceae

Ramalina bistorta Nyl. - On twigs in scrub on top of exposed ridge, c. 1250 m. Camp 2: 26788.

Ramalina camptospora Nyl. - On twigs in scrub on exposed ridge and at margin of mossy forest, c. 1250-1500 m. Camp 2: 26767; camp 5: 27246c.

In addition, 56 unidentified specimens of Lecanorales, most of them falling within the old concepts of the families Lecanoraceae and Lecideaceae.

MELANOMMATALES

Aspidotheliaceae

Aspidothelium fugiens (Müll. Arg.) R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27281.

Pyrenulaceae

Pyrenula anomala (Ach.) Vainio - Epiphyte in understorey of c. 15 m tall forest, c. 320 m. Camp 7: 26388, 26430.

Pyrenula marginata Hook. in Kunth - Epiphyte in understorey of c. 15 m tall forest, c. 320 m. Camp 7: 26394.

Pyrgillus americanus Nyl. - Epiphyte in forest and scrub, c. 600-1250 m. Camp 2: 26744, 26850; camp 8: 27269b.

In addition, 12 unidentified specimens of *Pyrenula*.

Trypetheliaceae

Astrothelium cinnamomeum (Eschw.) Müll. Arg. - In scattered scrub on sandstone plateau and in stunted, mossy forest on rocky slope, c. 950-1000 m. Camp 4: 26539, 26548, 26633a, 26658.

Astrothelium gigasporum Harris - Trunk epiphyte in c. 15 m tall forest, c. 320-350 m. Camp 7: 26338, 26438, 26442.

Astrothelium ochrothelium (Nyl.) Müll. Arg. - On scattered shrubs in *Stegolepis* bog on sandstone plateau, c. 1000 m. Camp 4: 26522, 26526, 26535.

Astrothelium scorioides Nyl. - In stunted, interrupted forest on rocky slope, c. c. 800 m. Camp 3: 26986, 27005, 27007, 27011, 27016.

Astrothelium subfuscum Kremp. - In stunted, mossy, more or less interrupted forest on rocky slope, c. 800-950 m. Camp 3: 26950, 26952, 26972.

Astrothelium versicolor Müll. Arg. - In stunted, mossy, more or less interrupted forest on rocky slope, c. 800-950 m. Camp 3: 26947; camp 4: 26656.

Laurera subdisjuncta (Müll. Arg.) Harris - Epiphyte in low forest in clefts of rocky slope, c. 800 m. Camp 3: 27006.

Trypethelium aeneum (Eschw.) A. Zahlbr. - Epiphyte in canopy of c. 15 m tall forest and in low forest and scrub, c. 320-1200 m. Camp 2: 26934; camp 3: 26983, 27076; camp 4: 26525, 26533; camp 7: 26329.

Trypethelium nitidiusculum (Nyl.) Harris - Epiphyte in canopy of c. 15 m tall forest, in understorey of low mossy forest and in scrub, c. 320-1100 m. Camp 2: 26826, 26883, 26886, 26897; camp 3: 27017, 27018, 27022, 27048; camp 4: 26523, 26650, 26659, 26686; camp 7: 26301.

Trypethelium ochroleucum (Eschw.) Nyl. - Epiphyte in low forest and scrub, c. 800-1200 m. Camp 2: 26845; camp 3: 26940, 26943, 26959, 26960, 26965, 26971, 26981, 27009, 27015; camp 4: 26529, 26553, 26629, 26657, 26673.

Trypethelium tuberculosum (Vainio) Harris - Epiphyte in low forest, c. 1200 m. Camp 2: 26841.

In addition, 26 unidentified specimens, mainly belonging in *Astrothelium*, *Polymeridium* and *Trypethelium*, and 2 representing *Pseudopyrenula*.

VERRUCARIALES

Verrucariaceae

Normandina pulchella (Borr.) Nyl. - Epiphyte in scrub on sandstone plateau, c. 1200 m. Camp 2: 26811.

ORDER UNCERTAIN

Gomphillaceae

Actinoplaca strigulacea Müll. Arg. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27277.

Aulaxina minuta R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27282.

Aulaxina opegraphina Fée - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27283a.

Aulaxina quadrangula (Stirt.) R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27283.

Calenia conspersa (Stirt.) R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27294, 27295.

Calenia submaculans R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27296.

Caleniopsis laevigata (Müll. Arg.) Vezda & Poelt - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27297.

Echinoplaca affinis Kalb & Vezda - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27303.

Echinoplaca heterella (Stirt.) R. Sant. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27305.

Gyalectidium filicinum Müll. Arg. - Foliicolous in undergrowth of forest, c. 320 m. Camp 7: 27308.

Gyalideopsis robusta Kalb & Vezda - On thin litter layer on sandstone plate in half-shade, c. 800 m. Camp 3: 27080a.

Tricharia hyalina Kalb & Vezda - Foliicolous in undergrowth of c. 15 m tall forest, c. 320 m. Camp 7: 27329.

Strigulaceae

Raciborskiella janeirensis (Müll. Arg.) R. Sant.

- Foliicolous in understorey of c. 15 m tall forest, c. 320 m. Camp 7: 27326.

Strigula melanobapha (Kremp.) R. Sant. - Foliicolous in understorey of c. 15 m tall forest, c. 320 m. Camp 7: 27328.

Strigula nemathora Mont. - Foliicolous in understorey of c. 15 m tall forest, c. 320 m. Camp 7: 27327.

Trichotheliaceae

Porina epiphylla (Fée) Fée - Foliicolous in understorey of c. 15 m tall forest, c. 320 m. Camp 7: 27321.

Porina exasperatula Vainio - Epiphyte on treetrunk in c. 15 m tall forest along river, c. 320 m. Camp 7: 26478

Porina fusca Lücking - Foliicolous in understorey of c. 15 m tall forest, c. 320 m. Camp 7: 27325.

Porina imitatrix Müll. Arg. - Foliicolous in understorey of c. 15 m tall forest, c. 320 m. Camp 7: 27322.

Porina mastoidea (Ach.) Müll. Arg. - Epiphyte on treetrunk in c. 15 m tall forest and on branchlets in undergrowth of mossy forest in narrow valley, also on sandstone boulder on bank of river, c. 320-1100 m. Camp 2: 26914; Camp 7: 26396, 26412. Nr. 26412 and 26914 are deviating by their large spores. Further investigations might reveal that they belong to different species.

Porina rubentior (Stirt.) Müll. Arg. - Foliicolous in understorey of c. 15 m tall forest, c. 320 m. Camp 7: 27323.

Porina rufula (Kremp.) Vainio - Foliicolous in understorey of c. 15 m tall forest, c. 320 m. Camp 7: 27324.

Porina tetracerae (Afz. in Ach.) Müll. Arg. - Epiphyte on shrubs, palms, trunks, in undergrowth of c. 15 m tall forest, c. 320 m. Camp 7: 26437, 26454, 26471, 27249.

Porina tetralocularis Aptroot, ined. - Trunk epiphyte in mossy forest in narrow valley, c. 1100 m. Camp 2: 26924. To be published by Aptroot & Sipman (1992, in prep.).

Trichothelium annulatum (Karst.) R. Sant. - Foliicolous in undergrowth of c. 15 m tall forest, c. 320 m. Camp 7: 27330.

In addition, 3 unidentified specimens of *Porina*.

BASIDIOMYCETES

Corticiaceae

Corella zahlbruckneri Schiffn. - On mossy, horizontal treetrunk in mossy forest along streamlet, c. 1500 m. Camp 5: 27192.

Dictyonema glabratum (Spreng.) Hawksw. - Epiphyte on branches in stunted forest, c. 950-1500 m. Camp 2: 26777; camp 4: 26627; camp 5: 27186, 27187.

Dictyonema sericeum (Sw.) Berk. - In stunted forest, c. 650-1500 m. Camp 2: 26793; camp 3: 27037; camp 4: 26587, 26626; camp 8: 27265.

INCERTAE SEDIS

Phyllophiale alba R. Sant. - Foliicolous in understorey of c. 15 m tall forest, c. 320 m. Camp 7: 27320.

Siphula carassensis Müll. Arg. - On sandstone plates along periodically dry streamlets, 1000-1500 m. Camp 2: 26704, 26730; camp 4: 26486; camp 5: 27099 (cf.), 27156. Nr. 27099 differs by its taller, more slender stature, and its organic substrate. TLC: siphulin, thamnolic acid (nr. 27156 without thamnolic acid).

Siphula decumbens Nyl. - On thinner or thicker layer of organic, decaying material on sandstone rock, long moist after rain, in open places, and on decaying bark of sheltered treetrunks, c. 800-1500 m. Camp 2: 26708, 26748; camp 3: 27078; camp 5: 27226. TLC: thamnolic acid, with or without traces of siphulin.

Bryophyta

HEPATICAE

Trichocoleaceae

Trichocolea flaccida (Spruce) Jack & Steph. - On soil in stunted, mossy forest on rocky slope, c. 950 m. Camp 4: 26608. Dupl. in U det. by S. R. Gradstein, 1991.

Lepidoziaceae

Bazzania cf. *roraimensis* (Steph.) Fulf. - In scrub on exposed sandstone ridge, c. 1250 m. Camp 2: 26766. Dupl. in U det. by S. R.

Gradstein, 1991.

Micropterygium bolivarense Fulf. - In scrub on exposed ridge and in stunted forest in rock cleft, c. 800-1250 m. Camp 2: 26745, 26746; camp 3: 27042. Dupl. in U det. by S. R. Gradstein, 1991.

Micropterygium cf. *tatei* Reimers - In stunted mossy forest along streamlet, c. 1500 m. Camp 5: 27219. Dupl. in U det. by S. R. Gradstein, 1991.

Micropterygium trachyphyllum Reimers - In mossy forest in narrow valley, c. 1100 m. Camp 2: 26893. Dupl. in NY det. by W. R. Buck, 1991.

Mytilopsis albifrons Spruce - In mossy stunted forest, c. 800-1500 m. Camp 3: 27020; camp 4: 26619; camp 5: 27092, 27207, 27228. Nr. 27092 det. by M. Menzel, 1990.

Calypogeiaceae

Calypogeia venezuelana Fulf. - In stunted mossy forest along streamlet, c. 1500 m. Camp 5: 27147, 27166. Dupl. in U det. by S. R. Gradstein, 1991.

Cephaloziaceae

Anomoclada portoricensis (Hampe & Gott.) Vana - In open scrub with boggy places on sandstone flats, c. 1000 m. Camp 4: 26557. Dupl. in U det. by S. R. Gradstein, 1991.

Jamesoniella rubricaulis (Nees) Grolle - In blanket bog with rock outcrops and along streamlet, c. 1500 m. Camp 5: 27085, 27177. Dupl. in U det. by S. R. Gradstein, 1991.

Scapaniaceae

Scapania portoricensis Hampe & Gott. - In mossy forest along stream, c. 1500 m. Camp 5: 27149.

Geocalycaceae

Leptoscyphus ovatus (Spruce) Grolle - On sandy bank of stream in stunted mossy forest, c. 1500 m. Camp 5: 27155. Dupl. in U det. by S. R. Gradstein, 1991.

Lejeuneaceae

Blepharolejeunea saccata (Steph.) v. Slag. & Kruijt - Along streamlet in stunted mossy forest, c. 1500 m. Camp 5: 27171. Dupl. in U det. by S. R. Gradstein, 1991.

Ceratolejeunea grandiloba Jack & Steph. - Along streamlet in stunted mossy forest, c. 1500 m. Camp 5: 27154, 27205. Dupl. in U det. by S. R. Gradstein, 1991.

Cheilolejeunea fragrantissima (Spruce) Schust. - In mossy forest in narrow valley and in scrub on exposed ridge, c. 1100-1250 m. Camp 2: 26763, 26913. Dupl. in U det. by S. R. Gradstein, 1991.

Pycnolejeunea cf. *macroloba* (Nees & Mont.) Steph. - Blanket bog with scattered shrubs and rock outcrops, c. 1500 m. Camp 5: 27090. Dupl. in U det. S. R. Gradstein, 1991.

Thysananthus amazonicus (Spruce) Schiffn. - In stunted, mossy forest on rocky slope, c. 950 m. Camp 4: 26654, 26678. Dupl. in U det. by S. R. Gradstein, 1991.

In addition, unidentified Hepaticae are available from the following families and genera: Herbertaceae (*Herbertus* 6); Lepidoziaceae (*Bazzania* 7, *Lepidozia* 2); Cephaloziaceae (*Cephalozia* 1, *Odontoschisma* 2); Plagiochilaceae (*Plagiochila* 10); Radulaceae (*Radula* 1); Frullaniaceae (*Frullania* 6); Lejeuneaceae (*Cheilolejeunea* (*Strepsilejeunea*) 3, *Cololejeunea* (*Pedinolejeunea*) 1, *Colura* 1, *Lejeunea* 1); Aneuraceae (*Riccardia* 3).

MUSCI

Sphagnaceae

Sphagnum oxyphyllum Warnst. - On bank of streamlet in stunted mossy forest, c. 1500 m. Camp 5: 27227. Dupl. in NY det. by H. Crum, 1991.

Sphagnum sanguinale Warnst. - Terrestrial in *Stegolepis* bog and in mossy forest along streamlet, c. 1500 m. Camp 5: 27086, 27231. Dupl. in NY det. by H. Crum, 1991.

Sphagnum sipmanii Crum, *n. sp.*
Fig. 11a-g.
Type: VENEZUELA, Estado Bolivar, Cerro Guaiquinima, c. 5°40' N, 63°34' W, alt. c. 950 m, on soil in a low, mossy forest, on a rocky slope towards a stream, H. Sipman 26618, February 5,

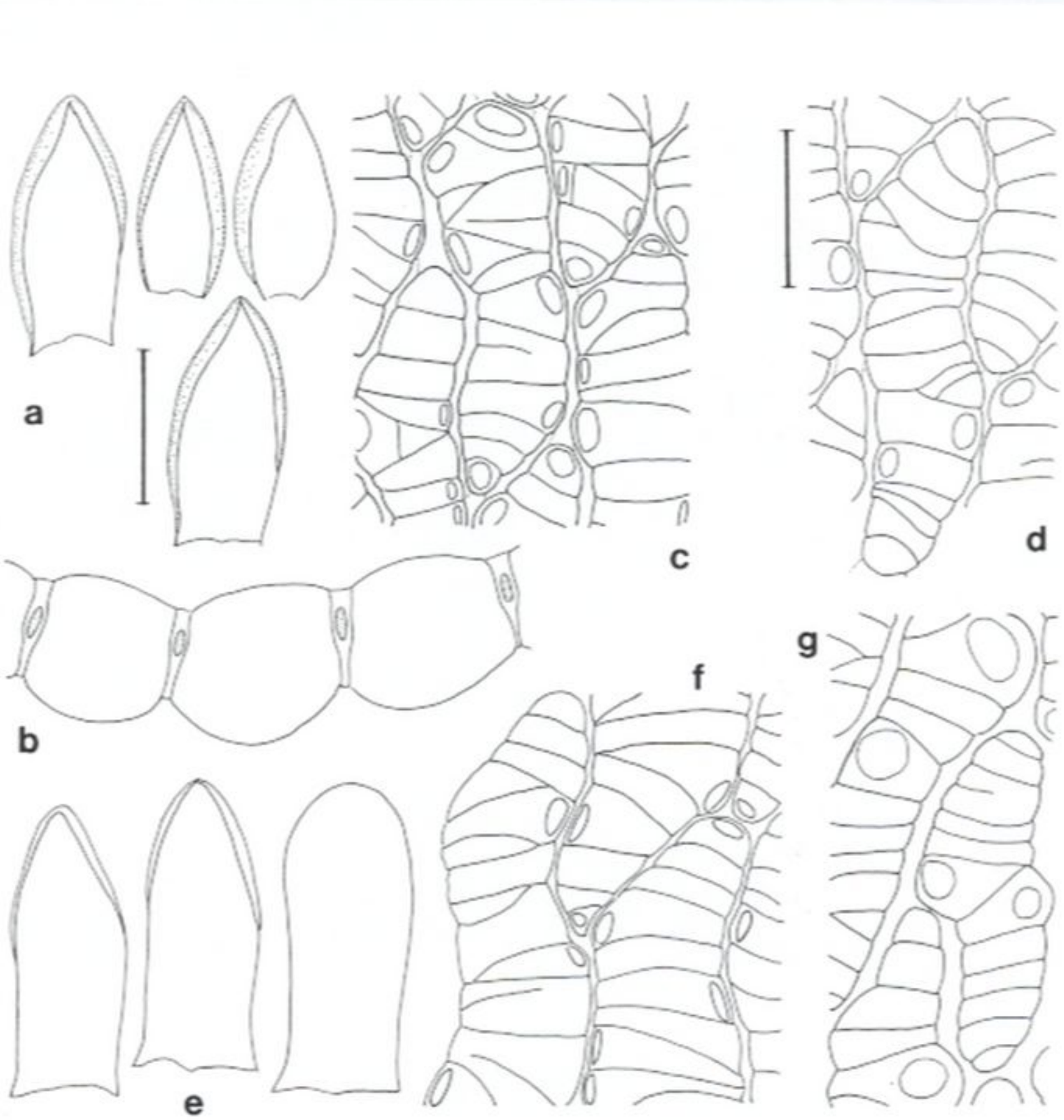


Fig. 11. *Sphagnum sipmanii*. a. Branch leaves; scale = 1 mm. b. Cross-section of branch leaf; scale as d. c. Branch leaf, outer surface; scale as d. d. Branch leaf, inner surface; scale = 50 µm. e. Stem leaves; scale as a. f. Stem leaf, outer surface; scale as d. g. Stem leaf, inner surface; scale as d.

1990 (NY holotype, B, VEN).

Diagnosis: Plantae pallide subfuscae. Epidermis caulina stratis 3, efibrillosa, parietes exteriores cellularum superficialium sine foraminibus, raro uniporosae; cylindrus lignosus obscure fuscus. Folia caulina oblonga, apice rotundata, saepe concavo-obtusa, ad apicem porosa fibrosaque; cellulae hyalinae non septatae, dorso foliorum poris ellipticis ad commissuras, saepe in angulis 2-3, superficie interiore poris rotundis magnis dispergentibus. Rami 2-fasciculati. Folia ramulina concavo-ovata, cucullata; cellulae hyalinae ad basim fibrosa, dorso foliorum poris ellipticis ad commissuras saepe poris annulatis binis ternisque in cellularum angulis coniunctis, interiore foliorum poris magnis rotundis; cellulae chlorophylliferae sectione transversali anguste fusiformes utroque latere foliorum liberae, cum pariete exteriore latiore.

Plants of moderate size, in tawny clumps. Stems brown; cortical cells 3-layered, very delicately fibrillose or, more commonly, efibrillose, without pores at the surface or occasionally uniporose; wood cylinder dark brown. Stem leaves 1.4-1.6 mm long, brown, oblong-lingulate, rounded at the apex but often concave-pointed, bordered by a resorption furrow; hyaline cells not divided, fibrillose in the upper 1/4-1/3, on the outer surface with 2-4 elliptic, ringed pores and pseudopores at corners and commissures, often in 2's and 3's at adjacent angles, near midleaf just below the fibrillose and porose zone with 2-4 large, imperforate, rounded or oblong membrane gaps, on the inner surface with 0-4 large, round, unringed pores (about as wide as the cells). Branches paired (1 spreading); cortical cells efibrillose (or less often very delicately or faintly fibrillose), uniporose at the upper ends. Branch leaves loosely erect, not noticeably 5-ranked, 1.7 mm long, concave, oblong-ovate or ovate, bordered by a resorption furrow and slightly roughened by resorption at the extreme apex; hyaline cells fibrillose throughout, on the outer surface with 1-3 elliptic, ringed pores at corners and commissures, often in groups of 2-3 at adjacent cell angles, on the inner surface with 0-3 rounded or rounded-elliptic, thin-margined pores at or near angles and commissures; hyaline cells in section somewhat convex on the inner surface, more so on the outer, and green cells narrowly lenticular, very narrowly exposed on both surfaces but more broadly so on the inner surface.

This species is more notable for a combination of characters rather than for any striking features. The stem and branch leaves both have a marginal resorption furrow and a similar porosity of hyaline cells. Perhaps the most curious feature of the stem leaves is the narrow zone of efibrillose cells with membrane gaps located next below the fibrillose, porose upper cells. The cortical cells of both stems and branches typically lack fibrils. The green cells of branch leaves are narrowly lenticular in section, with a somewhat broader exposure on the inner surface. (The sectional view of green cells is much like that of *S. perichaetiale* Hampe).

Distribution and ecology: The species is only known from its type, which was collected on the ground in stunted, mossy forest on sandstone, at 950 m elevation on Cerro Guaiquinima, Venezuela.

Sphagnum tenerum Sull. & Lesq. - On bank of streamlet in mossy forest, c. 1500 m. Camp 5: 27224. Dupl. in NY det. by H. Crum, 1991.

Dicranaceae

Bryohumbertia filifolia (Hornsch.) Frahm - In mossy forest in narrow valley, c. 1100 m. Camp 2: 26923. Dupl. in herb. Frahm det. by J.-P. Frahm, 1990.

Campylopus savannarum (C. Müll.) Mitt. - Rocky slope with stunted forest, c. 800 m. Camp 3: 26975. Dupl. in herb. Frahm det. by J.-P. Frahm, 1990.

Campylopus subcuspidatus (Hampe) Jaeg. - On boggy or sandy soil in open low scrub on sandstone tableland, c. 1000-1500 m. Camp 2: 26740; camp 4: 26556; camp 5: 27122. Dupl. in herb. Frahm det. by J.-P. Frahm, 1990.

Leucobryaceae

Leucobryum albidum (Brid.) Lindb. - On soil

along streamlet in mossy stunted forest, c. 1500 m. Camp 7: 27168. Dupl. in NY det. by W. R. Buck, 1991.

Leucobryum crispum C. Müll. - In mossy forest, c. 950-1500 m. Camp 2: 26857, 26912; camp 4: 26596; camp 5: 27144. Dupl. in NY det. by W. R. Buck, 1991.

Leucobryum martianum (Hornsch.) Hampe - On mossy rock in stunted forest in cleft between sandstone rocks, c. 800 m. Camp 3: 27029. Dupl. in NY det. by W. R. Buck, 1991.

Octoblepharum cylindricum Mont. - In stunted forest on exposed ridge, in clefts between sandstone rocks, and along streamlet, c. 800-1500 m. Camp 2: 26750; camp 3: 27047; camp 5: 27167. Dupl. in NY det. by W. R. Buck, 1991.

Calymperaceae

Syrrhopodon elongatus Sull. var. *glaziovii* (Hampe) Reese - In stunted forest on exposed ridge or in clefts between rocks, c. 800-1250 m. Camp 2: 26799; 26803; camp 3: 27034b. Dupl. in NY det. by W. R. Buck, 1991.

Syrrhopodon fimbriatus Mitt. - Epiphyte in stunted mossy forest on rocky slope, c. 950 m. Camp 4: 26622. Dupl. in NY det. by W. R. Buck, 1991.

Syrrhopodon flexifolius Mitt. - On thin, small tree, just above the soil, in stunted forest in cleft between sandstone rocks, c. 800 m. Camp 3: 27072. Dupl. in NY det. by W. R. Buck, 1991.

Syrrhopodon helicophyllus Mitt. - Epiphyte in stunted mossy forest on rocky slope, c. 950 m. Camp 4: 26606, 26653. Dupl. in NY det. by W. R. Buck, 1991.

Syrrhopodon leprieurii Mont. - In mossy stunted forest along streamlet, c. 1500 m. Camp 5: 27153. Dupl. in U det. by S. R. Gradstein, 1991.

Syrrhopodon steyermarkii Robinson - On bank of periodically dry rivulet in mossy forest in narrow valley, c. 1100 m. Camp 2: 26879. Dupl. in NY det. by W. R. Buck, 1991.

Rhizogoniaceae

Pyrrhobryum spiniforme (Hedw.) Mitt. - On bank of periodically dry rivulet in mossy forest in narrow valley, c. 1200 m. Camp 2: 26891. Dupl. in NY det. by W. R. Buck, 1991.

Orthotrichaceae

Macromitrium cf. *portoricense* Williams - In scrub in bog on sandstone tableland, c. 1000 m. Camp 4: 26693. Dupl. in NY det. by W. R. Buck, 1991.

Meteoriaceae

Squamidium leucotrichum (Tayl.) Broth. - In mossy forest in narrow valley, c. 1100 m. Camp 2: 26929. Dupl. in NY det. by W. R. Buck, 1991.

Thuidiaceae

Thuidium tomentosum Schimp. ex Besch. - On soil in mossy forest in narrow valley, c. 1100 m. Camp 2: 26898. Dupl. in NY det. by W. R. Buck, 1991.

Sematophyllaceae

Acroporium pungens (Hedw.) Broth. - In mossy forest, c. 1100-1500 m. Camp 2: 26875; camp 5: 27146. Dupl. in NY det. by W. R. Buck, 1991.

Sematophyllum subsimplex (Hedw.) Mitt. - In mossy stunted forest, c. 1500 m. Camp 5: 27148. Dupl. in NY det. by W. R. Buck, 1991.

Discussion

1. The significance of the presented list as a baseline record of a virgin area

Cerro Guaiquinima bears at present no sign at all of human influence. Such influence is the more unlikely as the area is very infertile and of difficult access. Even for a sporadic hunting party the area seems unsuitable because of the difficulty of bringing prey home. Therefore the list of species can be considered as the record of a virgin situation, which can serve as a baseline for study of future changes when the area becomes more influenced by man. However, it is probably not very representative for virgin neo-

Table 1. Comparison of the lichen flora of Cerro Guaiquinima (C.G., first column) with the N-slope of Mount Roraima and surroundings (M.R., third column, after Sipman & Aptroot 1992). Species numbers are presented for the more important orders and families. The second column gives the species numbers in common between both areas.

	C.G.		M.R.
Arthoniales	16	13	17
Caliciales	3	2	4
Thelotremataceae	35	20	34
Gyalectales	4	3	4
Lecanorales (excl. Cladoniaceae, Parmeliaceae)	52	31	77
Cladoniaceae	25	19	23
Parmeliaceae	31	16	34
Melanommatales	16	12	26
Gomphillaceae	12	7	13
Trichotheliaceae	10	10	15
Basidiolichenes	3	3	4
total number (incl. smaller groups)	216	144	276

tropical areas in general, because the area is uniformly very oligotrophic, and for that reason is likely to have a poor flora.

The value of the species list as a baseline record of a virgin situation depends of course upon its completeness. This is difficult to estimate. On one hand the expedition provided ample time to study the lichen flora on each site. On the other hand the number of visited sites was restricted and, in view of the large size of the mountain and the fact that the investigations were rarely made more than a few hundred meters away from the camps, it is possible that important habitats have remained unobserved. The numbers of unidentified specimens show that about one third of the observed flora remains unnamed because of taxonomical problems. Further incompleteness can be expected because mosses and lichens tend to grow on specialized microhabitats which easily remain unobserved. Foliicolous lichens have been studied in some detail only from one site. Therefore it seems probable that at most half of the real flora is recorded, and only the commoner species seem well represented, whereas the less common elements are probably still very incompletely known. Since more attention was paid to lichens than to bryophytes, the latter are likely to be more incompletely reported.

2. Characteristics of the flora

An interpretation of the results is hardly possible because few comparable observations from other tropical areas are available. Literature on tropical lichens and bryophytes usually concerns taxonomically delimited groups, or the flora of a larger area, or incidental observations. The only available comparable reports concern an area which also belongs to the Guayana Highland, the N-slope of Mount Roraima and surroundings (Gradstein & Florschütz-de Waard 1989, Sipman & Aptroot 1992). Since much less

attention was paid to bryophytes on Guaiquinima, a comparison with the above area is restricted to lichens, cf. table 1.

Table 1 shows that the comparison area shares slightly more than half of their species with Guaiquinima. The proportions of the different groups in both areas are rather similar. The total species number from the Roraima area is higher, probably reflecting the larger and more diverse investigated area. Comparison of the species lists shows that an agreement is also found in the poor representation of certain groups which are normally common in the tropics, like *Leptogium*, *Pannaria*, Lobariaceae.

The second column of Table 1 shows that the agreement at species level between Guaiquinima and Roraima is not as high as one would expect in view of the fact that both areas are very similar and that lichen species tend to be widely distributed. A possible explanation is that the exploration of both areas is very incomplete, so that most of the species found in only one area would eventually turn up in the other after more exploration. Alternatively it might indicate that the distribution of many lichens is rather patchy. This hypothesis is supported by the fact that some of the species lacking in one area were observed several times in the other. This concerns the following species, which have been found only in the Roraima area: *Myriotrema hartii*, *M. wrightii*, *Ocellularia subemersa*, "*Catillaria*" *endochroma*, *Squamacidia janeirensis*, *Parmotrema subochraceum*, and those which have been found only on Guaiquinima: *Nadvornikia hawaiensis*, *Ocellularia comparabilis*, *O. glaucoglyphica*, *O. xanthostroma*, *Cladina argentea*, *C. dendroides*, *Cladonia guianensis*, *C. vareschii*, *C. variegata*, *Pyrrhospora russula*, *Bulbothrix apophysata*, *Heterodermia flabellata*. The "patchy" distribution of these species is not correlated with very evident ecological factors, and it would be worth while to investigate whether subtle ecological differences are involved or perhaps dispersal limitations. In this connection the observation by Montfoort and Ek should be mentioned, that lichens occur more dispersed in lowland rainforest than bryophytes (Gradstein 1992: 239).

Some of the species, which are rather frequent in the Roraima area and absent from Guaiquinima, were found mostly but not exclusively in cultivated areas: *Graphis afzelii*, *Bulbothrix goebelii*, *Physcia atrostriata*, *Physcia sorediosa*, *Pseudopyrenula subgregaria*.

Present knowledge is insufficient to decide whether there exist lichen species restricted to the Guayana Highland or Cerro Guaiquinima in other groups than Cladoniaceae (Ahti 1987). A number of new crustose species are being described from the area, both in the present paper and by Sipman & Aptroot (1992), which are known so far only from the Highland. However, the crustose lichen flora of other tropical lowland areas in northern South America is very little known, so that it is uncertain whether the new species are absent from those areas. Future fieldwork is very likely to show that these areas contain many more species than known at present. The same counts for the new bryophyte taxa reported by Gradstein & Florschütz-de Waard (1989). Since small ranges are unusual in lichens and bryophytes, the existence of Guaiquinima endemics is not very likely.

3. Altitudinal zonation

A comparison of the different sampling sites shows, that the altitudinal differences are strongly correlated with differences in vegetation structure: the lowest camp has closed forest, whereas the the higher camps have much open scrub. The floristic differences between the sites appear to reflect principally these differences in vegetation structure. Thus in the lowest camp, nr. 7 at c. 300 m, Cladoniaceae are almost absent, reflecting the absence of clearings in the forest. In the camps on the summit plain at 800-1500 m more Trypetheliaceae were found and less Thelotremataceae, reflecting the more open vegetation.

Characteristic species for the lowest site (camp 7, c. 300 m, some also present in 8, c. 600 m), which have been found only there and seem to be rather frequent since they are represented by more than one collection, include *Myriotrema guianensis*, *Ocellularia auberiana*, *Ocellularia comparabilis*, *Ocellularia glaucoglyphica*, *Ocellularia papillata*, *Ocellularia perforata*, *Ocellularia xanthostroma*, *Thelotrema albomaculatum*, *Crocynia gossypina*, "*Lecidea*"

granifera, *Astrothelium gigasporum*, *Porina tetracerae*. It concerns forest lichens.

The intermediate stations (camp 2, 3, 4, 800-1200 m) appear to have a rather uniform flora, and contain few species restricted to one camp site and observed there more than once. It concerns for camp 2: *Ocellularia tenuis*, *Hypotrachyna flavida*, *Usnea aspera*, *Buellia aptrootii*, *Cheilolejeunea fragrantissima*; for camp 3: *Hypotrachyna degelii*, *Astrothelium scorioides*, *Astrothelium subfuscum*; for camp 4: *Nadvornikia hawaiensis*, *Biatorella wrightii*, *Astrothelium cinnamomeum*, *Astrothelium ochrothelium*, *Thysananthus amazonicus*, *Syrrhopodon helicophyllus*. Unclear is whether their restricted occurrence should be explained by some less obvious ecological differences or by incomplete collecting.

Characteristic species for the highest site, camp 5 at c. 1500 m, which are observed only there and were found more than once, include *Phaeographis exaltata*, *Ocellularia nigropuncta*, *Calypogeia venezuelana*, *Jamesoniella rubricaulis*, and *Sphagnum sanguinale*. It concerns mainly bryophytes, no doubt because of the higher humidity of the site. At least one species can be considered as a montane element, *Jamesoniella rubricaulis*, widespread in high-andean habitats.

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Appendix:

Ocellularia sinuosa Sipman, *sp. nov.*
Fig. 8.

Type: Colombia, Comisaría Amazonas, Comunidad de Villazul, E of Araracuara, N-bank of river Caquetá, opposite E-end of Isla Morrocoy, alt. c. 300 m, coord. 0°36' S, 72°10' W, c. 10 m tall, light savannaforest on podsolized soil with peaty toplayer, on Tertiary sediments, 2 km N of the river, 3 nov. 1988, H. Sipman & J. Duivenvoorden 28497 (ARA holotype, B).

Diagnosis: Thallus corticola, epiphloeodes, 10 cm diametro vulgo superans, cinereus vel pallide viridicinereus, laevis, nitidus, acidum hypoprotocetraricum continens. Apothecia sessilia, rotundata, magna, ad 10 mm lata, margine tenui recurvato non carbonaceo, disco pallide rubro, a columellis linearibus sinuosis partim carbonaceis divisae; hymenium 75 µm altum, hyalinum; sporae hyalinae, transversaliter 9-septatae, I+, c. 24 x 6 µm.

Thallus corticolous, epiphloeodal, often over 10 cm. diam., grey or pale greenish grey, smooth, slightly glossy, without vegetative propagules, 20-40 µm thick; cortex composed of agglutinated hyphae, c. 6 µm thick; TLC: hypoprotocetraric acid with unknown accessory spot; algal cells subglobose, c. 8 µm diam.; medulla without crystals, in part entering the bark cells. Apothecia frequent, rounded with recurved, chroodiscoid margin, measuring up to 10 x 5 mm, flat and appressed on the thallus; disc pink, with numerous parallel, sinuous, partly carbonized columellae; hymenium 75 µm high, clear; spores hyaline, transversely 9-septate, 8 per ascus, I+, c. 24 x 6 µm.

Ocellularia sinuosa is a very conspicuous species because of its large apothecia with pink discs and sinuous linear columellae. The columellae are composed of carbonized tissue which evidently developed along the apothecial margin; with successive enlargement of the apothecia they become detached and situated on the disc, and a repetition of the process produces the numerous parallel columellae. The carbonization shows that the species belongs in *Ocellularia*, and not among the chroodiscoid species in *Thelotrema*, as the recurved margin would suggest. Similar chroodiscoid forms occur in *Ocellularia auberiana* (Mont.) Hale, e.g. the form originally described as *Thelotrema anamorphoides* Nyl.

Older apothecia tend to grow mainly on one side, which causes the apothecia to become more or less semilunar. Most of the apothecia appeared to be without fertile hymenia, and among the available collections spores were found only in nr. 28497.

Distribution and ecology: The available records, from Cerro de la Neblina in Venezuela and Araracuara in Colombia, suggest that the species may be widespread in the eastern part of the Amazon basin. It grows on smooth bark of thin stems in light forest at low elevations (140-300 m). The Colombian finds were from oligotrophic, boggy places.

Additional material: COLOMBIA: Comisaría Amazonas, Comunidad de Villazul, E of Araracuara, N-bank of river Caquetá, opposite Isla Mariñame, 2 nov. 1988, H. Sipman & J. Duivenvoorden 28363 (ARA, B). VENEZUELA: Amazonas, Depto. Río Negro, Cerro de la Neblina, along Río Mawarinuma, just outside Cañon Grande, 21 Febr. 1984, W. R. Buck 11047 (NY). ibidem, 8 Mar. 1984, W. R. Buck 11453 (NY).

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Taxonomic Results of the BRYOTROP Expedition to Zaire and Rwanda

7. Ricciaceae

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Abstract. Four *Riccia* species, namely *R. lanceolata*, *R. okahandjana*, *R. stricta* and *R. vulcanicola* of the hepatic family Ricciaceae (order Marchantiales) from Rwanda and Zaïre are described and illustrated in this report. *Riccia lanceolata* and *R. stricta* are new records for Rwanda.

RICCIACEAE Reichenbach
(Marchantiales)

Plants thalloid, small to large, scattered or in gregarious patches or in rosettes, green; terricolous, rarely aquatic. Branches 2 or 3 times dichotomously furcate, linear to obovate; apex truncate to rounded, emarginate. Groove median along dorsal face. Thallus margins acute to obtuse, glabrous or occasionally ciliated. Flanks sloping obliquely or steep; ventral face rounded to flat. Scales small to large, rarely absent, generally imbricate, lateral or ventral, hyaline or variously coloured, purple, red or black.

Dorsal covering an epithelium of hyaline, echlorophyllose cells in 1 or 2 strata with air pores numerous, small, regular spaces; or else, dorsal covering an epidermis, chlorophyllose, generally unistratose with air pores fewer, simple, delimited stomata, scattered, and often becoming cavernous. Assimilation tissue compact, cell columns enclosing narrow vertical air canals; or spongy, with mostly unistratose cell plates enclosing wide polyhedral air chambers; storage tissue occupying ventral ½ or less of thallus; rhizoids long, unicellular, smooth or tuberculate, arising from ventral epidermis.

Monoicous or dioicous. Gametangia acropetally arranged, embedded, only necks projecting, single, median along groove or scattered. Sporangia without stalk or foot, enclosed by venter wall, soon disintegrating to liberate spores, elaters absent. Spores generally large, separating at maturity, rarely remaining coherent in tetrads, triangular-globular or subglobular, ornamentation mostly reticulate, often specific.

The family, classified in the Marchantiales, comprises two genera: firstly, the species-rich genus *Riccia* with up to about 200 species worldwide, and secondly, the monotypic, cosmopolitan genus *Ricciocarpos*.

Abbreviations::

* New record for Rwanda viz. Zaire
KB: Kahuzi-Biega (Zaire)
Ka: Karisimbi (Rwanda)
Ny: Nyungwe Forest (Rwanda)
Ak: Akagera region (Rwanda)
Ki: Kigali region (Rwanda)
100-171, number of collecting site.
For locality data and a description see the contribution by E. Fischer on the vegetation of the study area in this volume (Tropical Bryology 8: 13-37, 1993). The specimens are deposited at the Botanical Museum Berlin (B) as well as in the herbarium of the author (except for unicates).

RICCIA L.

Riccia L. Species Plantarum: 1138 (1753); Steph.(1898: 314); Sim (1926: 8); Müller (1951-1958: 416); S. Arnell (1963: 13); Hässel (1962: 208); Na-Thalang (1980: 71); Jovet-Ast (1986: 291). Lectotype species: *R. glauca* L., fide Hässel in Opera Lilloana 7: 208 (1962).

The species dealt with in this report belong to two different subgenera: *Riccia* and *Ricciella* (A. Braun) Reichenb. The latter is here represented by both its sections: section *Ricciella* and section *Spongodes* Nees.

KEY TO THE SPECIES OF *RICCIA* IN THIS REPORT

1a. Thalli covered by a dorsal epithelium of echlorophyllose cells in one or rarely in two strata; air pores numerous, small and regular intercellular spaces; assimilation tissue compact, in vertical rows of chlorophyllose cells separated by mostly very narrow interstitial air canals; scales small to large; habitat often xeric, sometimes mesic (Subgenus *Riccia*):

2a. Thalli glaucous green to green; scales deep violet with hyaline edges extending to thallus margins but never inflexed over them; spores distinctly polar, winged, proximal face with well-defined triradiate mark, facets and distal face often with incomplete areolae....1.*R. lanceolata*

2b. Thalli bluish green; scales prominent, black, projecting above thallus margins, and inflexed over dorsal face, dry; spores not distinctly polar, wingless, lacking triradiate mark, densely papillate.....2. *R. okahandjana*

1b. Thalli covered by a dorsal epidermis of thin-walled, chlorophyllose cells; air pores mostly clearly delimited, often ringed by smaller cells, well-spaced, fewer, frequently becoming cavernous; assimilation tissue loosely arranged, spongy, unistratose cell plates enclosing large polyhedral air chambers; scales small and evanescent; habitat mostly mesic, rarely xeric or aquatic (Subgenus *Ricciella*):

3a. Thalli not in rosettes; branches linear, strap-shaped or 'ribbon-like'; never cavernous; sporangia in a row, oblique and markedly bulging ventrally; distal spore face with areolar walls wide and prominent, proximal face with thick triradiate mark ....3. *R. stricta* (section Ricciella)

3b. Thalli in partial rosettes; branches not linear; becoming cavernous proximally; sporangia numerous, crowded, bulging dorsally and ventrally; areolar walls on both spore faces and triradiate mark on proximal face thin.....
.....4. *R. vulcanicola* (section Spongodes)

Subgenus *Riccia*

Thalli small to large; terricolous. Groove deep or shallow. Scales mostly large, lateral, rarely ventral, rounded, variously pigmented or hyaline, extending to, or projecting above thallus margins, scale margins entire, rarely denticulate or crenate.

Dorsal epithelium hyaline, in one or more strata, air pores small spaces, numerous, regular. Assimilation tissue compact, with mostly narrow interstitial vertical air canals.

Spores large, (65-)80-120 µm in diameter; tetrads separating at maturity, triangular-globular or subglobose, variously ornamented.

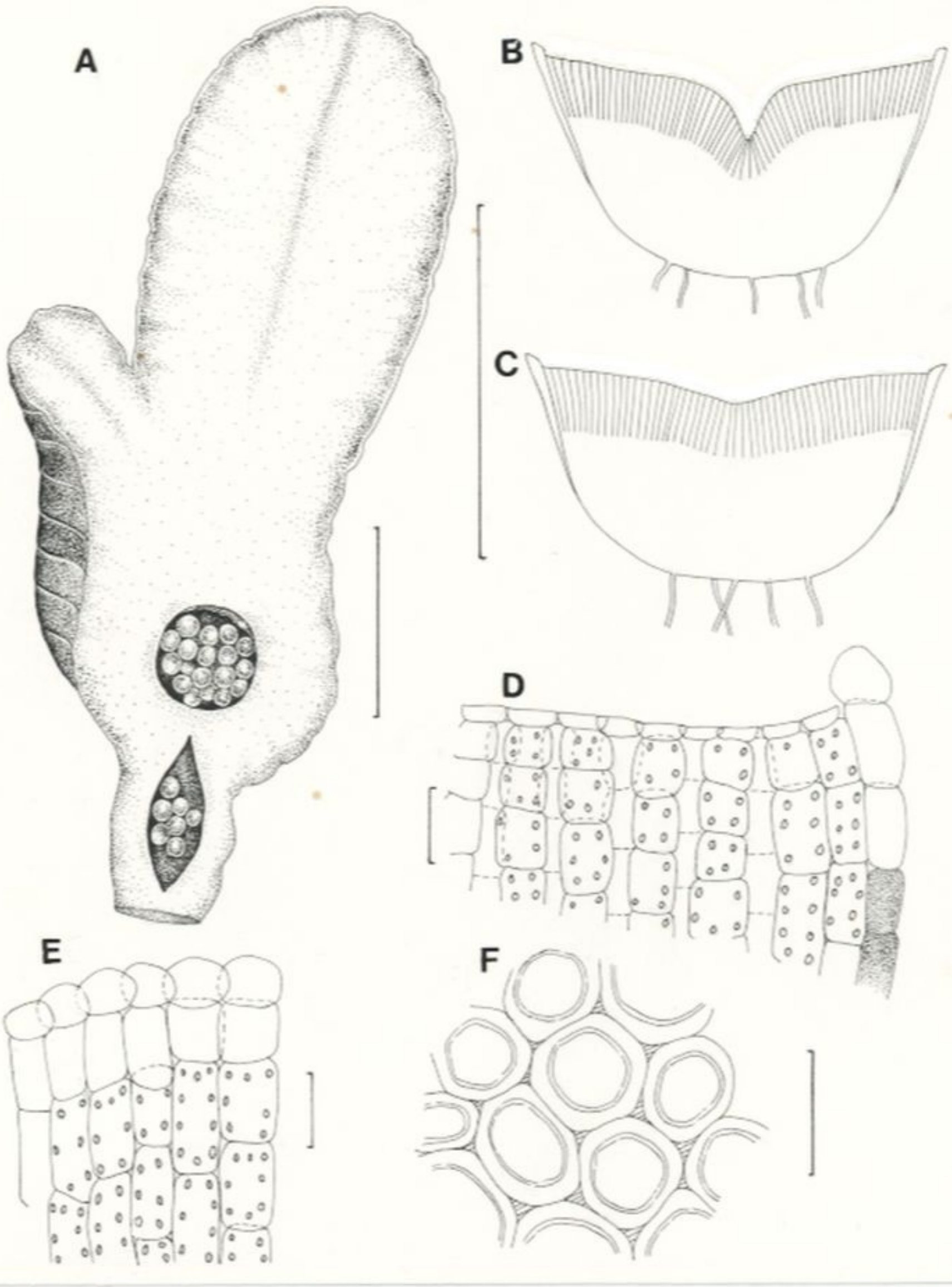

Figure 1. *Riccia lanceolata*. A, thallus branches seen from above; B,C, transverse sections of thallus branch near apex and toward base respectively. D, collapsed dorsal cells and assimilation tissue toward margin, with scale attached, in transverse section; E, intact dorsal cells and assimilation tissue toward groove, in transverse section; F, dorsal cells from above. A–F, *Frahm 6524*. Scale bars on A–C = 1mm; D–F = 50 μm.

1. ***Riccia lanceolata* Steph.** in Hedwigia 27: 110 (1888); *ibid.* (1898: 34); Jones (1957: 218). Type: Dahomey: Canné, *F. Newton 6* (G, holo.!)

Plants medium-sized, in crowded, gregarious or overlapping patches, rarely in irregular rosettes or scattered; glaucous green to bright green, with narrow white or sometimes violet band on inner side of hyaline, undulating margins; when dry, dorsally pale green to whitish, margins raised to incurved and occasionally clasped together apically, exposing purple flanks, sometimes appearing vertically 'striped', due to hyaline margins of scales. Branches simple, to once or twice dichotomously furcate, closely to moderately divergent, rarely asymmetrically branched, with one long and one short, almost parallel lobe; broadly ovate or ± linear, 4.0-8.5 mm long, (1.0-)1.5-2.5 mm wide, 0.7-1.0 mm thick and in section (1½-)22½(-3) times wider than thick; apex obtusely rounded to somewhat tapered, shortly emarginate. Groove apically narrow and deep, becoming shallower, but persisting to ± midlength of dorsal face. Thallus margins acute, slightly raised, hyaline, wavy. Flanks distally vertical, proximally sloping steeply upward and outward, basally reddish purple to deep violet, at margins hyaline or white; ventral face rounded, entirely purple or green with purple blotches. Scales fragile, closely adherent to flanks, imbricate, rounded, 400 x 500 µm, projecting up to 90 µm above thallus margins, with hyaline border of 2-4 cell rows above purple base, cells in body of scale long hexagonal, 50-65(-85) x 37 µm, marginally smaller, isodiametric or short-rectangular.

Dorsal epithelium unistratose, hyaline, cells globose to rounded above, 27.5-37.5 x 32.5-37.5 µm, soon collapsed and cup-shaped, sub-dorsal cells 30.0-62.5 x 27.5-37.5 µm, mostly echlorophyllose, walls uniformly thin; air pores triangular. Assimilation tissue 320-375(400) µm thick, less than ½the thickness of thallus, consisting of vertical columns of 6 or 7 rectangular cells 40-60 x 27-37 µm, enclosing 4-sided air canals, ± 15 µm wide; storage tissue occupying ventral part of thallus, cells angular or rounded, closely packed together, 35.0-62.5 µm wide.

Monoicous. Antheridia with inconspicuous hyaline necks, projecting ± 80 µm, in a row along dorsal groove. Archegonia with purple necks and hyaline tips, total length 300 µm, of which 200 µm projecting above dorsal surface. Sporangia 3 or 4 proximally in a central row, each containing 115-125 spores, overlying tissue turning white and disintegrating, leaving sporangia exposed in longitudinal hollow. Spores (87.5-) 92.5-100.0(-105.0) µm in diameter, triangular-globular, polar, reddish-brown, semi-transparent; wing faintly granular, 5 µm wide, marginal angles not perforated, margin roughened to finely crenulate; ornamentation mostly incompletely reticulate on both spore faces: distal face convex, areolae incomplete and generally not extending to margin, (5)6-8 across, (10-)12-22 µm wide, central walls up to 5 µm high, raised at nodes, outer walls low and often absent; proximal face with triradiate mark distinct; facets mostly with poorly developed areolar walls, only disconnected low walls or nearly smooth. Chromosome number: n = 16 (Bornefeld 1987).

Riccia lanceolata can be distinguished from the other *Riccia* species with wavy, hyaline margins, namely *R. atropurpurea*, *R. nigerica* and *R. radicosa*, by its medium-sized thalli (it is more robust than *R. atropurpurea* and *R. radicosa*, but smaller than *R. nigerica*); by its winged spores, the ornamentation of which is rarely completely reticulate, by the bright green colour of living plants, the dorsal cells lacking any fine deposit of salts as is usually found in *R. atropurpurea*; and by its 'striped' flanks. (Note: in the type specimen, *Newton 6*, the spore ornamentation is variable, the areolar walls being poorly to well-defined.)

Habitat. *Riccia lanceolata* was found on soil in a bog in the area reported on. Otherwise it grows on shallow soil overlying granite or ironstone, often between grasses.

Altitudinal range. 2330 m

General distribution. *Riccia lanceolata* is known from Benin (= Dahomey), Nigeria and Uganda (Jones 1957), Ghana (Jones & Harrington 1983), Ivory Coast (leg. *Porembski*), Malawi (leg. *Perold*), Tanzania (leg. *Pócs*), Zambia (leg. *Bing-*

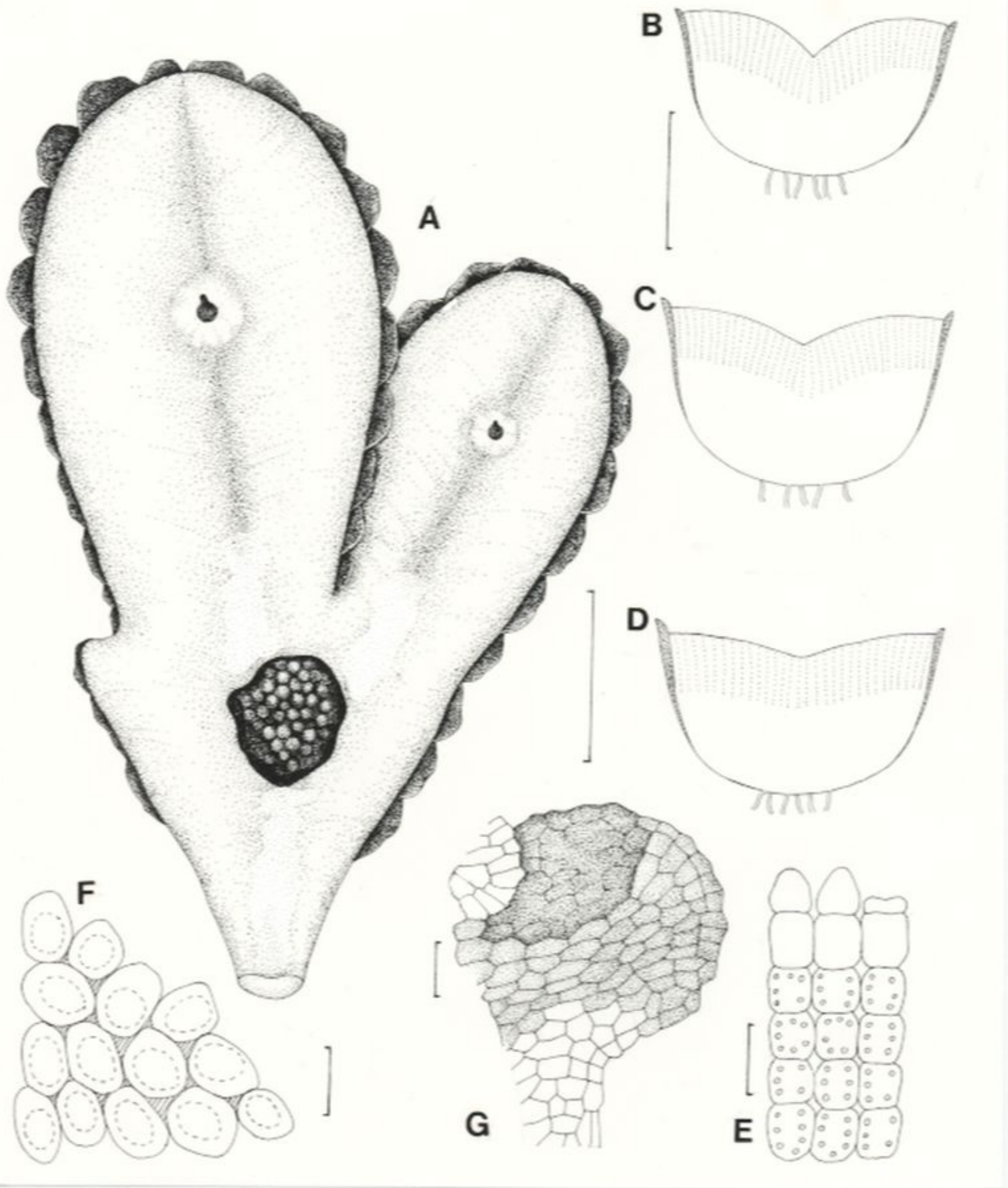

Figure 2. *Riccia okahandjana*. A, thallus braches seen from above; B–D, transverse sections of thallus branch from apex toward base; E, dorsal cells and assimilation tissue in transverse section; F, dorsal cells from above; G, ventral scale. A–G, *Frahm 9023*. Scale bars on A–D = 1 mm; E,F = 50 μm; G = 100 μm.

ham) and now from Rwanda.

Illustrations. Figures 1AE; 5A,B.

Specimen examined. **Ny:** 115, *Frahm 6524*.

2. ***** ***Riccia okahandjana*** **S. Arnell** in Mitteilungen der botanischen Staatssammlung München 16: 268 (1957); S. Arnell (1963: 32). Type: Namibia: Bez. Otjiwarongo: Okosongomingo, *Volk 11944* (PRE-CH4233) (M; PRE, lecto.!, selected by Perold, Ph.D thesis, Pretoria University 1991).

Plants medium-sized, in crowded gregarious patches or in rosettes 15-30 mm across; green to bluish green, sometimes blotched with violet, black scales projecting vertically above margins; when dry, dorsally yellowish green, mostly hidden by tightly inflexed sides covered with shiny black scales. branches simple or once or twice to several times symmetrically or asymmetrically furcate, narrowly to moderately divergent; linear to ligulate or narrowly ovate, 5.0-8.0 (-10.0) mm long, (1.2-)1.5-1.8 mm wide, 0.8-1.0 mm thick and in section 1½ times to twice wider than thick; apex rounded, shortly emarginate. Groove narrow and deep apically, shallow and wider proximally, disappearing toward base. Thallus margins subacute to acute. Flanks steep, covered by black scales; ventral face gently rounded to almost flat, green or with purple bands across. Scales conspicuous, imbricate, 400-600 x 350-450 µm, projecting 100-250 µm above thallus margins, rounded to oblong, shiny black, often hyaline toward base and partly covering the next more apical scale, giving flanks a somewhat 'striped' appearance when dry, cells in body of scale oblong-hexagonal, 65 x 30 µm, walls mostly straight to slightly sinuous, margin crenate and cells smaller, 25-37 x 25 µm.

Dorsal epithelium bistratose, upper layer intact only when young, cells conical or somewhat elongated and sometimes slightly constricted in the middle, dumbbell-shaped, hyaline, 22-40 x 20-25 µm, soon collapsing; second layer of cells also without chloroplasts, 32-45 x 32-50 µm; air pores mostly triangular, small. Assimilation tissue 350 µm thick, 1/3 to almost ½ the thikness of thallus, cells quadrangular to short-rectangular, 25-37 x 22-25 µm, in columns of 6 or 7(8), enclosing narrow, 4-sided air canals; storage tissue occupying ventral part of thallus, cells up to 50 µm wide, rounded, irregularly arranged.

Monoicous. Antheridia with hyaline necks, in 1 or 2 rows along dorsal groove. Archegonia with purple necks projecting 80-100 µm, scattered singly along median part of thallus. Sporangia single or 2(3) serially arranged, each with about 150 spores, causing slight bulging of overlying dorsal tissue, which gradually disintegrates, leaving clean-edged, deep, round hollows filled with spores. Spores 92-110(-120) µm in diameter, triangularglobular, polar, straw-coloured or golden brown, semi-transparent; wingless, perforated at marginal angles, margin crenulate; ornamentation densely papillate, the same on both faces, papillae blunt, smooth, rounded, up to 5 µm high and 7.5 µm wide, discrete or several joined together to form short vermiculate ridges, separated by narrow grooves or obscuring small round areolae; distal face convex; proximal face without distinct apex or triradiate mark, but with flattening of 3 facets, caused by earlier pressure from sibling spores. Chromosome number: n = 8 (Bornefeld 1984; 1989).

Riccia okahandjana can be distinguished most readily from other *Riccia* species with shiny black scales, that also occur in tropical Africa, by its light brown papillate spores. Its thalli are generally smaller than those of *R. congoana* and of *R. angolensis*; on transverse section, *R. okahandjana* has steep, not sloping, flanks and its scales are vertically arranged when the thallus is turgid. In dry plants, the inflexed margins and flanks covered by black scales, often have more soil particles clinging to the scales than in *R. angolensis*, but they are not nearly 'buried' as in *R. congoana*.

Habitat. *Riccia okahandjana* was found on riverine sandy soil in the area reported on. Otherwise it grows on shallow soil overlying granite, quartzite, basalt or sandstone or on

clayey soil.

Altitudinal range. Not known.

General distribution. *Riccia okahandjana* is common and widespread, occurring throughout tropical Africa, namely Angola (leg. *Welwitsch*), Zimbabwe (leg. *Le Brun*), Malawi (leg. *Perold*), Mocambique (leg. *Sérgio*), and Tanzania (leg. *Pócs* et al.) as well as in southern Africa, except for the winter rainfall areas of the southwestern and southern Cape Province. It was recently also reported from the Arabian Peninsula (Frey & Kürschner 1988).

Illustrations. Figures 2AG; 5C,D.

Specimen examined. Zaïre, Prov. Kivu, Virunga Nat. Park, beside Rutshuru River at Mata Moto hot springs, leg. *Frahm 9023*.

Subgenus *Ricciella*

Ricciella (A. Braun) Reichenb., Der Deutsche Botaniker. Das Herbarienbuch: 23 (1841), (fide Grolle (1983: 426). Lectotype species: *R. fluitans* L.).

=Spongodes (Nees) Volk in Mitteilungen der Botanischen Staatssammlung München 19: 456 (1983). Type species: not designated.

Thalli smallish to large; terricolous, rarely aquatic. Scales small, ventral, mostly evanescent.

Dorsal epidermis chlorophyllose; air pores scattered, soon enlarging, often becoming cavernous. Assimilation tissue with large, polyhedral to irregular air chambers.

Sporangia immersed or bulging ventrally; vertical or rarely oblique. Spores smallish to medium-sized to large; tetrads separating at maturity.

Section *Ricciella*

Ricciella (A. Braun, *pro gen.*) *Bisch.* in Nova Acta Academiae Caesareae Leopoldino-Carolinae Germanicae Naturae Curiosorum 17: 1068 (1835). Lectotype species: *R. fluitans* L. fide Grolle (1976: 248).

Thalli smallish to rather large; terricolous or aquatic. Branches linear, quite firm or lax, 1015 mm long, sparingly furcate. Scales very small to small, ventral, mostly only toward apex, single or split, without central appendage.

Dorsal epidermis chlorophyllose, air pores small, surrounded by smaller companion cells, not becoming cavernous. Assimilation tissue with polyhedral air chambers enclosed by unistratose walls.

Sporangia bulging and opening ventrally; vertical or oblique. Spores smallish, areolar walls thick or partly thick.

3. * **Riccia stricta** (Lindenb.) Perold in Bothalia 22: 197-206 (1990). Type: Cape, Philipstown, ad arborum truncos (!?), *Ecklon* s.n. (BM, lecto.!).

R. fluitans L. var. ? *stricta* Gott. *et al.*, Synopsis hepaticarum: 610 (1846). Type: Cape, Philipstown, *Ecklon* (BM!).

R. stricta A.V. Duthie ined. fide S. Arnell: 37 (1963)

? *Ricciella stricta* (Gott. *et al.*)Trev. in Memorie de Reale Istituto Lombardo Ser. 3,4: 62 (1877).

Plants small to medium-sized, in dense, tangled masses; bright green, often with purple streaks along margins of thalli; when dry, flattened to almost unchanged, but groove more pronounced and longer, light green. Branches repeatedly symmetrically or asymmetrically furcate, moderately to widely divergent; linear or strap-shaped, 15.0-20.0 mm long, segments 5.0 mm or more long, (0.3-)0.5-0.8(-1.2) mm wide, 0.25-0.35(-0.5) mm thick and in section 13(-14) times wider than thick; apex slightly narrowed and somewhat tapering, occasionally bulbous. Groove only visible at apex in living plants. Thallus

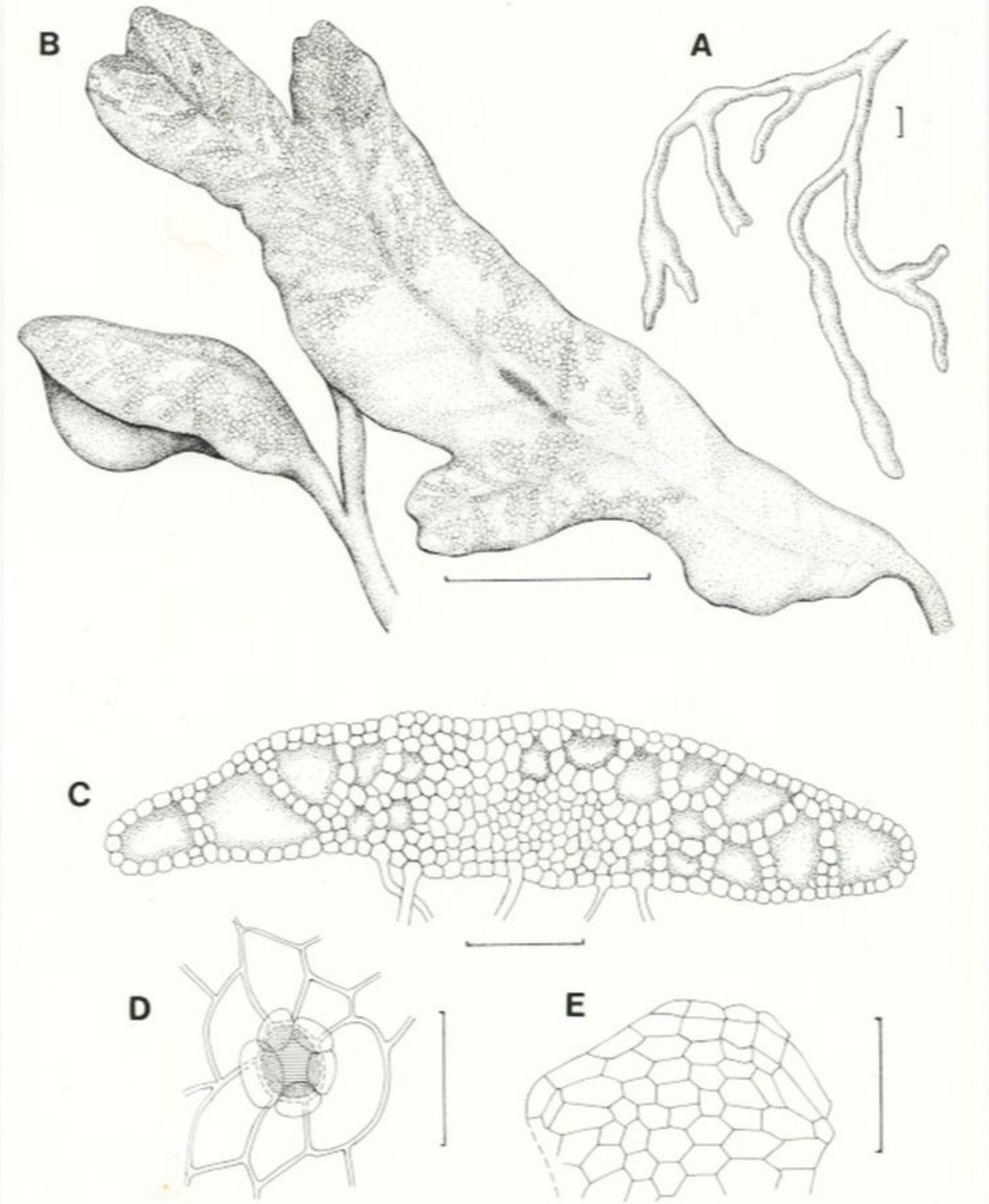

Figure 3. *Riccia stricta*. A, habit; B, branches with dorsal epidermal cells and bounding cells of air chambers partly drawn in; ventrally bulging sporangium shown on the left; C, transverse section through thallus; D, air pore (cross-hatched), with thin-walled companion cells and thicker-walled epidermal cells; E, single scale. A–E, *Pócs 6460*. Scale bars on A,B = 1 mm; C = 200 μm; D = 50 μm; E = 100 μm.

margins rounded, obtuse to subacute. Flanks vertical to sloping obliquely to almost flat; ventral face gently rounded to flat, green. Scales under apex and spaced at short or rather longer intervals along ventral face of terminal segment, apically single, soon splitting into two halves, obtusely triangular, concave, hyaline, occasionally somewhat purple, small, up to 250-500 x 150-400 µm, cells 4- or 5(6)-sided, isodiametric, 50-65 µm wide, 1 or 2 rows toward apex wider than long.

Dorsal epidermis forming a more or less flat, not domed, cover over elongated air chambers, cells longhexagonal, 42-65 x 25 µm, smaller and isodiametric at margins, ±25 µm, air pores small, up to 17 µm wide, surrounded by ring of 5 or 6 smaller companion cells, partly overlying slightly thicker-walled epidermal cells and sometimes raised. Assimilation tissue 100-500 µm thick, less than ½, to most of thickness of thallus, air chambers in 1 or 2 layers medianly, uniseriate laterally, up to 65 µm wide, enclosed by chlorophyllose plates, one cell thick, cells isodiametric, 25-40 µm; storage tissue occupying ventral part of thallus, cells rounded, ±25 µm wide.

Monoicous. Antheridia near apex and more proximally, single at intervals medianly along branches, necks forwardly placed, hyaline, conspicuous, 150-200 µm long, at the base surrounded by low, hyaline, conical cells, 37-50 x 30 µm. Archegonia median, up to 3 per segment, serially arranged, sometimes interspersed between antheridia, obliquely orientated, neck purple, long, sloping at an angle toward, and opening into shallow, apically directed furrow, the 'blind' end fringed with erect, hyaline, conical cells. Sporangia at generally wider and always thicker sites along thallus, oblique and protruding conspicuously ventrally, subspherical, up to 600 µm wide, abundantly supplied with rhizoids, containing ±270 spores each. Spores (50-)62-70(-75) µm in diameter, triangular-globular, polar, light brown, semi-transparent; wing thick, 7,5 µm wide, wider at perforated or notched marginal angles, with a row of fine granules along edge, margin crenulate; ornamentation reticulate, different on 2 spore faces: distal face highly convex, with (4-)5-6 large, deep areolae across diameter of spore, 17-20 µm wide, in centre a pillar or boss, from which several low ridges radiate outward, sometimes forming a network, areolar walls rounded, 34 µm wide and up to 7,5 µm high, sometimes sparsely granulate; proximal face with triradiate mark very prominent, up to 5 µm high, as wide (or wider) toward marginal angles at join with wing, each facet with 6-10 areolae, some incomplete, often subdivided by faint radiating ridges, wall thin, raised at nodes. Chromosome number: n = 8 (Bornefeld 1989).

Species in the *R. fluitans*-complex, to which *R. stricta* belongs, are very variable and notoriously difficult to distinguish from one another, ideally requiring cultivation under similar conditions (Berrie 1964). Nevertheless, *R. stricta* can generally be recognized by the mostly smooth dorsal surface of the thallus, through which the large air chambers are faintly to fairly clearly visible, by small ventral scales and by smallish spores with large, thick-walled areolae containing a central boss on the distal face and, on the proximal face, a prominent triradiate mark. It frequently sporulates, whereas *R. fluitans* L. *sensu stricto* very rarely does.

Much of the tropical African material identified as *R. fluitans* or *R. fluitans sensu lato* undoubtedly belongs to *R. stricta*. Arnell (1956) reported it from Masai Province in Kenya, and Stephani from Usambara as *R. fluitans* (Stephani in Brunnthaler 1913). Jones (1957) found that the spores of two of his African collections (*655* and *826*) named *R. fluitans sensu lato*, differed from those of European material and Bizot *et al.* (1978) concluded the same for material from Kilimanjaro. The spores illustrated by Jones (1985) (*Forster 55* from Kampala, Uganda, and *Jones 826* from Luki, Zaïre) show a pronounced triradiate mark on the proximal face and thick areolar walls on the distal face, strongly reminiscent of those of *R. stricta*. Vanden Berghen (1972) who examined some African collections of the complex (*Symoens 12436, 12774, Schmitz 7305* and *Jean Louis 4410*-all in BR) expressed the opinion that '*R. stricta* A.V. Duthie in S. Arnell (1963) Hep. South Afr., p. 37, est peut-être identique au taxon reconnu au Shaba'.

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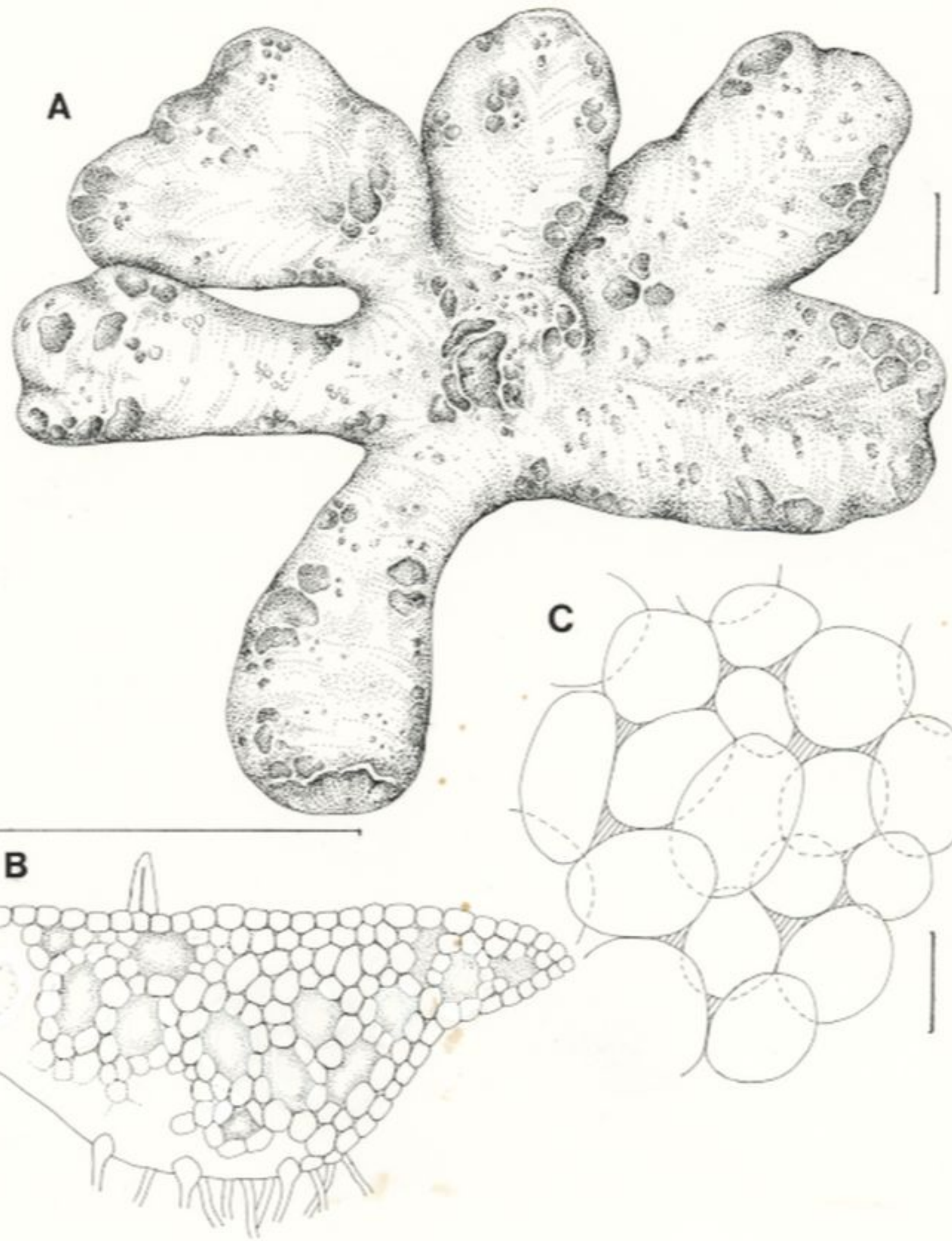

Figure 4. *Riccia vulcanicola.* A, thallus in partial rosette; B, transverse section of branch; C, dorsal cells from above. A–C, *Pócs 8068.* Scale bars on A,B = 1 mm; C = 50 µm.

Schmitz 7305 and *Jean Louis 4410* were also examined by me and their spores studied with LM and SEM. In both, the triradiate mark is pronounced and the areolar walls on the distal face are thickened; these collections should, accordingly, be assigned to *R. stricta*. (For a comparison of characters of *R. stricta* and *R. fluitans sensu stricto*, see Perold (1990)).

Habitat. *Riccia stricta* is either terrestrial, growing on damp soil in roadside ditches, near waterfalls or in swamps, or can be aquatic when it floats on, or is submerged in water.

Altitudinal range. In the area reported on, it is found at altitudes between 1600 m and 2400 m.

Illustrations. Figures 3AE; 5E,F.

General distribution. *Riccia stricta* is known from central, eastern and southern Africa. It is widely distributed in the summer rainfall areas especially, and is one of the most commonly collected *Riccia* species.
Specimens examined. **Ny:** 104, *Fischer 6201**; 109, *Fischer 6388**; 112, *Pócs 6460**; 113, *Pócs 6466**; 153, *Pócs 7990**; 153, *Pócs 8012*; 153, *Pócs 8020 c**. **KB:** 144, *Frahm 7576.*
* = specimens with ripe spores

Section *Spongodes*
Spongodes Nees, Naturgeschichte der Europäischen Lebermoose 4: 391 (1838). Lectotype species: *R. crystallina* L. emend. Raddi fide Grolle: 248 (1976).

Thalli medium-sized to large, rarely heterothallic with small male gametophytes; terricolous. Scales small, ventral, evanescent.

Dorsal epidermis chlorophyllose; air pores soon large, cavernous. Assimilation tissue with large polyhedral air chambers.

Sporangia mostly immersed, sometimes bulging somewhat ventrally or dorsally or both. Spores medium-sized to large; separating at maturity.

4. *Riccia vulcanicola* E. Fischer, Tropical Bryology 8: 70 (1993). Type: Rwanda Pref. Ruhengeri, between Mt. Karisimbi and Bisoke, *Pócs 8068* (EGR, holo-!)

Plants medium-sized, isolated or crowded and in overlying, incomplete, partial rosettes, 8-13 mm across; glaucous green to green, not or finely pitted apically, only toward base becoming somewhat spongy; when dry, yellowish green, finely spongy, margins not inflexed. Branches 2 or 3 times dichotomously furcate, shortly to more deeply divided, closely to moderately divergent; obcuneate to oblong or irregular, up to 5 mm long, 23 mm wide, 0.5 mm thick, in section 4-6 times wider than thick; apex rounded, truncate or slightly emarginate. Groove only present at apex, shallow. Thallus margins rounded, obtuse. Flanks sloping obliquely to almost horizontal; ventral face flat. Scales tiny, evanescent.

Dorsal epidermis with cells hyaline, globose, 42.5-45.0 x 55.0-75.0(-82.5) µm, mostly collapsed; walls of air chambers hardly visible from above, air pores apically small, soon widening as air chambers enlarge, eventually leaving some quite exposed. Assimilation tissue occupying most of thickness of thallus, air chambers apically narrow, 125 µm wide toward base, polygonal, bounded by one-layered plates of chlorophyllose cells; storage tissue confined to a few ventral layers of cells; rhizoids mostly smooth, 15.0-27.5 µm wide, rarely tuberculate, 17.5 µm wide.

Monoicous. Antheridia apically scattered, necks colourless, up to 250 µm long. Archegonia in several rows along lobes, necks purple-brown, 150 µm long. Sporangia numerous, bulging dorsally and ventrally, crowded, 650 µm wide, containing ± 850 spores each. Spores 62.5-70.0 µm in diameter, triangular-globular, polar, light brown, semi-transparent; wing thin, 10 µm wide, slightly wider at perforated marginal angles, margin crenulate to eroded; ornamentation reticulate, similar on the 2 spore faces: distal face convex, with 4 or 5(6) large areolae across diameter of spore, 12.5-17.5 µm wide, some with a central boss, from which 13 low ridges radiate outward, areolar walls thin, 5.0-7.5 µm high, edges crenate, not extending onto wing; proxi-

mal face with triradiate mark distinct, thin, 2.5-5.0 µm high, not extending across wing, each facet with 5 or 6 areolae, outer walls sometimes poorly developed or absent, otherwise 2.5 µm high, edges crenate. Chromosome number: n not known.

Morphologically the thalli of this new species are similar to those of *R. crystallina*, but *R. vulcanicola* is distinguished from it by its yellow-green colour and incomplete rosettes. The spore ornamentation is distinct from that of *R. crystallina* in that there are fewer and larger areolae with thin, high walls, not raised into bifid or trifid processes at the nodes.

Habitat. *Riccia vulcanicola* was collected on soil along a trail on a southern slope of Mt. Visoke in secondary *Hagenia-Dombeya* forest.

Altitudinal range. 2700-3000 m.

General distribution. So far, this new species is only known from the type specimen and two collections listed below.

Illustrations. Figures 4AC; 6A,B

Specimens examined. **Ka:** 158, *Pócs 8068, 8073*

Acknowledgements

I wish to thank J.-P. Frahm for sending me the collections for examination; also the curators of BM, BR and G for the loan of specimens. My thanks to the photographer at NBI, Mrs A. Romanowski, for developing and printing the SEM micrographs of the spores, as well as to the artist, Ms Anne Pienaar, for the drawings.

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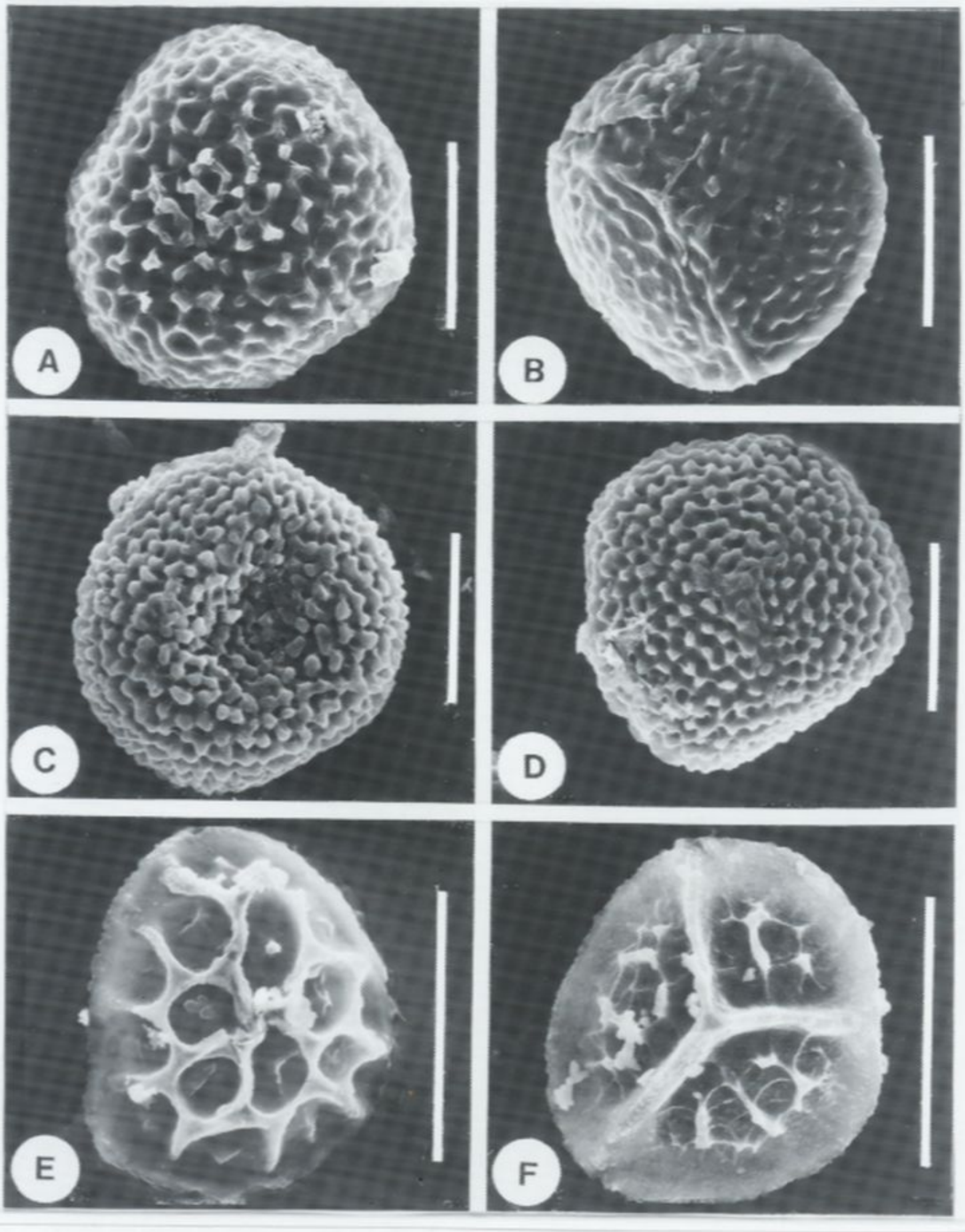

Figure 5. SEM micrographs of spores. A,B, *R. lanceolata* distal and proximal faces respectively; C,D, *R. okahandjana* distal and proximal faces respectively; E,F, *R. stricta* distal and proximal faces respectively. A,B, *Frahm 6524*; C,D, *Frahm 9023*; E,F *Frahm 6388*. Scale bars on A–F = 50 μm.

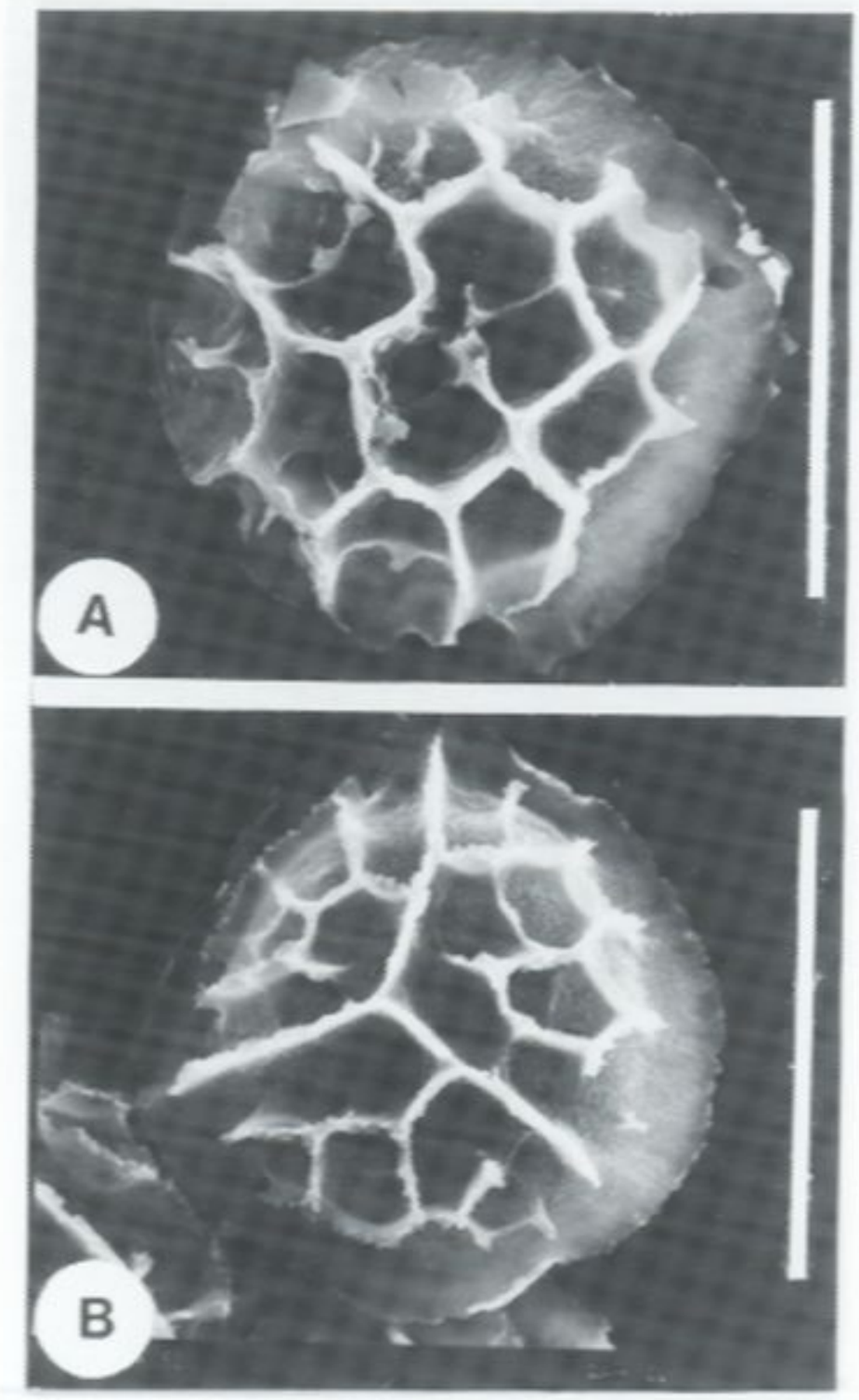

Figure 6. SEM micrographs of spores. A,B, *R. vulcanicola* distal and proximal faces respectively. A, *Pócs 8073*; B, *Pócs 8068*. Scale bars on A,B = 50 μm.

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Las Lejeuneaceae (Hepaticae) de Misiones, Argentina
I. Las especies holostipas

María Elena Reiner-Drehwald

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Resumen. Se describen e ilustran 17 especies holostipas (con anfigastrio entero) de la familia Lejeuneaceae (Jungermanniales) halladas en la provincia de Misiones, Argentina. Las especies pertenecen a dos subfamilias (Lejeuneoideae y Ptychanthoideae) y 15 géneros: *Anoplolejeunea, Lejeunea, Leucolejeunea, Omphalanthus, Acanthocoleus, Archilejeunea, Brachiolejeunea, Bryopteris, Caudalejeunea, Frullanoides, Lopholejeunea, Marchesinia, Mastigolejeunea, Odontolejeunea* y *Schiffneriolejeunea*. Todas las especies son citadas por primera vez para Misiones y con excepción de *Omphalanthus filiformis* y *Frullanoides densifolia* (conocidas para la provincia de Salta), son citas nuevas para Argentina. Para cada especie se indican también el habitat y la distribución geográfica mundial. Una clave para la identificación de estas especies y una sinopsis con la posición sistemática de las mismas completan el trabajo.

Abstract. Seventeen species of holostipous (underleaves undivided) Lejeuneaceae (Jungermanniales) found in the province of Misiones, Argentina, are described and illustrated. The species are members of the subfamilies Lejeuneoideae and Ptychanthoideae and belong to the genera *Anoplolejeunea, Lejeunea, Leucolejeunea, Omphalanthus, Acanthocoleus, Archilejeunea, Brachiolejeunea, Bryopteris, Caudalejeunea, Frullanoides, Lopholejeunea, Marchesinia, Mastigolejeunea, Odontolejeunea* and *Schiffneriolejeunea*. All of the species are new records for Misiones and, with exception of *Omphalanthus filiformis* and *Frullanoides densifolia* (known for the province of Salta), all of them are new records for Argentina. For each taxon the habitat and the geographical distribution are indicated. A key to the species and a synopsis of their systematic position are also provided.

La familia Lejeuneaceae (Jungermanniales) con 81 géneros (Grolle 1983) y aproximadamente 1500 taxa descriptos (Index Hepaticarum), es una de las mayores dentro de las hepáticas. El número de géneros, subgéneros y especies va modificándose a medida que se realizan monografías mundiales sobre distintos grupos. La distribución geográfica de las Lejeuneaceae se concentra en las regiones tropicales, subtropicales y templadas del mundo. En Argentina la familia está representada con mayor número de especies en los bosques andino-patagónicos (Solari 1983), en la selva Tucumano-Oranense (en el NO argentino) y en Misiones.

La provincia de Misiones está ubicada en el extremo NE de Argentina, aproximadamente entre los paralelos 25°30' y 28° S y entre los meridianos 53°30' y 56° O.

Fitogeográficamente, Misiones se encuentra dentro de la Provincia Paranense (Cabrera 1971). La vegetación de Misiones es tratada en detalle en Eskuche (1986).

Las Lejeuneaceae pueden dividirse en dos grupos: con y sin anfigastrios. Las especies con anfigastrios son subdivididas tradicionalmente en especies con anfigastrios enteros ("holostipous", holostipas) y especies con anfigastrios bífidos ("schizostipous"). A pesar de que estas clasificaciones no son naturales, son muy útiles a los fines de la identificación de especies (Gradstein 1985).

El objetivo de este trabajo es comenzar con el estudio de la familia Lejeuneaceae en Misiones. Esta primera contribución tratará las especies holostipas, es decir, aquellas que presentan anfigastrios enteros. Para Misiones existen citas de 7 especies de Lejeuneaceae (Massalongo 1906 y 1928, Herzog 1952), pero ninguna de éstas pertenece al grupo de las especies holostipas.

Metodología

La posición sistemática de los taxa estudiados figura en la sinopsis, basada en Grolle (1983) y en Gradstein (1990). Dentro de cada subfamilia los géneros fueron ordenados alfabéticamente.

En la clave se utilizaron principalmente caracteres vegetativos, para facilitar la identificación de material estéril. En algunos casos, sin embargo, cuando el material es muy escaso y no presenta la forma más típica (por ej. *Acanthocoleus aberrans* y *Frullanoides densifolia* pueden tener el ápice del lobo obtuso a redondeado en vez de la forma típica: ápice agudo hasta apiculado y generalmente incurvado) su identificación puede resultar más complicada.

Las descripciones de las especies están basadas exclusivamente en el material estudiado. La latitud de las plantas fue medida cuando las mismas se hallaban mojadas, y representa el ancho del tallo con hojas. El habitat se refiere al hallado en Misiones, salvo indicación contraria. Para cada especie se dibujaron el aspecto general de las mismas en vista ventral (con excepción de *Omphalanthus filiformis* y *Marchesinia brachiata* todos estos dibujos están realizados con la misma escala), células centrales del lobo, lobo y lóbulo, en algunos casos detalle de la región apical del lóbulo con dientes y papila hialina y el periantio con brácteas periqueciales (salvo pocos casos en los cuales no fueron hallados). Se realizaron los dibujos considerados necesarios para poder identificar correctamente plantas coleccionadas en el área de estudio. También se agregaron citas de trabajos en los cuales se pueden consultar más dibujos sobre las especies mencionadas. La distribución geográfica que se menciona es mundial; para Argentina se indican entre paréntesis las provincias en las cuales fue encontrada la especie en cuestión.

El material estudiado comprende principalmente muestras coleccionadas por la autora y por Uwe Drehwald en numerosos viajes a la provincia de Misiones. También se estudiaron muestras coleccionadas en un viaje realizado a las provincias de Jujuy y Salta (Argentina). El material estudiado se halla depositado en el herbario Drehwald; algunos duplicados se encuentran en el Herbario del Museo Argentino de Cs. Naturales B. Rivadavia (BA).

Abreviaturas utilizadas:

long. = longitud; lat. = latitud; * = indica que se trata de una nueva cita para la localidad indicada a continuación.

Sinopsis de las Lejeuneaceae holostipas de Misiones

LEJEUNEACEAE Cas.-Gil

A. LEJEUNEOIDEAE

I. *Anoplolejeunea* (Spruce) Schiffn.
1. *Anoplolejeunea conferta* (Meissn.) Evans
II. *Lejeunea* Lib.
2. *Lejeunea reflexistipula* (Lehm. & Lin denb.) Gott., Lindenb. & Nees
III. *Leucolejeunea* Evans
3. *Leucolejeunea unciloba* (Lindenb.) Evans
IV. *Omphalanthus* Lindenb. & Nees
4. *Omphalanthus filiformis* (Sw.) Nees

B. PTYCHANTHOIDEAE Mizut.

V. *Acanthocoleus* Schust.
5. *Acanthocoleus aberrans* (Lindenb. & Gott.) Kruijt
VI. *Archilejeunea* (Spruce) Schiffn.
6. *Archilejeunea auberiana* (Mont.) Evans
7. *Archilejeunea parviflora* (Nees) Schiffn.
VII. *Brachiolejeunea* (Spruce) Schiffn.
8. *Brachiolejeunea phyllorhiza* (Nees) Kruijt & Gradst.
VIII. *Bryopteris* (Nees) Lindenb.
9. *Bryopteris diffusa* (Sw.) Nees
10. *Bryopteris filicina* (Sw.) Nees
IX. *Caudalejeunea* (Steph.) Schiffn.
11. *Caudalejeunea lehmanniana* (Gott.) Evans
X. *Frullanoides* Raddi
12. *Frullanoides densifolia* Raddi ssp. *densifolia*
XI. *Lopholejeunea* (Spruce) Schiffn.
13. *Lopholejeunea subfusca* (Nees) Schiffn.
XII. *Marchesinia* S. Gray
14. *Marchesinia brachiata* (Sw.) Schiffn.
XIII. *Mastigolejeunea* (Spruce) Steph.
15. *Mastigolejeunea auriculata* (Wils.) Schiffn.
XIV. *Odontolejeunea* (Spruce) Schiffn.
16. *Odontolejeunea lunulata* (Web.) Schiffn.
XV. *Schiffneriolejeunea* Verd.
17. *Schiffneriolejeunea polycarpa* (Nees) Gradst.

Clave para identificar las Lejeuneaceae holostipas de Misiones

1. Margen del lobo dentado, en toda su extensión o principalmente en la región apical, o el margen entero pero entonces el ápice agudo hasta apiculado (en *Frullanoides densifolia* el ápice puede ser obtuso a redondeado) 2

1. Margen del lobo entero, ápice obtuso hasta ampliamente redondeado (ápice redondeado, obtuso a subagudo en *Mastigolejeunea auriculata*) 7

2. Margen del anfigastrio dentado, en todo el contorno o principalmente en la región apical 3

2. Margen del anfigastrio entero 5

3. Plantas epifilas o epífitas; anfigastrios redondeados con dientes pequeños formados por una célula cónica; generalmente con discos rizoidíferos secundarios; periantio con quillas aladas y dentadas; tallo en corte transversal formado por corteza y médula; merofito ventral de 2 células ....16. **Odontolejeunea lunulata**

3. Plantas epífitas, pendientes (pocas veces fueron halladas creciendo sobre roca); anfigastrios oblongos con dientes variables, pero no formados siempre por una única célula; sin discos rizoidíferos secundarios; periantio sin alas ni dientes; tallo en corte transversal formado por 3 capas: corteza, médula externa y médula interna; merofito ventral de 4 ó más células.....4

4. Ramificación seudodicotómica; lóbulo con margen libre plano, con 3 dientes variables; lobo con margen entero o con dientes en la región apical.....9. **Bryopteris diffusa**

4. Ramificación pinnada; lóbulo con margen libre involuto; lobo con márgenes dentados.....10. **Bryopteris filicina**

5. Base de los anfigastrios auriculada; lóbulo con 4-dientes.....12. **Frullanoides densifolia**
5. Base de los anfigastrios no auriculada; lóbulo con 0-2(3) dientes.....6

6. Merofito ventral de 8 células; anfigastrio 3,4-4,6 x el ancho del tallo; inserción del anfigastrio como una profunda U invertida .....14. **Marchesinia brachiata**
6. Merofito ventral de 2(4) células; anfigastrio 2,2-2,9 x el ancho del tallo; inserción del anfigastrio levemente arqueada .....5. **Acanthocoleus aberrans**

7. Merofito ventral de 2 células 8
7. Merofito ventral de 4 ó más células 9

8. Anfigastrio obcordado, ápice plano, 2,9-4,5 x el ancho del tallo, 300-420 µm de ancho; margen libre del lóbulo fuertemente involuto, curvado 1 vuelta sobre sí mismo .....1. **Anoplolejeunea conferta**
8. Anfigastrio reniforme, ápice generalmente incurvado, 4,5-6,5 x el ancho del tallo, 670-960 µm de ancho; margen libre del lóbulo apenas involuto.....2. **Lejeunea reflexistipula**

9. Plantas secas aplanadas, con las hojas extendidas.....10
9. Plantas secas casi cilíndricas, con las hojas curvadas sobre el eje 14

10. Plantas secas verdosas, pardas a negruzcas, brillantes; anfigastrio 5-5,6 x el ancho del tallo; quillas del periantio con dientes o lacinias .....13. **Lopholejeunea subfusca**
10. Plantas secas verde amarillentas a castaño claras; anfigastrio 2,8-4,8 x el ancho del tallo; quillas del periantio enteras (a veces con pequeños dientes).....11

11. Inserción del anfigastrio recta.....12
11. Inserción del anfigastrio ± arqueada 13

12. Lóbulo con 2 dientes .....6. **Archilejeunea auberiana**
12. Lóbulo con 0-1 diente .....7. **Archilejeunea parviflora**

13. Anfigastrio 3,4-4,8 x el ancho del tallo, ápice del mismo redondeado a suavemente truncado; lóbulo con 2 dientes, diente proximal agudo (3-7 células) y diente distal redondeado; periantio con 2 quillas laterales y 2 ventrales (a veces 1 quilla dorsal corta) .....3. **Leucolejeunea unciloba**
13. Anfigastrio 2,8-3,4 x el ancho del tallo, ápice del mismo truncado a retuso; lóbulo con 2 dientes, diente proximal corto y diente distal alargado (3-4 células); periantio con 2 quillas laterales y 1 ventral .....11. **Caudalejeunea lehmanniana**

14. Lobo redondeado; anfigastrios redondeados, inserción de los mismos en forma de una profunda U invertida y zona central convexa.....4. **Omphalanthus filiformis**
14. Lobo aovado a oval; anfigastrios obdeltoides o reniformes, inserción de los mismos ± recta o en forma de una corta U invertida.....15

15. Quillas del periantio con dientes o lacinias; anfigastrios ± reniformes .....8. **Brachiolejeunea phyllorhiza**
15. Quillas del periantio enteras; anfigastrios ± obdeltoides.....16

16. Ginoecio con 1-2 innovaciones; periantio con 3 quillas largas; ramas vegetativas de tipo *Lejeunea*; margen ventral del lobo algo ondulado o incurvado; inserción del anfigastrio ± recta con las bases levemente auriculadas .....15. **Mastigolejeunea auriculata**
16. Ginoecio sin innovaciones; periantio con 5 quillas cortas; ramas vegetativas de tipo *Frullania* o *Lejeunea*; margen ventral del lobo plano; inserción del anfigastrio arqueada .....17. **Schiffneriolejeunea polycarpa**

Descripción de las especies

1. ***Anoplolejeunea conferta*** (Meissn.) Evans
(Fig. 1 A-D)

Evans, Bull. Torrey Bot. Club 35: 175. 1908. *Jungermannia conferta* Meissner ex Sprengel in Linnaeus, Syst. Veg. (ed. 16) 4(2): 325. 1827. Typus: Perú.

Plantas secas verdosas a amarillentas, pálidas; hojas extendidas, no curvadas sobre el tallo; 5-9 mm long. x 0,8-1,3 mm lat.; irregularmente pinnadas a bipinnadas, ramas de tipo *Lejeunea* con anillo basal notorio; se encuentran ramas microfilas con lobos muy pequeños. **Tallo** en corte transversal redondeado, 65-115 µm (6 células) de ancho x 80-90 µm (5-6 células) de alto; corteza de 7-8 células rectangulares de 16-20 x 26-33 µm, pared celular delgada a mediana; médula de 10-11 células irregulares de 9-14 x 13-20 µm, pared celular delgada.
Hojas imbricadas, ampliamente extendidas. **Lobo** aovado a redondeado, 450-700 µm long. x 350-650 µm lat.; cóncavo; márgenes enteros; ápice ampliamente redondeado, ocasionalmente incurvado; margen libre dorsal redondeado, cubre o excede apenas el tallo. **Células** centrales del lobo isodiamétricas, algunas hexagonales, 19-23 x 23-27 µm, pared celular delgada a mediana con trígonos; células marginales cuadradas a rectangulares de 13-17 x 16-20 µm. **Lóbulo** oval a redondeado, 190-230 µm long. x 150-200 µm lat.; inflado; margen libre fuertemente involuto, curvado una vuelta sobre sí mismo; quilla arqueada, continua con el margen ventral del lobo o formando un ángulo amplio con éste; ocasionalmente hay lóbulos reducidos, ovales, margen libre apenas incurvado, poco inflados. **Anfigastrios** continuos; obcordados, 300-420 µm ancho x 230-300 µm alto; 2,9-4,5 x el ancho del tallo; márgenes enteros; ápice truncado a retuso; inserción ± recta; generalmente con rizoides en la base; merofito ventral de 2 células.

Habitat: Crece sobre corteza, generalmente de *Araucaria angustifolia* (Bert.) O. Ktze. Fue hallada entre 200 y 800 m s.n.m.

Observaciones: El material de las muestras es muy escaso y está estéril.
En la base de algunos lobos se observaron grupos de 3 células de 23-27 x 29-37 µm, algo mayores que el resto; el contenido celular se hallaba destruído, pero podría tratarse de ocelos con un solo oleocuerpo grande por célula (Evans 1908: 177).
Entre las células basales se encontró ocasionalmente 1 espesamiento intercelular por lado.
Ilustraciones: Evans 1908 (pl. 8: fig. 9-23).
Distribución geográfica: América tropical, *Argentina (Misiones).
Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Iguazú. Parque Nacional Iguazú, Cataratas, U.Drehwald 2646, 10-XII-1987. Dpto. Gral. M. Belgrano. San Antonio, bosque cerca de la pista de aterrizaje, U.Drehwald A.284, 12-XII-1987; U.Drehwald 2693, 13-XII-1987. Bernardo de Irigoyen, U.Drehwald A.320, 16-XII-1987. Dpto. San Pedro. ruta 14, ± 5 km al E de San Pedro, M.E.Reiner 1670, U.Drehwald 2585, 11-IX-1987.

2. ***Lejeunea reflexistipula*** (Lehm. & Lindenb.) Gott., Lindenb. & Nees
(Fig. 1 E-G)

Gottsche, Lindenberg & Nees, Syn. Hep.: 335. 1845. *Jungermannia reflexistipula* Lehm. & Lindenb., in Lehmann, Nov. Stirp. Pug. 5: 10. 1833. Typus: Brasil, "Serra de Estrella", leg. Beyrich.

Plantas secas verdosas; hojas extendidas; 0,4-1 cm long. x 1,1-1,3 mm lat.; ramificación escasa, ramas cortas de tipo *Lejeunea*. **Tallo** en sección transversal redondeado, 130-150 µm ancho; pared celular uniforme, delgada, hialina; corteza de 8 células ± rectangulares, de 16-37 x 46-53 µm; médula de 16 células de 13-23 x 16-30 µm.
Hojas imbricadas; oblicua hasta ampliamente extendidas. **Lobo** aovado, 0,6-0,7 mm long. x 0,5-0,7 mm lat.; base libre dorsal redondeada, excede un poco el tallo; márgenes enteros, contorno algo crenulado; ápice redondeado, plano a incurvado. **Células** del lobo poligonales, pared celular delgada con trígonos peque-

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Metodología

La posición sistemática de los taxa estudiados figura en la sinopsis, basada en Grolle (1983) y en Gradstein (1990). Dentro de cada subfamilia los géneros fueron ordenados alfabéticamente.

En la clave se utilizaron principalmente caracteres vegetativos, para facilitar la identificación de material estéril. En algunos casos, sin embargo, cuando el material es muy escaso y no presenta la forma más típica (por ej. *Acanthocoleus aberrans* y *Frullanoides densifolia* pueden tener el ápice del lobo obtuso a redondeado en vez de la forma típica: ápice agudo hasta apiculado y generalmente incurvado) su identificación puede resultar más complicada.

Las descripciones de las especies están basadas exclusivamente en el material estudiado. La latitud de las plantas fue medida cuando las mismas se hallaban mojadas, y representa el ancho del tallo con hojas. El habitat se refiere al hallado en Misiones, salvo indicación contraria. Para cada especie se dibujaron el aspecto general de las mismas en vista ventral (con excepción de *Omphalanthus filiformis* y *Marchesinia brachiata* todos estos dibujos están realizados con la misma escala), células centrales del lobo, lobo y lóbulo, en algunos casos detalle de la región apical del lóbulo con dientes y papila hialina y el periantio con brácteas periqueciales (salvo pocos casos en los cuales no fueron hallados). Se realizaron los dibujos considerados necesarios para poder identificar correctamente plantas coleccionadas en el área de estudio. También se agregaron citas de trabajos en los cuales se pueden consultar más dibujos sobre las especies mencionadas. La distribución geográfica que se menciona es mundial; para Argentina se indican entre paréntesis las provincias en las cuales fue encontrada la especie en cuestión.

El material estudiado comprende principalmente muestras coleccionadas por la autora y por Uwe Drehwald en numerosos viajes a la provincia de Misiones. También se estudiaron muestras coleccionadas en un viaje realizado a las provincias de Jujuy y Salta (Argentina). El material estudiado se halla depositado en el herbario Drehwald; algunos duplicados se encuentran en el Herbario del Museo Argentino de Cs. Naturales B. Rivadavia (BA).

Abreviaturas utilizadas:

long. = longitud; lat. = latitud; * = indica que se trata de una nueva cita para la localidad indicada a continuación.

Sinopsis de las Lejeuneaceae holostipas de Misiones

LEJEUNEACEAE Cas.-Gil

A. LEJEUNEOIDEAE

I. *Anoplolejeunea* (Spruce) Schiffn.
1. *Anoplolejeunea conferta* (Meissn.) Evans
II. *Lejeunea* Lib.
2. *Lejeunea reflexistipula* (Lehm. & Lin denb.) Gott., Lindenb. & Nees
III. *Leucolejeunea* Evans
3. *Leucolejeunea unciloba* (Lindenb.) Evans
IV. *Omphalanthus* Lindenb. & Nees
4. *Omphalanthus filiformis* (Sw.) Nees

B. PTYCHANTHOIDEAE Mizut.

V. *Acanthocoleus* Schust.
5. *Acanthocoleus aberrans* (Lindenb. & Gott.) Kruijt
VI. *Archilejeunea* (Spruce) Schiffn.
6. *Archilejeunea auberiana* (Mont.) Evans
7. *Archilejeunea parviflora* (Nees) Schiffn.
VII. *Brachiolejeunea* (Spruce) Schiffn.
8. *Brachiolejeunea phyllorhiza* (Nees) Kruijt & Gradst.
VIII. *Bryopteris* (Nees) Lindenb.
9. *Bryopteris diffusa* (Sw.) Nees
10. *Bryopteris filicina* (Sw.) Nees
IX. *Caudalejeunea* (Steph.) Schiffn.
11. *Caudalejeunea lehmanniana* (Gott.) Evans
X. *Frullanoides* Raddi
12. *Frullanoides densifolia* Raddi ssp. *den sifolia*
XI. *Lopholejeunea* (Spruce) Schiffn.
13. *Lopholejeunea subfusca* (Nees) Schiffn.
XII. *Marchesinia* S. Gray
14. *Marchesinia brachiata* (Sw.) Schiffn.
XIII. *Mastigolejeunea* (Spruce) Steph.
15. *Mastigolejeunea auriculata* (Wils.) Schiffn.
XIV. *Odontolejeunea* (Spruce) Schiffn.
16. *Odontolejeunea lunulata* (Web.) Schiffn.
XV. *Schiffneriolejeunea* Verd.
17. *Schiffneriolejeunea polycarpa* (Nees) Gradst.

Clave para identificar las Lejeuneaceae holostipas de Misiones

1. Margen del lobo dentado, en toda su extensión o principalmente en la región apical, o el margen entero pero entonces el ápice agudo hasta apiculado (en *Frullanoides densifolia* el ápice puede ser obtuso a redondeado) 2
1. Margen del lobo entero, ápice obtuso hasta ampliamente redondeado (ápice redondeado, obtuso a subagudo en *Mastigolejeunea auriculata*) 7

2. Margen del anfigastrio dentado, en todo el contorno o principalmente en la región apical 3
2. Margen del anfigastrio entero 5

3. Plantas epifilas o epífitas; anfigastrios redondeados con dientes pequeños formados por una célula cónica; generalmente con discos rizoidíferos secundarios; periantio con quillas aladas y dentadas; tallo en corte transversal formado por corteza y médula; merofito ventral de 2 células .....
.....16. **Odontolejeunea lunulata**
3. Plantas epífitas, pendientes (pocas veces fueron halladas creciendo sobre roca); anfigastrios oblongos con dientes variables, pero no formados siempre por una única célula; sin discos rizoidíferos secundarios; periantio sin alas ni dientes; tallo en corte transversal formado por 3 capas: corteza, médula externa y médula interna; merofito ventral de 4 ó más células.....4

4. Ramificación seudodicotómica; lóbulo con margen libre plano, con 3 dientes variables; lobo con margen entero o con dientes en la región apical.....9. **Bryopteris diffusa**
4. Ramificación pinnada; lóbulo con margen libre involuto; lobo con márgenes dentados.....10. **Bryopteris filicina**

5. Base de los anfigastrios auriculada; lóbulo con 4-dientes.....12. **Frullanoides densifolia**
5. Base de los anfigastrios no auriculada; lóbulo con 0-2(3) dientes.....6

6. Merofito ventral de 8 células; anfigastrio 3,4-4,6 x el ancho del tallo; inserción del anfigastrio como una profunda U invertida .....14. **Marchesinia brachiata**
6. Merofito ventral de 2(4) células; anfigastrio 2,2-2,9 x el ancho del tallo; inserción del anfigastrio levemente arqueada ....5. **Acanthocoleus aberrans**

7. Merofito ventral de 2 células 8
7. Merofito ventral de 4 ó más células 9

8. Anfigastrio obcordado, ápice plano, 2,9-4,5 x el ancho del tallo, 300-420 µm de ancho; margen libre del lóbulo fuertemente involuto, curvado 1 vuelta sobre sí mismo ....1. **Anoplolejeunea conferta**
8. Anfigastrio reniforme, ápice generalmente incurvado, 4,5-6,5 x el ancho del tallo, 670-960 µm de ancho; margen libre del lóbulo apenas involuto.....2. **Lejeunea reflexistipula**

9. Plantas secas aplanadas, con las hojas extendidas.....10
9. Plantas secas casi cilíndricas, con las hojas curvadas sobre el eje 14

10. Plantas secas verdosas, pardas a negruzcas, brillantes; anfigastrio 5-5,6 x el ancho del tallo; quillas del periantio con dientes o lacinias .....13. **Lopholejeunea subfusca**
10. Plantas secas verde amarillentas a castaño claras; anfigastrio 2,8-4,8 x el ancho del tallo; quillas del periantio enteras (a veces con pequeños dientes).....11

11. Inserción del anfigastrio recta.....12
11. Inserción del anfigastrio ± arqueada 13

12. Lóbulo con 2 dientes ....6. **Archilejeunea auberiana**
12. Lóbulo con 0-1 diente ....7. **Archilejeunea parviflora**

13. Anfigastrio 3,4-4,8 x el ancho del tallo, ápice del mismo redondeado a suavemente truncado; lóbulo con 2 dientes, diente proximal agudo (3-7 células) y diente distal redondeado; periantio con 2 quillas laterales y 2 ventrales (a veces 1 quilla dorsal corta) ....3. **Leucolejeunea unciloba**
13. Anfigastrio 2,8-3,4 x el ancho del tallo, ápice del mismo truncado a retuso; lóbulo con 2 dientes, diente proximal corto y diente distal alargado (3-4 células); periantio con 2 quillas laterales y 1 ventral ....11. **Caudalejeunea lehmanniana**

14. Lobo redondeado; anfigastrios redondeados, inserción de los mismos en forma de una profunda U invertida y zona central convexa.....4. **Omphalanthus filiformis**
14. Lobo aovado a oval; anfigastrios obdeltoides o reniformes, inserción de los mismos ± recta o en forma de una corta U invertida.....15

15. Quillas del periantio con dientes o lacinias; anfigastrios ± reniformes ....8. **Brachiolejeunea phyllorhiza**
15. Quillas del periantio enteras; anfigastrios ± obdeltoides.....16

16. Ginoecio con 1-2 innovaciones; periantio con 3 quillas largas; ramas vegetativas de tipo *Lejeunea*; margen ventral del lobo algo ondulado o incurvado; inserción del anfigastrio ± recta con las bases levemente auriculadas .....15. **Mastigolejeunea auriculata**
16. Ginoecio sin innovaciones; periantio con 5 quillas cortas; ramas vegetativas de tipo *Frullania* o *Lejeunea*; margen ventral del lobo plano; inserción del anfigastrio arqueada ....17. **Schiffneriolejeunea polycarpa**

Descripción de las especies

1. ***Anoplolejeunea conferta*** (Meissn.) Evans (Fig. 1 A-D)

Evans, Bull. Torrey Bot. Club 35: 175. 1908. *Jungermannia conferta* Meissner ex Sprengel in Linnaeus, Syst. Veg. (ed. 16) 4(2): 325. 1827. Typus: Perú.

Plantas secas verdosas a amarillentas, pálidas; hojas extendidas, no curvadas sobre el tallo; 5-9 mm long. x 0,8-1,3 mm lat.; irregularmente pinnadas a bipinnadas, ramas de tipo *Lejeunea* con anillo basal notorio; se encuentran ramas microfilas con lobos muy pequeños. **Tallo** en corte transversal redondeado, 65-115 μm (6 células) de ancho x 80-90 μm (5-6 células) de alto; corteza de 7-8 células rectangulares de 16-20 x 26-33 μm, pared celular delgada a mediana; médula de 10-11 células irregulares de 9-14 x 13-20 μm, pared celular delgada.
Hojas imbricadas, ampliamente extendidas. **Lobo** aovado a redondeado, 450-700 μm long. x 350-650 μm lat.; cóncavo; márgenes enteros; ápice ampliamente redondeado, ocasionalmente incurvado; margen libre dorsal redondeado, cubre o excede apenas el tallo. **Células** centrales del lobo isodiamétricas, algunas hexagonales, 19-23 x 23-27 μm, pared celular delgada a mediana con trígonos; células marginales cuadradas a rectangulares de 13-17 x 16-20 μm. **Lóbulo** oval a redondeado, 190-230 μm long. x 150-200 μm lat.; inflado; margen libre fuertemente involuto, curvado una vuelta sobre sí mismo; quilla arqueada, continua con el margen ventral del lobo o formando un ángulo amplio con éste; ocasionalmente hay lóbulos reducidos, ovales, margen libre apenas incurvado, poco inflados. **Anfigastrios** continuos; obcordados, 300-420 μm ancho x 230-300 μm alto; 2,9-4,5 x el ancho del tallo; márgenes enteros; ápice truncado a retuso; inserción ± recta; generalmente con rizoides en la base; merofito ventral de 2 células.

Habitat: Crece sobre corteza, generalmente de *Araucaria angustifolia* (Bert.) O. Ktze. Fue hallada entre 200 y 800 m s.n.m.

Observaciones: El material de las muestras es muy escaso y está estéril.
En la base de algunos lobos se observaron grupos de 3 células de 23-27 x 29-37 μm, algo mayores que el resto; el contenido celular se hallaba destruído, pero podría tratarse de ocelos con un solo oleocuerpo grande por célula (Evans 1908: 177).
Entre las células basales se encontró ocasionalmente 1 espesamiento intercelular por lado.
Ilustraciones: Evans 1908 (pl. 8: fig. 9-23).
Distribución geográfica: América tropical, *Argentina (Misiones).
Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Iguazú. Parque Nacional Iguazú, Cataratas, U.Drehwald 2646, 10-XII-1987. Dpto. Gral. M. Belgrano. San Antonio, bosque cerca de la pista de aterrizaje, U.Drehwald A.284, 12-XII-1987; U.Drehwald 2693, 13-XII-1987. Bernardo de Irigoyen, U.Drehwald A.320, 16-XII-1987. Dpto. San Pedro. ruta 14, ± 5 km al E de San Pedro, M.E.Reiner 1670, U.Drehwald 2585, 11-IX-1987.

2. ***Lejeunea reflexistipula*** (Lehm. & Lindenb.) Gott., Lindenb. & Nees
(Fig. 1 E-G)

Gottsche, Lindenberg & Nees, Syn. Hep.: 335. 1845. *Jungermannia reflexistipula* Lehm. & Lindenb., in Lehmann, Nov. Stirp. Pug. 5: 10. 1833. Typus: Brasil, "Serra de Estrella", leg. Beyrich.

Plantas secas verdosas; hojas extendidas; 0,4-1 cm long. x 1,1-1,3 mm lat.; ramificación escasa, ramas cortas de tipo *Lejeunea*. **Tallo** en sección transversal redondeado, 130-150 μm ancho; pared celular uniforme, delgada, hialina; corteza de 8 células ± rectangulares, de 16-37 x 46-53 μm; médula de 16 células de 13-23 x 16-30 μm.
Hojas imbricadas; oblicua hasta ampliamente extendidas. **Lobo** aovado, 0,6-0,7 mm long. x 0,5-0,7 mm lat.; base libre dorsal redondeada, excede un poco el tallo; márgenes enteros, contorno algo crenulado; ápice redondeado, plano a incurvado. **Células** del lobo poligonales, pared celular delgada con trígonos peque-

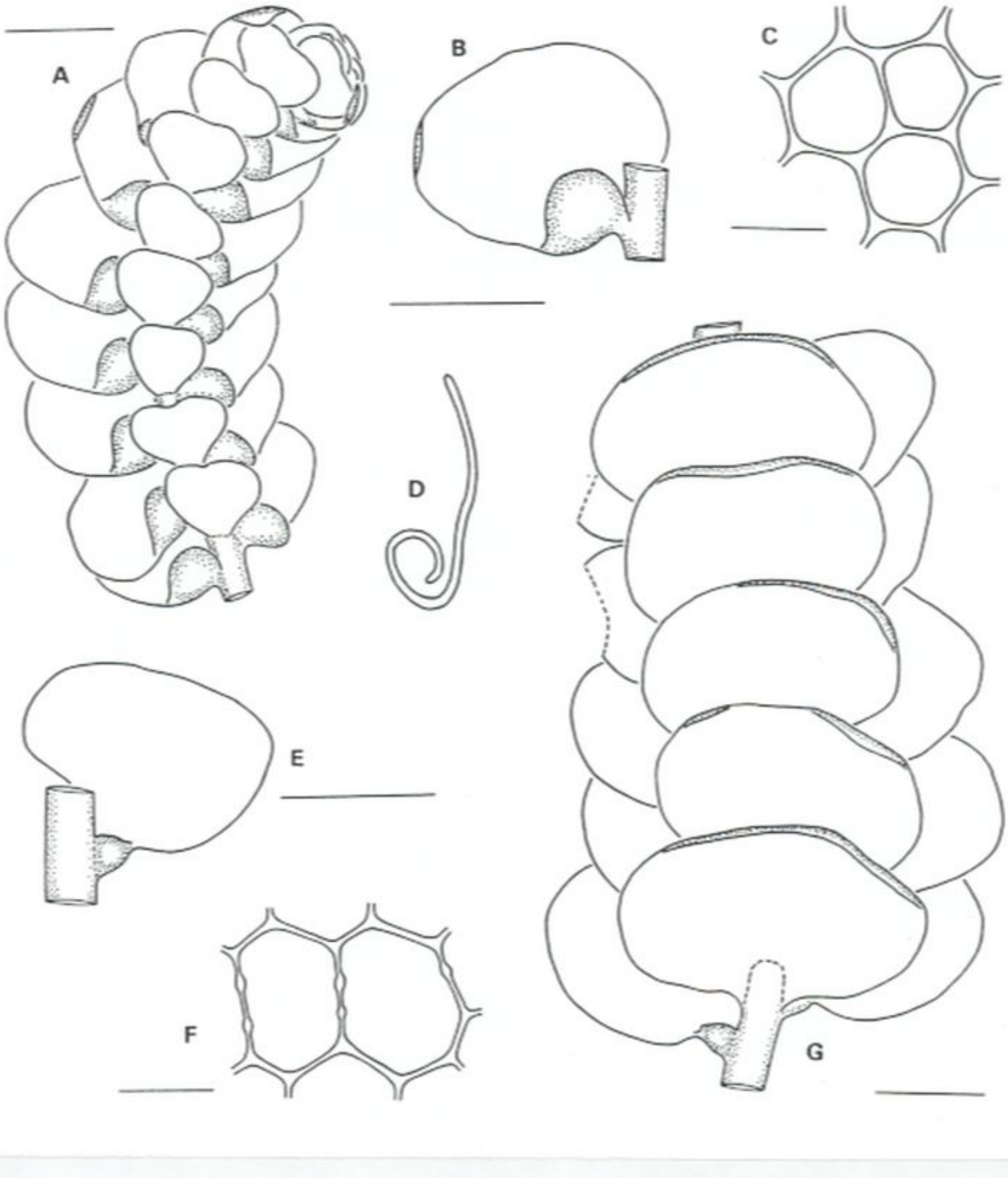

Fig. 1. A-D: ***Anoplolejeunea conferta***. A, aspecto general, vista ventral; B, lobo y lóbulo; C, células centrales del lobo; D, corte longitudinal de lobo y lóbulo. (M.E.Reiner 1670). E-G: ***Lejeunea reflexistipula***. E, lobo y lóbulo; F, células centrales del lobo; G, aspecto general, vista ventral. (U.Drehwald A.273). Escalas: A, B, D, E, G = 400 µm; C, F = 25 µm.

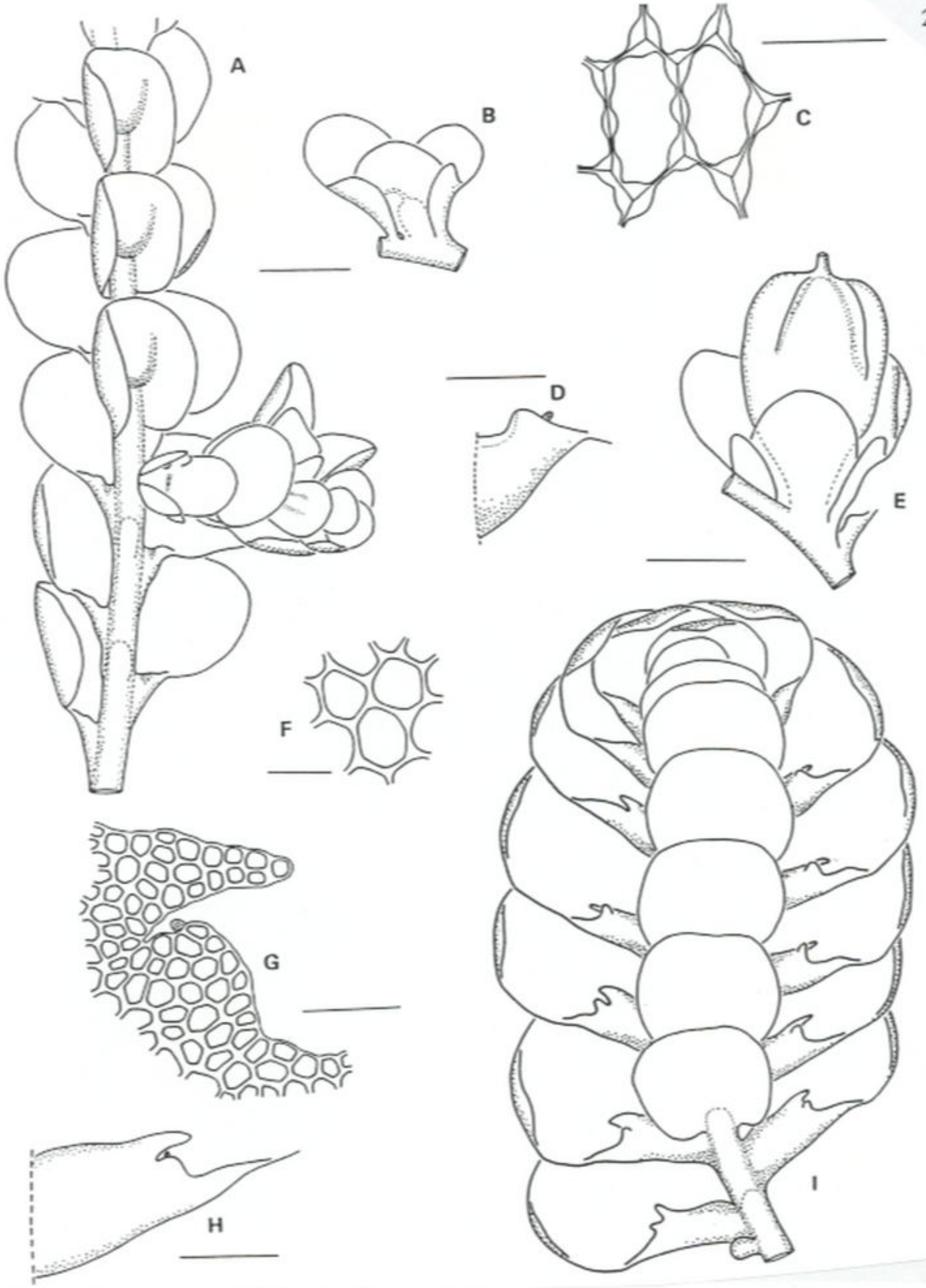

Fig. 2. A-D: ***Omphalanthus filiformis***. A, aspecto general de una planta femenina, vista ventral; B, brácteas y bractéola periqueciales; C, células centrales del lobo; D, lóbulo. (A-C: U.Drehwald 2776, D: U.Drehwald 2547). E-I: ***Leucolejeunea unciloba***. E, periantio, brácteas y bractéola periqueciales, vista ventral; F, células centrales del lobo; G, región apical del lóbulo en H; H, lóbulo; I, aspecto general, vista ventral. (U.Drehwald 2579). Escalas: A, B, E, I = 400 µm; C, F = 25 µm; D, H = 200 µm; G = 50 µm.

base y con 1 innovación (raras veces 2) que puede volver a originar un ginoecio, este último con o sin innovación. Lobo de la bráctea periquecial ovalado, 540-750 µm long. x 360-430 µm lat.; margen entero; ápice obtuso a redondeado, en ocasiones incurvado. Lóbulo de la bráctea como un pliegue rectangular de 310-470 µm long. x 110-135 µm lat.; ápice obtuso a redondeado. Bractéola periquecial redondeada, 320-430 µm ancho x 340-540 µm alto; libre. No se observó ningún tipo de reproducción asexual.

Habitat: epífita sobre corteza de árboles, generalmente pendiente. En algunos casos las plantas crecían sobre la corteza de *Araucaria angustifolia* (Bert.) O. Ktze. Fue hallada entre 300 y 800 m s.n.m.
Observaciones: Se observaron unos pocos periantios pequeños y mal formados, probablemente originados sin fecundación.
En esta especie el periantio es obovoide a obcónico, terete o levemente trígono en sección transversal, de 0,85 mm alto x 0,55 mm ancho (Evans 1907: 19).
Ilustraciones: Evans 1907 (pl. 3: 1-9); Lorscheitter Baptista 1977 (pl. V, XXXIV: 1).
Distribución geográfica: Zonas montañosas de América tropical, Argentina (Salta: Jack & Stephani 1896; *Misiones).
Material estudiado: ARGENTINA. Prov. Salta: ``In der Flussaue am Río Seco zwischen Orán und San Andrés", leg. Lorentz s/n (G). Prov. Misiones: Dpto. Gral. M. Belgrano. ± 6 km S Bernardo de Irigoyen, U.Drehwald 2731, 2733 y 2741, U.Drehwald A.320 y 324, 16-XII-1987. Bernardo de Irigoyen, Salto Andrecito, U.Drehwald 2776, 16-XII-1987. San Antonio, U.Drehwald A.317, 16-XII-1987. Dpto. San Pedro. entre Tobuna y San Pedro, camino lateral, ± 5 km San Pedro, M.E.Reiner 1631, U.Drehwald 2538, 2545, 2546 y 2547, 10-IX-1987. Ruta 14, ± 5 km E San Pedro, M.E.Reiner 1673, U.Drehwald 2584 y 2589, U.Drehwald A.B 1 y B 3, 11-IX-1987. Dpto. Ldor. Gral. San Martín. Salto Encantado, M.E.Reiner 1704, U.Drehwald 2612, 12-IX-1987. Dpto. Oberá. Oberá. Salto Berrondo, M.E.Reiner 1576, U.Drehwald 2483 y 2489, 8-IX-1987; U.Drehwald 845 y 846, 20-I-1987.

5. ***Acanthocoleus aberrans*** (Lindenb. & Gott.) Kruijt
(Fig. 3 A-F)

Kruijt, Bryophyt. Biblioth. 36: 62. 1988. *Lejeunea aberrans* Lindenb. & Gott., en Gottsche, Lindenberg & Nees, Syn. Hep.: 751. 1847. Typus: "México, Huatusco, Liebmann" (G 22616, isotypus).

Plantas secas verde oliváceas a verde oscuras; 0,7-1,1 cm long. x 0,9-1,8 mm lat. Ramificación irregularmente pinnada, ramas vegetativas de tipo *Lejeunea* y ocasionalmente algunas de tipo *Frullania*. **Tallo** en sección transversal oval-redondeado, 125-175 µm (8-9 células) de ancho x 115-125 µm (7-8 células) de alto; corteza de 10-14 células de 13-27 x 26-40 µm, las dorsales y ventrales similares, pared celular ± delgada y castaña clara; médula de 15-35 células de 13-17 x 13-23 µm, pared celular delgada, amarillenta.
Hojas imbricadas a subcontinuas; cuando secas curvadas sobre el eje, cuando húmedas ampliamente extendidas. **Lobo** aovado, 0,7-1 mm long. x 0,4-0,8 mm lat.; ápice agudo hasta apiculado, generalmente incurvado, ocasionalmente también redondeado; márgenes enteros o suavemente dentados cerca del ápice; base libre dorsal redondeada, cubre el tallo. **Células** del lobo ± alargadas; con trígonos medianos a pequeños, cordados; con algunos espesamientos intercelulares en las células basales y centrales; basales de 23-30 x 33-47 µm; centrales de 16-27 x 23-40 µm; marginales cuadradas a rectangulares de 13-17 x 16-20 µm. **Lóbulo** muy variable: generalmente se encuentra reducido a un pequeño pliegue de 2-4 células de alto x 8-10 células de largo; cuando está bien desarrollado: aovado a oblongo, 270-400 µm long. x 120-190 µm lat.; inflado; región apical plana y adpresa al lobo; diente apical de 2 células curvado hacia el lobo, papila hialina ± 2 células por debajo de este diente en la cara interna del lóbulo; diente proximal de 1 célula, generalmente poco notorio; entre los dos dientes 3-4 células; quilla arqueada. **Anfigastrios** distantes a subcontinuos; redondeados, 310-515 µm ancho x 320-480 µm alto; 2,2-2,9 x el ancho del tallo; ápice ampliamente redondeado a trunca-

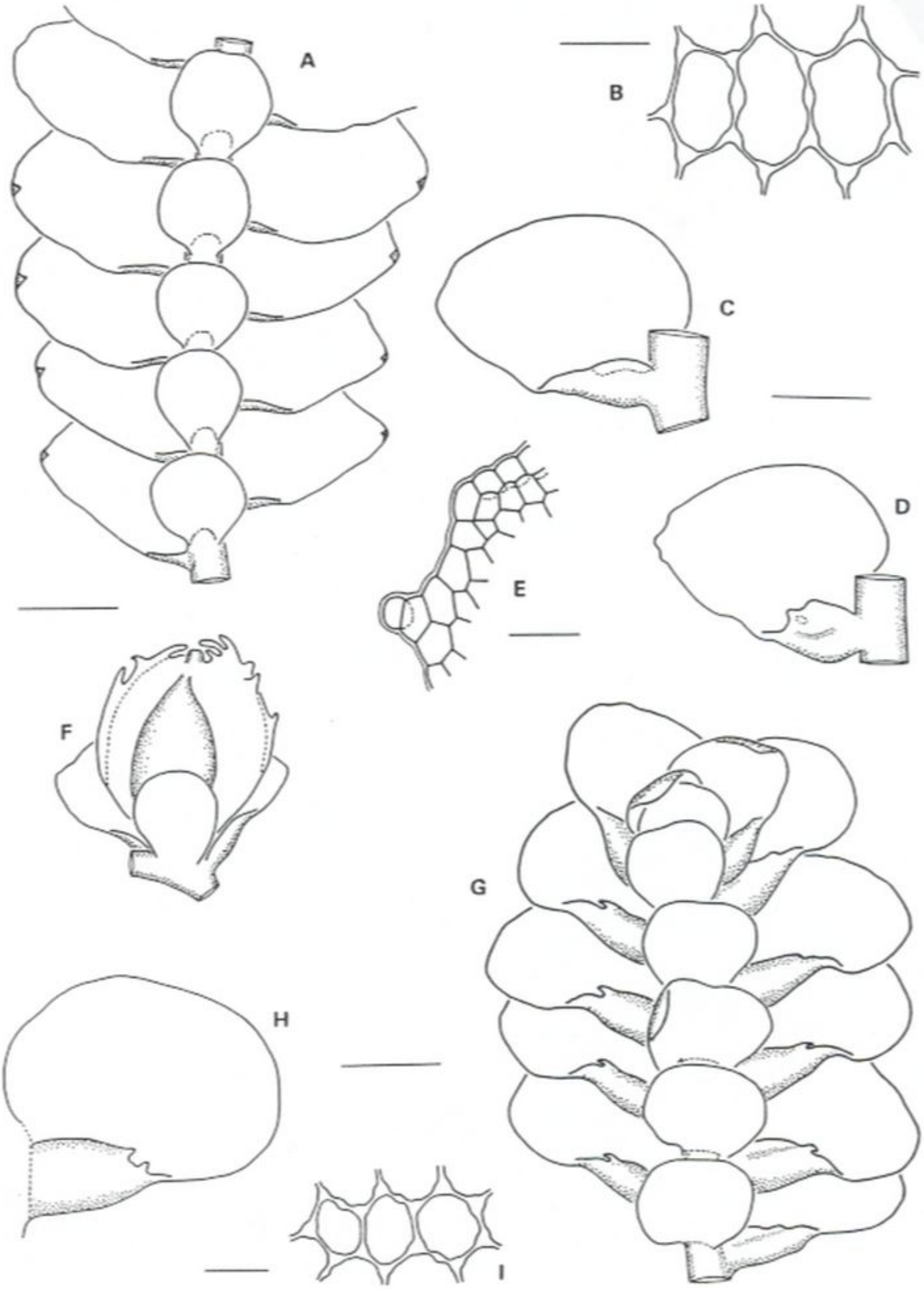

Fig. 3. A-F: ***Acanthocoleus aberrans***. A, aspecto general, vista ventral; B, células centrales del lobo; C y D, lobo y lóbulo; E, región apical del lóbulo en D; F, periantio, brácteas y bractéola periqueciales, vista ventral. (A: M.E.Reiner 1353, B-F: M.E.Reiner 1142). G-I: ***Archilejeunea auberiana***. G, aspecto general, vista ventral; H, lobo y lóbulo; I, células centrales del lobo. (M.E.Reiner 1030). Escalas: A, C, D, F-H = 400 µm; B, I = 25 µm; E = 50 µm.

do; márgenes enteros; inserción en forma de una corta U invertida, bases 1-2 células decurrentes; zona inicial de los rizoides formada por numerosas células pequeñas de pared celular muy oscura, rizoides hialinos a castaño rojizos; merofito ventral de 2(4) células.

Autoica. **Androecio** terminal en una corta rama de tipo *Lejeunea* sin hojas vegetativas en la base; espiga de 490-950 µm long. x 450-540 µm lat., 2-5(6) pares de brácteas perigoniales; lóbulos inflados, imbricados, quilla fuertemente arqueada; bractéolas en toda la extensión del androecio, similares pero de menor tamaño que los anfigastrios. **Ginoecio** terminal sobre el eje principal, sobre ramas o sobre innovaciones, con 1-2 innovaciones que pueden volver a ser fértiles; un par de brácteas periqueciales; lobo aovado, 580-750 µm long. x 380-540 µm lat., ápice agudo, márgenes enteros a levemente dentados cerca del ápice; lóbulo reducido a un pequeño pliegue o ± rectangular a oblongo, 200-230 µm long. x 60-70 µm lat.; bractéola redondeada, 350-380 µm ancho x 365-380 µm alto, márgenes enteros, libre. **Periantio** cuando maduro excede 1/2 las brácteas; obcordado, 615-750 µm ancho x 740-950 µm alto, a veces con un pie de 120-170 µm de alto; dos quillas laterales, una quilla ventral ancha y en vista dorsal muy cóncavo, ocasionalmente en la superficie dorsal se encuentra una quilla corta poco elevada; el margen de las quillas es muy variable, generalmente se encuentra un ala de 1-2 células de ancho con numerosos dientes (hasta 8 células de alto x 2 de ancho en la base) o lacinias; rostro corto de 30-45 µm (3-4 células) de alto.

No se observó ningún tipo de reproducción asexual.

Habitat: epífita sobre corteza y rama de árboles, sobre troncos en descomposición (no es muy común) o sobre rocas. En Misiones fue hallada entre 150 y 800 m s.n.m.

Observaciones: la forma de los lóbulos es muy variable; se encuentran hojas con lóbulos nulos o reducidos a un pequeño pliegue; lóbulos oblongos, inflados, con el margen libre involuto; lóbulos con la región apical visible in situ y con dos dientes. Se observó que las plantas con lóbulos muy reducidos tenían lobos con ápice apiculado incurvado y con tendencia a una región apical dentada, mientras que en plantas con lóbulo muy desarrollado el ápice del lobo no es tan agudo, generalmente es plano y no se observan dientes en la región apical. La forma y tamaño de los dientes o lacinias del periantio son también caracteres muy poco constantes.

Ilustraciones: Kruijt 1988 (pl. 6); Schuster 1970 (fig. 2, como *Acanthocoleus fulvus*).

Distribución geográfica: América tropical, * Argentina (Jujuy, Salta, Misiones, Entre Ríos). Madera, Islas Canarias (La Palma, Gomera). Africa tropical, Madagascar.

Material estudiado: BRASIL. Dpto. Paraná. Parque Nacional Iguazú, Cataratas, M.E.Reiner 1056, 4-VIII-1986. ARGENTINA. Prov. Jujuy: Dpto. Capital. Termas de Reyes, M.E.Reiner 1238, 18-XI-1986. Cerro Zapla, M.E.Reiner 1305, 22-XI-1986. Dpto. El Carmen. sobre ruta 9, Abra de Santa Laura, M.E.Reiner 1264, 1267, 1270, 1272, 1277 y 1278, U.Drehwald S 155, 21-XI-1986. Prov. Salta: Dpto. La Capital. Quebrada de San Lorenzo, M.E.Reiner 296 y 299, 22-IX-1985. Dpto. Anta. sobre ruta 20, camino al Parque Nacional El Rey, a 4 km de la ruta 5, M.E.Reiner 1163 y 1164, 14-XI-1986. Parque Nacional El Rey, camino entre el río La Sala y Pozo Verde, M.E.Reiner 1183, 1185, 1188, 1189 y 1193, U.Drehwald S 29, 15-XI-1986. Parque Nacional El Rey, sendero Santa Elena, M.E.Reiner 1228 y 1230, U.Drehwald S 76 y S 85, 16-XI-1986. Prov. Misiones: Dpto. Iguazú. Parque Nacional Iguazú, ruta 101, zona de palo rosa, U.Drehwald A.274, 9-XII-1987; U.Drehwald A.279 y 280, 10-XII-1987. Parque Nacional Iguazú, ruta 101, picada frente Seccional Yacuiba, M.E.Reiner 1030, U.Drehwald A.47 y 51, 3-VIII-1986. Parque Nacional Iguazú, Sendero Macuco, U.Drehwald A.9, 31-VII-1986. Dpto. Gral. M. Belgrano. San Antonio, U.Drehwald A.309, 311 y 312, 14-XII-1987. Bernardo de Irigoyen, U.Drehwald A.321, XII-1987. Dpto. Eldorado. Pt. Pinares, U.Drehwald 479, 8-VIII-1986. Dpto. San Pedro. sobre ruta 17, 10 km al E del empalme con la ruta 20, M.E.Reiner 1099, 8-VIII-1986. ruta 14, ± 5 km al E de San Pedro, U.Drehwald 2588, 11-IX-1987. sobre ruta 14 entre Macaca y Tobuna, M.E.Reiner 1604, U.Drehwald 2517, 2520 y 2523, 10-IX-1987. camino lateral ± 5 km de

San Pedro, U.Drehwald 2544, 10-IX-1987. Dpto. Montecarlo. Hostería ACA Montecarlo, M.E.Reiner 763, 765 y 766, 19-VII-1986; U.Drehwald 272, 21-VII-1986. Dpto. Guaraní. camino a Rosa Mística, U.Drehwald 2253, 25-VII-1987. Dpto. Ldor. Gral. San Martín. Gruta India, Salto 3 de Mayo, M.E.Reiner 1142, 9-VIII-1986. Salto Encantado, U.Drehwald 2166, 2169 y 2192, 22-VII-1987. Dpto. San Ignacio. Ruinas Jesuíticas de San Ignacio, M.E.Reiner 740, 18-VII-1986. San Ignacio, U.Drehwald A.103-106, 110 y 111, 1-X-1986. Jardín América, Salto del Tabay, U.Drehwald 2020 y 2053, 20-VII-1987. Dpto. Oberá. Oberá, Salto Berrondo, M.E.Reiner 1563, U.Drehwald 2473, 2491 y 2500, 8-IX-1987; U.Drehwald 844, 20-I-1987; U.Drehwald 870, U.Drehwald A.251, 21-I-1987. Dpto. Candelaria. Loreto, U.Drehwald A.127 y 131, 2-X-1986; U.Drehwald A.80 y 82, 29-IX-1986. cerca de Loreto, en el bosque, M.E.Reiner 1353, 1355 y 1360, U.Drehwald 642 y 644, U.Drehwald A.86 y 87, 30-IX-1986. Arroyo Yabebiry, detrás de la escuela, U.Drehwald 659, M.E.Reiner 1372, 2-X-1986; U.Drehwald A.164, 4-X-1986. Santa Ana, Ruinas, U.Drehwald 47, III-1986; U.Drehwald A.166, 167, 170-173, 178 y 179, 13-I-1987; U.Drehwald A.213, 216, 235 y 237, 17-I-1987
. Cerro Sta. Ana, U.Drehwald 741, 747, 748, 752, 761 y 763, U.Drehwald A.184, 185, 186, 189, 191 y 192, 14-I-1987. Prov. Entre Ríos: Dpto. Colón. Parque Nacional El Palmar, leg. A. Vinocur s/n, 31-V-1986.

6. ***Archilejeunea auberiana*** (Mont.) Evans
(Fig. 3 G-I)

Evans, Bull. Torrey Bot. Club 35: 168. 1908. *Lejeunea auberiana* Mont., in de la Sagra, Hist. Phys. Nat. Cuba (Bot. Pl. Cell.): 483. 1842. Typus: Cuba, leg. Auber.

Plantas cuando secas verde amarillentas; hojas extendidas, no curvadas sobre el eje; 0,7-1 cm long. x 1,5-1,7 mm lat.; irregularmente pinnadas (bipinnadas), ramas de tipo *Lejeunea*, generalmente fértiles. **Tallo** en sección transversal redondeado, 110-200 µm (7 células) de ancho x 130-140 µm (7 células) de alto; corteza de 13-16 células, médula de 22-30 células, no se diferencian las células de la corteza de las medulares, células irregulares de 13-23 x 19-30 µm, pared celular delgada a mediana, castaña clara.
Hojas imbricadas; oblicuamente extendidas. **Lobo** aovado, algo falcado, 0,7-1,1 mm long. x 0,4-0,8 mm lat.; cóncavo; ápice redondeado, plano o incurvado; márgenes enteros; base dorsal libre redondeada, cubre el tallo. **Células** del lobo irregulares, ± alargadas; pared celular delgada, con trígonos pequeños y 0-1 espesamiento intercelular; células basales de 23-30 x 29-40 µm, centrales de 19-27 x 29-37 µm, marginales de 9-14 x 13-17 µm. **Lóbulo** rectangular-aovado, 270-470 µm long. x 100-280 µm lat.; inflado; quilla suavemente arqueada, 340-570 µm, algo crenulada por el contorno de las células; margen libre involuto; ápice con un diente proximal de 3-4 células de alto x 2 células en la base, y un diente distal similar al anterior, separados por un seno cóncavo de 3-4 células, dientes rectos o curvados hacia el lobo; papila hialina en la base proximal del diente distal. **Anfigastrios** distantes a continuos; reniformes a redondeados, 400-600 µm ancho x 300-400 µm alto, 3,2-3,7 x el ancho del tallo; planos a escuarrosos; ápice ampliamente redondeado a truncado, plano u ocasionalmente incurvado; márgenes enteros; inserción ± recta; merofito ventral de 4-6 células.
Autoica. **Androecio** terminal en el eje principal o en ramas largas de tipo *Lejeunea*; 4-8 pares de brácteas perigoniales, imbricadas, menores que las hojas vegetativas, lóbulo inflado, quilla arqueada, ápice obtuso; bractéolas en toda la extensión del androecio, menores que los anfigastrios. **Ginoecio** terminal en el eje principal, en ramas o en innovaciones; con 1-2 innovaciones generalmente de tipo *Radula*, se observaron algunos ginoecios con dos innovaciones de las cuales una era de tipo *Lejeunea* (con collar basal); el primer elemento de la innovación es una hoja lateral; un par de brácteas periqueciales, lobo aovado, 670-770 µm long. x 450-520 µm lat., cóncavo, ápice redondeado, margen entero; lóbulo rectangular a ± triangular, 360-540 µm long. x 70-140 µm lat., ápice extendido; bractéola aovada-redondeada, 450-550 µm ancho x 580-750 µm alto, ápice redondeado, márge-

nes enteros. **Periantio** cuando maduro excede ½ las brácteas; oval-oblongo, 0,5-0,7 mm ancho x 0,9-1,1 mm alto; 5-carinado, 2 quillas laterales, 2 ventrales y 1 quilla dorsal poco elevada y corta; contorno de las quillas entero o con pequeños dientes; rostro notorio de 65-100 µm (5-7 células) de alto.
No se observó ningún tipo de reproducción asexual.

Habitat: epífita sobre pequeñas ramitas o sobre corteza de árboles. Se encontró a ± 200 m s.n.m.
Observaciones: Los lóbulos están generalmente bien desarrollados, pero se encuentran algunos menores y sin dientes.
Ilustraciones: Gradstein & Buskes 1985 (fig. 3 d, como *A. parviflora* var. *florentissima* (Spruce) Gradst. & Buskes); Montagne 1842 (tab. XIX fig. 1).
Distribución geográfica: América tropical, *Argentina (Misiones).
Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Iguazú. Parque Nacional Iguazú, Sendero Macuco, M.E.Reiner 814, U.Drehwald 286 y 316, 22-VII-1986. Parque Nacional Iguazú, sobre ruta 101, picada frente a la Seccional Yacuiba, M.E.Reiner 1030, 3-VIII-1986. ruta 12, 2 km al S del límite del Parque Nacional Iguazú, U.Drehwald A.273, 8-XII-1987.

7. ***Archilejeunea parviflora*** (Nees) Schiffn.
(Fig. 4 A-E)

Schiffner, Hedwigia 33: 181. 1894. *Jungermannia parviflora* Nees, in Martius, Fl. Brasil. 1,1: 353. 1833. Typus: Brasil, "Flumen Amazonum", Martius s.n. (G 20381, isotypus).

Plantas secas amarillentas a castaño claras; hojas ± extendidas, no curvadas sobre el eje; 0,5-1 cm long. x 1,2-1,6 mm lat.; generalmente fértiles. Irregularmente pinnadas, ramas de tipo *Lejeunea*. **Tallo** en sección transversal oval, 105-150 µm (9 células) de ancho x 110-130 µm (8 células) de alto; pared celular ± uniforme, castaña clara; corteza de 13-17 células ± rectangulares de 16-23 x 19-37 µm; médula de 22-36 células irregulares de 9-17 x 16-23 µm, algo menores que las corticales.
Hojas imbricadas; cuando húmedas ampliamente extendidas. **Lobo** aovado-oval, 0,7-1,1 mm long. x 0,5-0,7 mm lat.; algo cóncavo; ápice ampliamente redondeado y plano, ocasionalmente incurvado; márgenes enteros; base libre dorsal redondeada, cubre ½ o totalmente el tallo. **Células** del lobo isodiamétricas a levemente alargadas; trígonos pequeños a medianos, no cordados; con 0-1 espesamiento intercelular; células basales de 23-27 x 29-43 µm; centrales de 16-23 x 19-30 µm; marginales ± cuadradas de 9-17 x 13-27 µm. **Lóbulo** prácticamente nulo, reducido a un pequeño pliegue; o aovado-oblongo, hasta 300-340 µm long. x 80-130 µm alto; inflado; margen libre cerca del tallo algo involuto, hacia el ápice plano y extendiéndose en forma oblicua hasta su unión con el margen ventral del lobo; sin diente o con uno apenas definido, de 1 célula; quilla recta a muy suavemente arqueada, algo crenulada por la superficie convexa de las células. **Anfigastrios** distantes a sub-continuos; redondeados a reniformes, 340-460 µm ancho x 270-340 µm alto, 2,9-3,6 x el ancho del tallo; algo escuarrosos; ápice anchamente redondeado, a veces incurvado; márgenes enteros; inserción recta; merofito ventral de 4-7 células.
Autoica. **Androecio** intercalar en el eje o sobre ramas de tipo *Lejeunea*; 4-9 pares de brácteas perigoniales, imbricadas, algo menores que las hojas vegetativas; lóbulo inflado, quilla muy arqueada, ápice obtuso; bractéolas en toda la extensión del androecio, similares a los anfigastrios. **Ginoecio** terminal en el eje, ramas o innovaciones; con 1-2 innovaciones que pueden volver a ser repetidamente fértiles; el primer elemento de la innovación es una hoja lateral; un par de brácteas periqueciales; lobo oblongo a lanceolado, 0,8-1,1 mm long. x 0,4-0,5 mm lat., ápice agudo a obtuso, márgenes enteros; lóbulo muy reducido a ± rectangular, hasta 200 µm long. x 70 µm lat., ápice agudo; bractéola obovada, 0,4-0,5 mm ancho x 0,5-0,7 mm alto, ápice ampliamente redondeado, márgenes enteros. **Periantio** cuando maduro excede hasta 1/3 de su long. las brácteas; oblongo, 450-580 µm ancho x 700-1100 µm alto, con un corto pie; 2 quillas laterales, 2 quillas ventra-

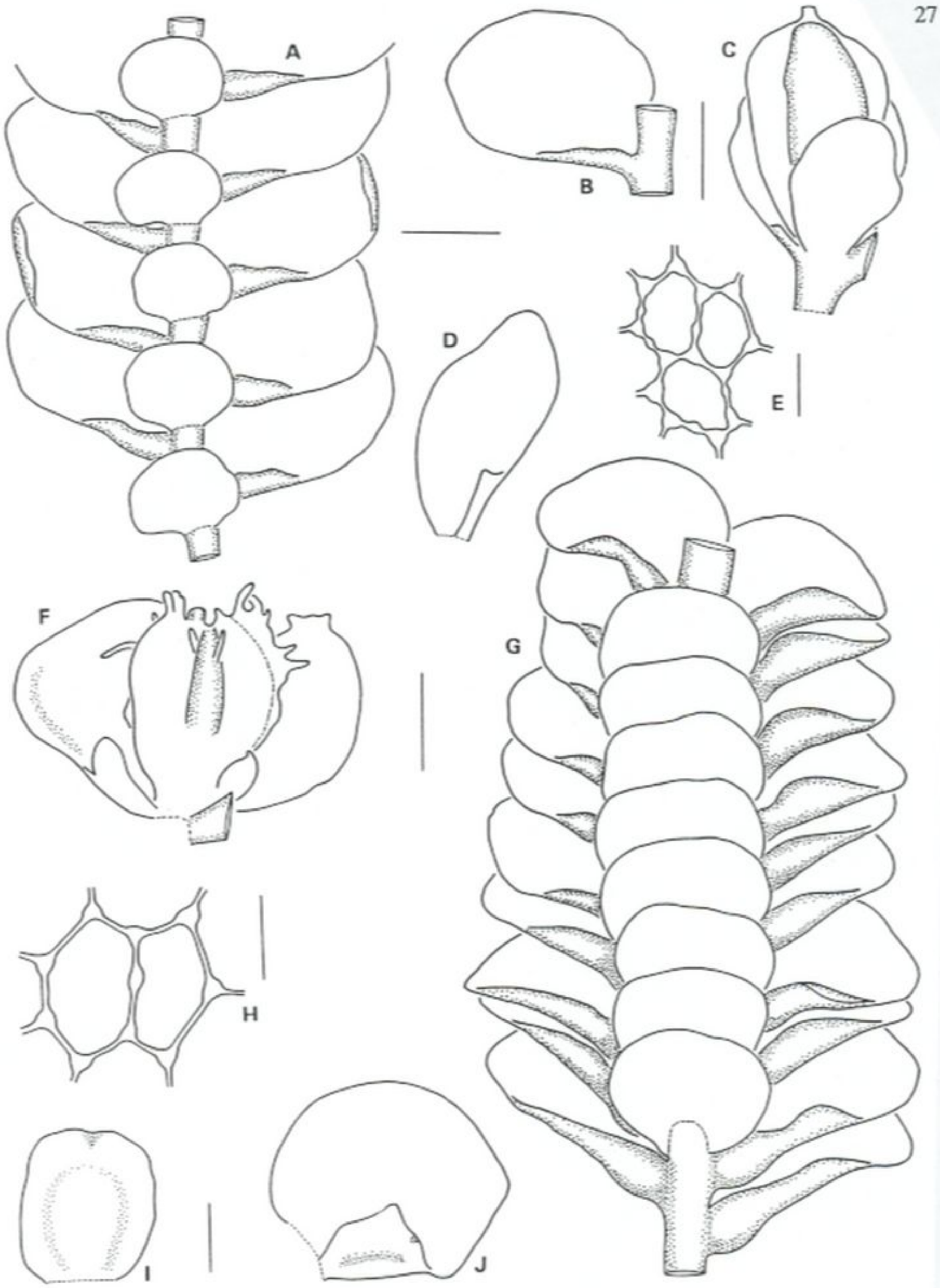

Fig. 4. A-E: ***Archilejeunea parviflora***. A, aspecto general, vista ventral; B, lobo y lóbulo; C, periantio, brácteas y bractéola periqueciales, vista ventral; D, bráctea periquecial; E, células centrales del lobo. (U.Drehwald 2194). F-J: ***Brachiolejeunea phyllorhiza***. F, periantio y brácteas periqueciales, vista ventral; G, aspecto general, vista ventral; H, células centrales del lobo; I, bractéola periquecial; J, lobo y lóbulo. (U.Drehwald 2267). Escalas: A-D, F, G, I, J = 400 µm; E, H = 25 µm.

les elevadas y extendidas a todo lo largo del periantio y 1 quilla dorsal corta y poco elevada; superficie y quillas lisas, sin dientes ni lacinias; rostro notorio de 60-80 μm (5-7 células) de alto.
No se observó ningún tipo de reproducción asexual.

Habitat: epífita sobre corteza de árboles.
Observaciones: de acuerdo a Gradstein & Buskes (1985: 102) las células corticales y medulares del tallo (en sección transversal) son similares y el androecio suele ser terminal; en el material estudiado las células de la corteza son algo mayores que las medulares y se encontraron solamente androecios intercalares.
Ilustraciones: Gradstein & Buskes 1985 (fig. 3 a-c).
Distribución geográfica: Bahamas, América tropical, *Argentina (Misiones).
Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Ldor Gral. San Martín. Salto Encantado, U.Drehwald 2194, 22-VII-1987.

8. ***Brachiolejeunea phyllorhiza*** (Nees) Kruijt & Gradst.
(Fig. 4 F-J)

Kruijt & Gradstein, Nova Hedwigia 43: 299. 1986. *Jungermannia phyllorhiza* Nees, in Martius, Fl. Brasil. 1,1: 348. 1833. Typus: Brasil, "Flum. Amaz., in terra nuda, leg. Martius".

Plantas secas amarillentas a castañas claras, brillantes; hojas curvadas sobre el eje a suberectas; 1-1,7 cm long. x 1,8-2,4 mm lat.; irregularmente pinnadas, ramas de tipo *Frullania* y *Lejeunea*. **Tallo** en sección transversal oval a redondeado, 200-250 μm (9 células) de ancho x 180 μm (10 células) de alto; corteza de 16-17 células rectangulares, las dorsales de 23-30 x 29-37 μm, algo mayores que las ventrales de 19-20 x 29-37 μm, pared celular delgada a levemente engrosada; médula de 40-65 células irregulares de 13-23 x 23-30 μm, la capa externa con la pared celular algo engrosada, las internas con pared celular delgada.
Hojas imbricadas; oblicuamente extendidas cuando húmedas. **Lobo** anchamente aovado a redondeado, 1,1-1,4 mm long. x 1,2-1,3 mm lat.; márgenes enteros; ápice redondeado a obtuso; margen ventral incurvado; margen libre dorsal redondeado, cubre el tallo. **Células** basales y centrales del lobo alargadas, trígonos cordados, 0-1 espesamiento intercelular; células centrales de 29-37 x 33-50 μm; células marginales ± cuadradas, 19-23 x 19-27 μm. **Lóbulo** cuando extendido rectangular a triangular, 440-580 μm long. x 310-410 μm lat.; quilla arqueada e inflada en toda su extensión; margen libre recto; generalmente con dos dientes, el proximal forma un ápice ± recto en el lóbulo; el diente distal consta de 2-3 células, incurvado, por debajo de éste y en la cara interna del lóbulo se encuentra la papila hialina; entre la quilla y el diente distal hay 6-7 células, entre éste y el diente proximal hay 10-12 células; in situ, el lóbulo está inflado y el margen libre involuto. **Anfigastrios** imbricados; redondeados a levemente reniformes, 700-800 μm ancho x 590-630 μm alto, 3-3,4 x el ancho del tallo; márgenes enteros; ápice truncado; márgenes y ápice ocasionalmente incurvados; inserción en forma de una U invertida; zona inicial de los rizoides oscura, a veces con rizoides; merofito ventral de 4-6 células.
Autoica. **Androecio** sobre ramas de tipo *Lejeunea* sin hojas vegetativas; espiga compacta de 490-540 μm lat. x 1-1,1 mm long., generalmente no excede las hojas vegetativas; 4-8 pares de brácteas perigoniales desigualmente bilobadas, imbricadas, quilla arqueada, lóbulo inflado; bractéolas en toda la extensión del androecio, imbricadas, márgenes enteros, similares pero menores que los anfigastrios. **Ginoecio** terminal en el eje principal, en ramas o en innovaciones; con 1-2 innovaciones que pueden volver a ser repetidamente fértiles, el primer elemento de la innovación es un anfigastrio; un par de brácteas periqueciales; lobo aovado, 1-1,1 mm long. x 0,9 mm lat.; márgenes enteros a dentados, con 3-4 dientes de 1-2 células en la región apical; ápice agudo; lóbulo en general reducido o en forma de un pequeño pliegue rectangular a triangular, de 400-500 μm long.; sin ala; bractéola ± oval, 0,7-0,9 mm ancho x 0,8-1 mm alto; gibosa; márgenes enteros, planos o algo incurvados. **Periantio** cuando maduro cubierto por la bractéola o la excede apenas; obovado,

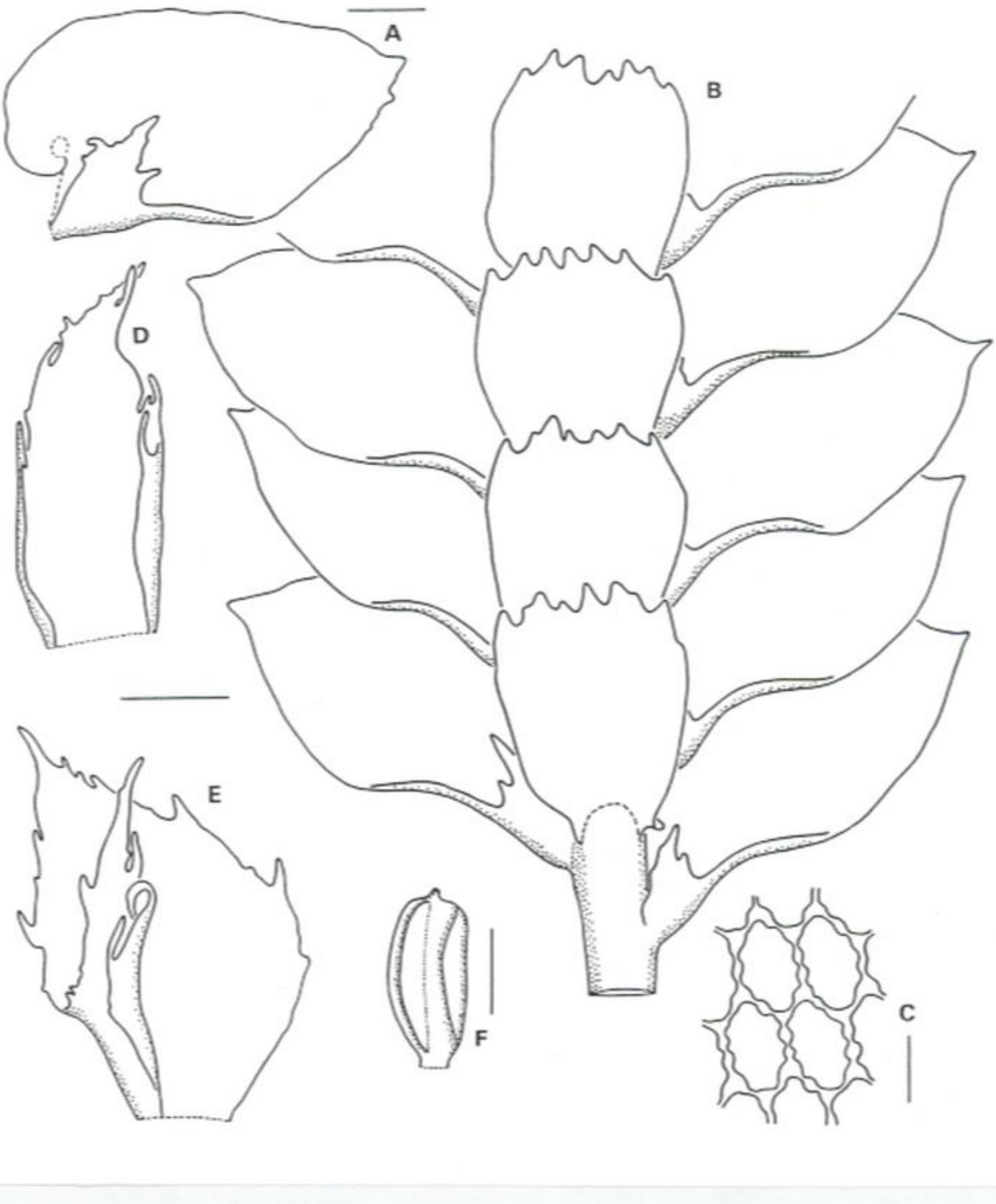

Fig. 5. A-F: ***Bryopteris diffusa***. A, lobo y lóbulo; B, aspecto general, vista ventral; C, células centrales del lobo; D, bractéola periquecial; E, bráctea periquecial; F, periantio, vista ventral. (A-C: M.E.Reiner 1555; D-F: U.Drehwald 846). Escalas: A, B, D, E = 400 µm; C = 25 µm; F = 1 mm.

580-680 μm ancho x 800-900 μm alto; 2 quillas laterales y una ventral obtusa; en vista dorsal cóncavo a convexo cuando la cápsula madura, ventralmente inflado; quillas con un ala de 1-2 células de ancho, con dientes o lacinias de 7-11 células de alto x 3-4 células en la base, agrupadas principalmente en la región apical; rostro de 60-80 μm (4-5 células) de alto.
No se observó ningún tipo de reproducción asexual.

Habitat: Epífita sobre corteza de árboles. Fue hallada entre 500 y 800 m s.n.m.
Observaciones: el número y tamaño de las lacinias del periantio son muy variables.
Ilustraciones: Kruijt & Gradstein 1986 (fig. 1).
Distribución geográfica: América tropical, *Argentina (Misiones). Africa: Kenia, Rhodesia, Africa del Sur, Madagascar.
Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Gral. M. Belgrano. San Antonio, U.Drehwald A.305, 14-XII-1987. Dpto. San Pedro. ruta 14, ± 5 km al E de San Pedro, U.Drehwald 2588, 11-IX-1987. Dpto. Guaraní. San Vicente, U.Drehwald 2267, 25-VII-1987.

9. ***Bryopteris diffusa*** (Sw.) Nees
(Fig. 5 A-F)

Nees, in Gottsche, Lindenberg & Nees, Syn. Hep.: 286. 1845. *Jungermannia diffusa* Sw., Nova Spec. Gen. Pl. Prodr.: 144. 1788. Typus: Jamaica, Swartz s.n.

Los tallos se encuentran adheridos por rizoides a la corteza y ramas de árboles, y de estos nacen abundantes y largas ramas pendientes; plantas verdosas a castaño oscuras; 6-13 cm long. x 1,8-3,3 mm lat., crecimiento delicuescente. Ramificación repetidamente seudodicotómica, ramas vegetativas de tipo *Frullania*; ramas fértiles de tipo *Lejeunea*. **Tallo** en sección transversal oval-redondeado, 215-315 μm (17-18 células) de ancho x 190-205 μm (15-16 células) de alto; se diferencian 3 capas: corteza externa de 1 capa de células de espesor, células ± rectangulares de 6-10 x 16-20 μm, pared celular ± gruesa y castaño oscura; médula externa de 2-3 capas de células con lumen muy pequeño, de 5-10 μm, pared celular muy gruesa: 6-7 μm y castaña amarillenta a rojiza; médula interna de células irregulares de 13-14 x 23-27 μm, pared celular de 3-4 μm, amarillenta a hialina.
Hojas imbricadas; cuando húmedas oblicuamente extendidas, cuando secas curvadas sobre el tallo. **Lobo** asimétricamente aovado-oval, 1,1-2,1 mm long. x 0,7-1,2 mm lat.; base dorsal libre cordada, excede un poco el tallo; ápice agudo hasta apiculado; margen entero, la región apical puede tener a veces unos pocos dientes pequeños y mal definidos. **Células** del lobo alargadas, pared celular castaño rojiza con trígonos cordados: dos lados convexos y un lado cóncavo, 1-2 espesamientos intercelulares por lado; células basales de 16-20 x 36-47 μm, centrales de 16-20 x 26-40 μm, marginales de 6-10 x 9-17 μm. **Lóbulo** ± triangular; unido al tallo por unas pocas células; quilla algo arqueada, en su unión con el margen ventral del lobo forma un ángulo muy amplio; inflado en la parte inferior, margen libre plano y adpreso al lobo; en el margen libre se encuentran generalmente 3 dientes de forma y tamaño muy variables, desde unas pocas células de alto en una hilera hasta ± laminares en forma de lacinias. **Anfigastrios** continuos hasta imbricados; oblongo-rectangulares, 650-1025 μm ancho x 810-1010 μm alto, 3-3,8 x el ancho del tallo; ápice truncado e irregularmente dentado; márgenes laterales enteros; bases cordadas, línea de inserción en forma de una amplia U invertida, por encima de la línea de unión y casi hasta el ápice la zona central del anfigastrio es gibosa.
Dioica. **Androecio** terminal en ramas laterales cortas de tipo *Lejeunea*; 4-5 pares de brácteas periqueciales: lobo aovado, margen entero, ápice apiculado; lóbulo inflado, quilla arqueada, imbricados; bractéolas en toda la extensión de la espiga, oblongas, margen entero, ápice truncado a retuso. **Ginoecio** terminal sobre cortas ramas laterales de tipo *Lejeunea*, sin innovación; 3 pares de brácteas y bractéolas. Lobo de la bráctea inferior al periantio asimétricamente aovado, 1,6 mm long. x 0,9-1,1 mm lat.; lateralmente extendido; ápice acuminado, margen dentado a sublacerado. Lóbulo oblongo-rectangular, 1,2-1,45 mm long. x 0,3-0,4 mm lat.; ápice acuminado; margen dentado a lacerado. Bractéola oblonga (lanceolada), 0,5 mm

ancho x 1,2 mm alto; ápice bífido con lobos subulados; margen dentado a lacerado y en ocasiones incurvado; quilla media elevada. **Periantio** oblongo, 615-860 µm ancho x 1,8-2,5 mm alto; cuando maduro excede 1/2 las brácteas; trígono: dos quillas laterales y una ventral extendida desde el ápice hasta la base del mismo, superficie dorsal lisa; ápice truncado con un rostro notorio de 80-110 µm (3-5 células) de alto.

Habitat: pendiente de la corteza y ramas de árboles. En Misiones fue hallada entre 200 y 800 m s.n.m.

Ilustraciones: Stotler & Crandall-Stotler 1974 (fig. 93; 100-123).

Distribución geográfica: América tropical, Chile, *Argentina (Misiones).

Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Iguazú. Parque Nacional Iguazú, Sendero Macuco, U.Drehwald 287, 22-VII-1986. Parque Nacional Iguazú, Puerto Canoas, zona de camping, M.E.Reiner 820, U.Drehwald 327, 23-VII-1986. Puerto Canoas, camino a secc. Hidrómetro, M.E.Reiner 992, U.Drehwald 406, 1-VIII-1986. Dpto. Gral. M. Belgrano. San Antonio, Colonia Belgrano, bosque cerca de la pista de aterrizaje, U.Drehwald 2666, U.Drehwald A.286 y 287, 12-XII-1987; U.Drehwald 2706 y 2707, 15-XII-1987; U.Drehwald A.317, 16-XII-1987. Bernardo de Irigoyen, Salto Andrecito, U.Drehwald 2762, 16-XII-1987. Dpto. San Pedro. entre Tobuna y San Pedro, camino lateral, ± a 5 km de San Pedro, M.E.Reiner 1620, 1621 y 1622, U.Drehwald 2538, 10-IX-1987. ruta 16, ± 4 km SE ruta 14, M.E.Reiner 1644, 11-IX-1987. San Pedro, selva con *Araucaria angustifolia*, leg. Eskuche 12-136, 20-XII-1970. Dpto. Guaraní. San Vicente, U.Drehwald 2266, 25-VII-1987. Rosa Mística, U.Drehwald 2245, 2246 y 2250, 25-VII-1987. Dpto. Ldor. Gral. San Martín. Salto Encantado, U.Drehwald 2131, 22-VII-1987; M.E.Reiner 1686, U.Drehwald 2621, 12-IX-1987. Dpto. San Ignacio. Jardín América, Salto del Tabay, U.Drehwald 2047, 20-VII-1987; U.Drehwald 2236 y 2239, 25-VII-1987. Dpto. Oberá. Oberá, Salto Berrondo, M.E.Reiner 1545, 1546, 1547, 1553, 1555, 1558 y 1572, 8-IX-1987; U.Drehwald 845, 846, 847, 849 y 857, 20-I-1987; U.Drehwald 872, U.Drehwald A.249, 251 y 252, 21-I-1987. Dpto. Candelaria. Arroyo Yabebiry, bosque inundable, M.E.Reiner 1382, U.Drehwald A.154, 4-X-1986.

10. ***Bryopteris filicina*** (Sw.) Nees
(Fig. 6 A-E)

Nees, in Gottsche, Lindenberg & Nees, Syn. Hep.: 284. 1845. *Jungermannia filicina* Sw., Nova Gen. Spec. Pl. Prodr.: 145. 1788. Typus: Jamaica, Swartz s.n.

Plantas secas verde oliváceas; pendientes de la corteza de árboles o sobre rocas; 6-12 cm long. x 2,5-3,7 mm lat. Ramificación regularmente pinnada (bipinnada), ramas vegetativas abundantes de tipo *Frullania*, en tallos decapitados de tipo *Lejeunea*; crecimiento excurrente. **Tallo** en sección transversal oval, 210-460 µm (16-22 células) de ancho x 165-310 µm (16-21 células) de alto; corteza de una capa de células, las dorsales de 16-20 x 26-33 µm y algo mayores que las ventrales, pared celular muy oscura; médula externa de 1-3 capas de células con lumen muy pequeño de 3-4 x 6-10 µm y pared celular castaña rojiza a negra de 6-7 µm; médula interna de células irregulares de 13-17 x 19-27 µm, pared celular castaña clara.

Hojas imbricadas; cuando secas curvadas sobre el eje, cuando húmedas ampliamente extendidas. **Lobo** asimétricamente aovado, 1,6-2,1 mm long. x 0,8-1,2 mm lat.; algo cóncavo; base libre dorsal cordada a levemente auriculada, cubre totalmente el tallo; ápice acuminado; márgenes dorsal y ventral dentados, entre el ápice y el lóbulo el margen ventral puede ser un poco ondulado o estar incurvado. **Células** del lobo alargadas, pared celular con trígonos cordados y espesamientos intercelulares muy notorios; basales de 13-20 x 50-70 µm; centrales de 6-14 x 16-27 µm; marginales de 6-14 x 13-17 µm. **Lóbulo** aovado, 270-300 µm long. x 200-220 µm lat.; inflado; margen libre involuto; quilla recta a levemente arqueada de 340-400 µm, en su unión con el margen ventral del lobo forma un ángulo muy amplio. **Anfigastrios** imbricados; oblongos, 600-700 µm ancho x

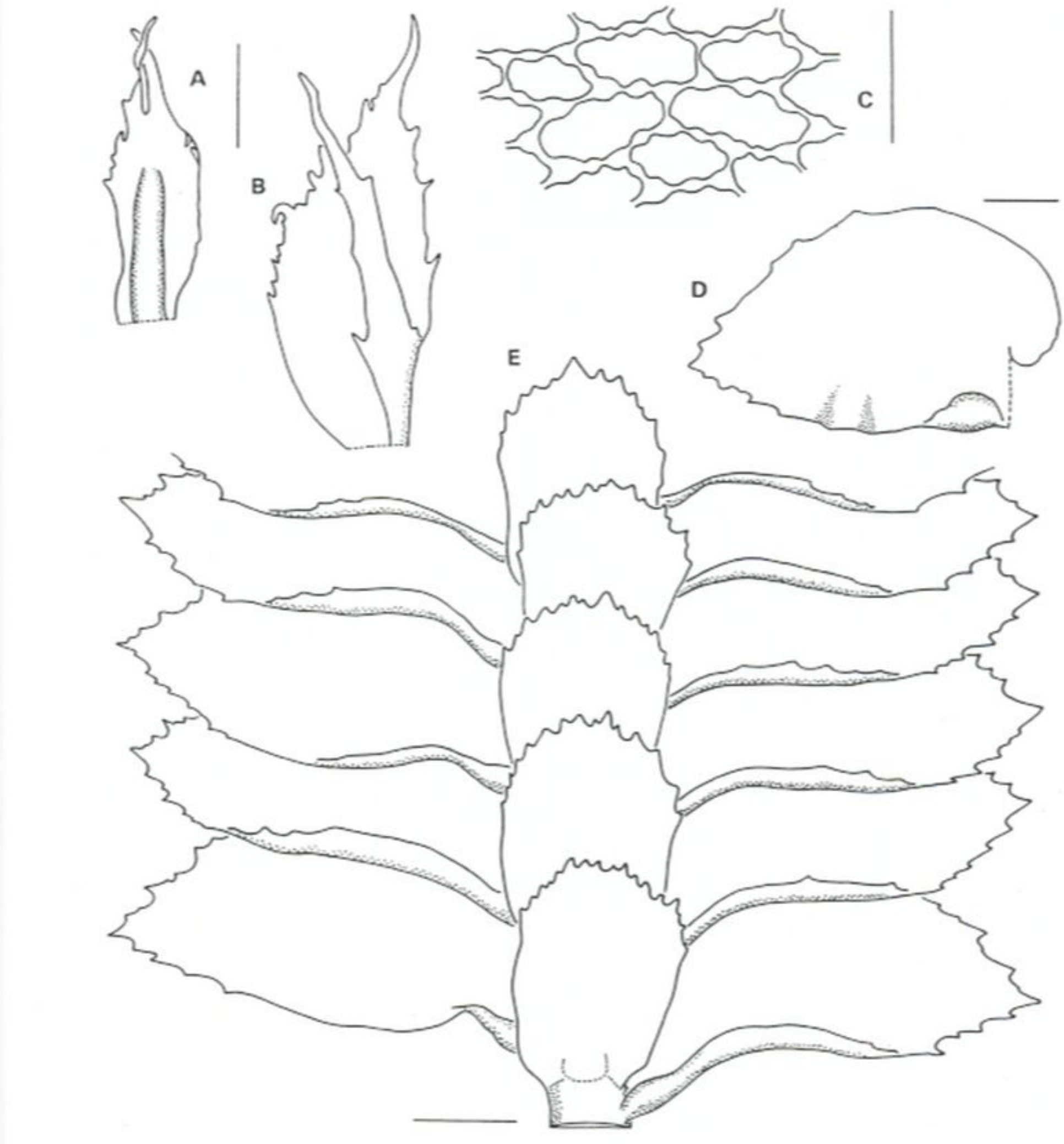

Fig. 6. A-E: ***Bryopteris filicina***. A, bractéola periquecial; B, bráctea periquecial; C, células centrales del lobo; D, lobo y lóbulo; E, aspecto general, vista ventral.(U.Drehwald 2171). Escalas: A, B, D, E = 400 µm; C = 25 µm.

880-950 µm alto, 2,3-2,4 x el ancho del tallo; ápice ampliamente redondeado a truncado, con dientes; márgenes laterales enteros; bases subcordadas, línea de inserción ± recta, por encima de ésta se encuentra una zona gibosa; rara vez con rizoides en la base.
Dioica. **Androecio** no visto. **Ginoecio** terminal sobre ramas cortas de tipo *Lejeunea*, sin innovación; 3-4 pares de brácteas. Lobo de la bráctea periquecial interna angostamente aovado, ápice acuminado, márgenes dentados. Lóbulo ± lanceolado, ápice acuminado, márgenes dentados. Bractéola oblonga, con una quilla elevada en el centro, 1/4 bífida con segmentos triangulares acuminados, márgenes dentados. No se encontraron periantios.

Habitat: pendiente de la corteza de árboles y sobre roca. Fue hallada entre 200 y 800 m s.n.m.
Observaciones: se encontraron solamente plantas femeninas con arquegonios no fecundados. El periantio es aovado y trígono (Stotler & Crandall-Stotler 1974: 89).
Ilustraciones: Stotler & Crandall-Stotler 1974 (fig. 94; 124-136); Evans 1907 (pl. 33 fig. 13-22).
Distribución geográfica: América tropical, Chile, *Argentina (Misiones).
Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Iguazú. Parque Nacional Iguazú, Cataratas, islote entre los rápidos, Eskuche & Fontana 2883-99, 23-VII-1982. Dpto. Gral. M. Belgrano. Bernardo de Irigoyen, U.Drehwald 2745, 15-XII-1987. Dpto. Guaraní. Salto Rosa Mística, U.Drehwald 2258, 25-VII-1987. Dpto. Ldor. Gral. San Martín. Salto Encantado, M.E.Reiner 1691, 12-IX-1987; U.Drehwald 2148, 2152, 2159, 2171 y 2173, 22-VII-1987.

11. ***Caudalejeunea lehmanniana*** (Gott.) Evans (Fig. 7 A-D)

Evans, Bull. Torrey Bot. Club 34: 554. 1907. *Lejeunea lehmanniana* Gott. in Gottsche, Lindenberg & Nees, Syn. Hep.: 325. 1845. Typus: Brasil, leg. Liebmann (G 024358, isotypus).

Plantas secas de herbario verde amarillentas; crecen adpresas sobre ramitas; 0,5-1 cm long. x 1,7-2,3 mm lat. Ramificación pinnada abundante, generalmente fértil; ramas de tipo *Lejeunea*, alcanzan el mismo tamaño que el eje principal. **Tallo** en sección transversal redondeado, 135-175 µm (7-8 células) de ancho x 140-160 µm (6-7 células) de alto; se diferencia una corteza de 11-12 células ± rectangulares de 23-27 x 26-40 µm y una médula de 20-22 células irregulares de 9-20 x 13-27 µm; pared celular amarillenta a castaña, ± gruesa y con trígonos.
Hojas imbricadas, oblicua- hasta ampliamente extendidas. **Lobo** aovado a oval, 0,9-1,3 mm long. x 0,5-0,8 mm lat.; plano; margen entero; ápice redondeado a obtuso; base dorsal libre redondeada, cubre el tallo totalmente o lo excede un poco. **Células** basales del lobo alargadas, 26-33 x 46-60 µm; células centrales poligonales, 19-24 x 26-40 µm; células marginales ± cuadradas, 13-17 x 16-20 µm; pared celular con trígonos y 1-2 espesamientos intercelulares muy notorios. **Lóbulo** ± rectangular, 310-450 µm long. x 160-200 µm lat.; inflado en toda su extensión; margen apical involuto; diente distal de 3-4 células de alto x 2 de ancho en la base, papila hialina en la base proximal del diente y en la cara interna del lóbulo; diente proximal corto, redondeado y en ocasiones muy reducido; quilla de 350-450 µm, recta a levemente arqueada; seno muy amplio. **Anfigastrios** continuos a imbricados; redondeados, 400-600 µm ancho x 420-540 µm alto, 2,8-3,4 x el ancho del tallo; ápice truncado a retuso; margen entero; inserción en forma de una corta U invertida, bases no decurrentes; con disco rizoidífero notorio, rizoides hialinos a castaños; merofito ventral de 4 células de ancho.
Autoica. Plantas usualmente fértiles. **Androecio** generalmente terminal en el eje principal, pero éste puede seguir creciendo en forma vegetativa y el androecio quedar intercalar. En la base de la inflorescencia masculina suelen encontrarse ramas femeninas. Androecio formado por 3-4 pares de brácteas perigoniales desigualmente bilobadas, imbricadas; lobo de las brácteas aovado, ápice obtuso; lóbulo inflado, ápice agudo a obtuso; quilla arqueada y continua con el lobo. Bractéolas en toda la extensión del androecio, redondeadas, ápice retuso. **Ginoecio** terminal en una rama corta de tipo *Lejeunea*, sin innovaciones. Las ramas

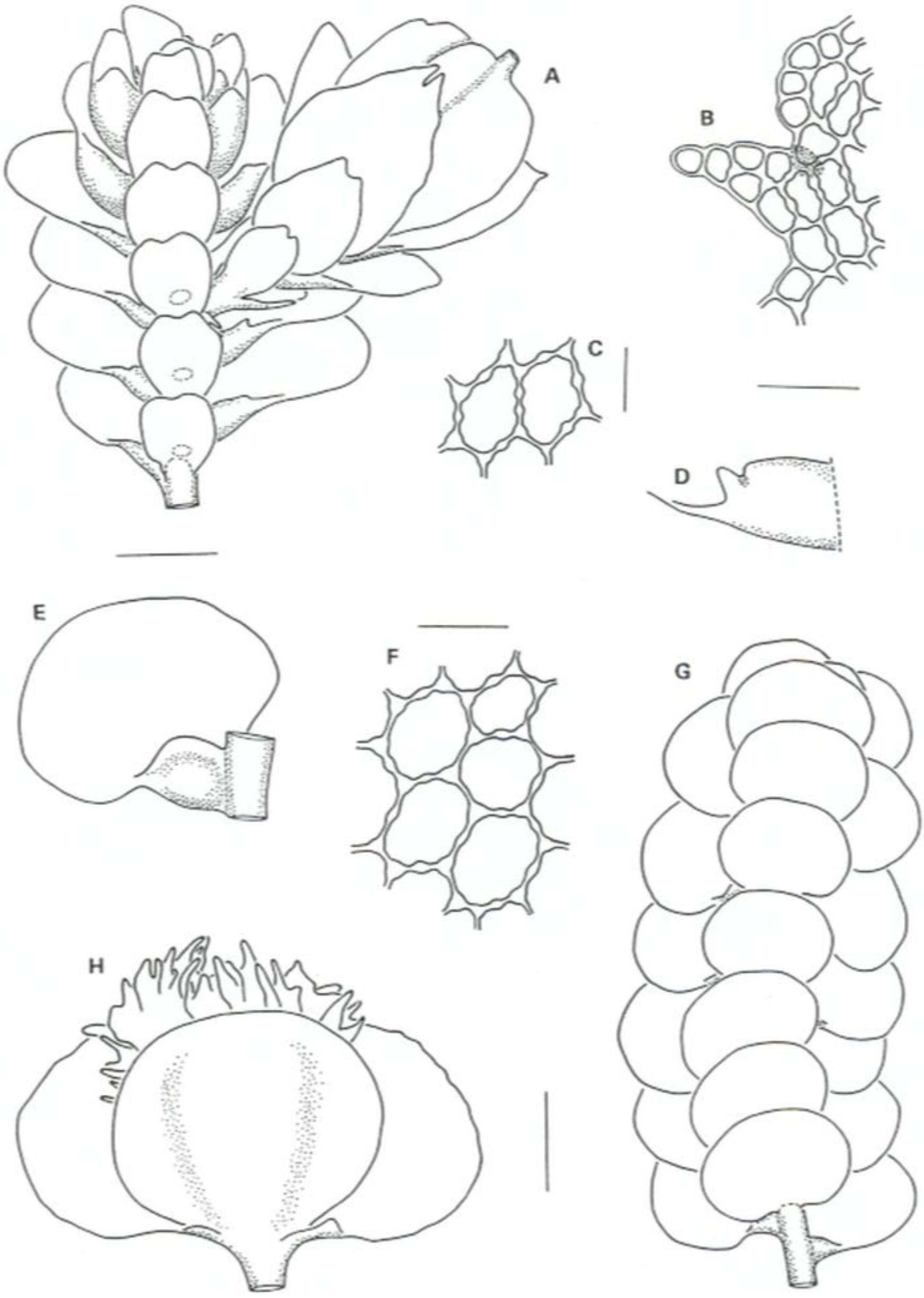

Fig. 7. A-D: ***Caudalejeunea lehmanniana***. A, aspecto general de una planta fértil, vista ventral; B, región apical del lóbulo en D; C, células centrales del lobo; D, lóbulo. (M.E.Reiner 1564). E-H: ***Lopholejeunea subfusca***. E, lobo y lóbulo; F, células centrales del lobo; G, aspecto general, vista ventral; H, periantio, brácteas y bractéola periqueciales, vista ventral. (U.Drehwald 440). Escalas: A, G, H = 400 µm; B = 50 µm; C, F = 25 µm; D, E = 200 µm.

femeninas presentan 2-4 pares de hojas que van variando gradualmente desde la forma vegetativa en la base hacia brácteas periqueciales por debajo del periantio. Lobo de las brácteas aovado, ápice agudo a extendido (1-2 células en una hilera); margen entero a suavemente dentado cerca del ápice. Lóbulo pequeño, algo inflado. Bractéola aovada, libre, margen entero a suavemente dentado, ápice bífido con segmentos cortos y seno agudo. **Periantio** cordado, 780-880 µm ancho x 980-1350 µm alto; 2 quillas laterales y 1 ventral, superficie dorsal lisa; margen entero o con pequeños dientes; rostro de 70-90 µm (3-4 células) de alto.

No se observó ningún tipo de reproducción asexual.

Habitat: crece sobre pequeñas ramitas. Fue hallada entre 200 y 300 m s.n.m.

Observaciones: En todas las muestras estudiadas el material es muy escaso.

De acuerdo a Schuster (1980: 781) esta especie posee reproducción asexual por medio de yemas discoidales originadas en la superficie dorsal de lobos jóvenes.

Ilustraciones: Evans 1907a (Pl. 33: 1-12); Schuster 1980 (Fig. 645: 6-9; 654: 1-14, 16; 655).

Distribución geográfica: U.S.A., Bahamas, América tropical, *Argentina (Misiones). Africa: Nigeria.

Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Iguazú. Parque Nacional Iguazú. Sendero Macuco, U.Drehwald A.10, 31-VII-1986. Dpto. Oberá. Oberá, Salto Berrondo, M.E.Reiner 1564 y 1571, U.Drehwald 2473, 8-IX-1987; U.Drehwald A.251, 21-I-1987.

12. ***Frullanoides densifolia*** Raddi ssp. ***densifolia***

(Fig. 8 A-D)

Raddi, Crittogame Brasiliane: 14 (1822 prep. repr.), Mem. Mat. Fis. Soc. Ital. Sci. Modena 19: 38. 1823. Typus: Brasil "Trovasi com'essa sugl'alberi negl'ombrosi boschi del Corcovado, Montagne prossima a Rio-janeiro", Raddi s.n.

Plantas secas verdosas a castaño oscuras a negras; 1,5-3,5 cm long. x 2,2-2,7 mm lat. Ramificación pinnada a bipinnada; ramas de tipo *Frullania* que pueden alcanzar el mismo tamaño que el eje principal; las plantas femeninas parecen dicotómicas por las dos innovaciones del ginoecio. **Tallo** en sección transversal redondeado, 180-260 µm (11-12 células) de ancho x 200-230 µm (9-12 células) de alto; corteza de 23-27 células, las células corticales dorsales algo mayores que las corticales ventrales; médula de 60-70 células de 13-20 x 16-33 µm; pared celular en la corteza castaña oscura y ± gruesa, entre las células medulares la pared es castaña clara.

Hojas imbricadas; ampliamente extendidas cuando húmedas y curvadas sobre el eje cuando secas. **Lobo** oval-falcado, 1,3-1,7 mm long. x 0,7-1,2 mm lat.; cóncavo; base dorsal libre redondeada, excede apenas el tallo; margen entero; ápice agudo hasta apiculado (a veces obtuso), generalmente incurvado; margen ventral entre el ápice y el lóbulo ± ondulado. **Células** del lobo alargadas, con trígonos cordados, pared celular castaña clara hasta muy oscura; células basales y centrales de 19-24 x 26-37 µm; marginales rectangulares a cuadradas, de 13-17 x 16-23 µm. Oleocuerpos numerosos: 8-27 x célula; elipsoidales y pequeños: 1,5-2 x 1,5-5 µm, lisos. **Lóbulo** aovado-triangular, 600-740 µm long. x 370-450 µm lat.; inflado a lo largo de la quilla; margen libre plano y adpreso al lobo; a lo largo del margen libre 4-8 dientes de 2-3 células de alto x 1-2 células en la base, curvados hacia el lobo; quilla de 600-820 µm, recta a suavemente arqueada. **Anfigastrios** imbricados; oblongo-cuadrados, 670-900 µm ancho x 670-810 µm alto; 3,5-4,2 x el ancho del tallo; inserción en forma de una U invertida, bases auriculadas y adpresas lateralmente al tallo; con rizoides castaño oscuros; ápice truncado y generalmente incurvado; márgenes ocasionalmente algo incurvados.

Dioica. **Androecio** intercalar o terminal en el eje o ramas, algo menor que las zonas vegetativas; 5-9 pares de brácteas perigoniales imbricadas; 2 anteridios por bráctea; lobo aovado, ápice apiculado incurvado; lóbulo redondeado, inflado en toda su extensión, quilla muy arqueada, margen apical libre redondeado con 4 dientes de 1 célula y poco definidos; bractéo-

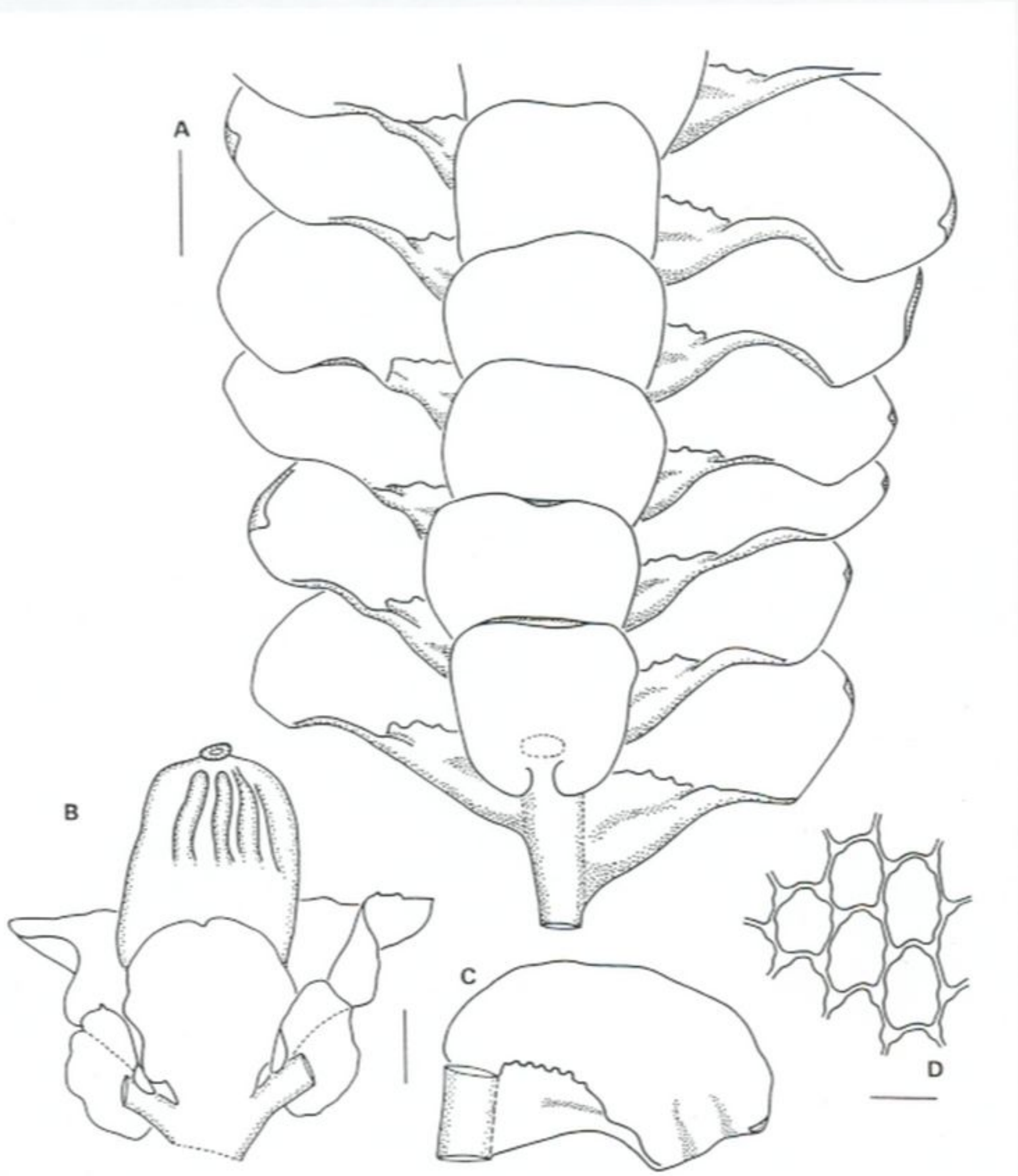

Fig. 8. A-D: ***Frullanoides densifolia*** ssp. ***densifolia***. A, aspecto general, vista ventral; B, periantio, brácteas y bractéola periqueciales, vista ventral; C, lobo y lóbulo; D, células centrales del lobo. (A, C, D: M.E.Reiner 1236; B: M.E.Reiner 1173). Escalas: A-C = 400 µm; D = 25 µm.

las en toda su extensión, imbricadas, similares a los anfigastrios. **Ginoecio** terminal en el eje, ramas o innovaciones; con 2 innovaciones que generalmente vuelven a ser fértiles; un par de brácteas periqueciales; lobo anchamente aovado, 1,7 mm long. x 1,4 mm lat.; ápice agudo, a veces con 2-3 dientes cortos (1-2 células de alto) en la región apical; lóbulo ± rectangular, 540-820 μm long. x 250-410 μm lat.; ápice redondeado a obtuso, ocasionalmente con un diente de 1-2 células de alto; quilla recta con un ala redondeada de 580-740 μm long. x 240-370 μm lat.; lóbulo y ala unidos por la base a la innovación; bractéola libre, obovada, 0,9-1,1 mm ancho x 1-1,2 mm alto, ápice truncado a retuso hasta levemente bífido. **Periantio** cuando maduro excede las brácteas; obovoide a cilíndrico, 0,86-1 mm ancho x 1,6-2,1 mm alto, parte inferior lisa, inflada por la cápsula, el 1/4 superior contraído, con 10-12 quillas cortas, redondeadas y lisas; rostro corto de 65 μm (6 células) de alto, la parte superior algo expandida.

No se observó ningun tipo de reproducción asexual.

Habitat: epífita sobre corteza de árboles o ramitas, una muestra fue hallada sobre tronco en descomposición (U.Drehwald A.327) y en Jujuy (M.E.Reiner 1273) fue hallada sobre roca.

En Misiones crece entre 500 y 800 m s.n.m. En Salta fue coleccionada entre 900 y 1100 m s.n.m. y en Jujuy hasta 1300 m s.n.m.

Observaciones: También pueden hallarse ocasionalmente ramas de tipo *Lejeunea*. El merofito ventral comprende 8-10(14) células de ancho. (van Slageren 1985: 92).

Ilustraciones: van Slageren 1985 (pl. XVIII-XXI).

Distribución geográfica: América tropical, Chile, Argentina (*Jujuy; Salta: Jack & Stephani 1896, van Slageren 1985; *Misiones).

Material estudiado: ARGENTINA.Prov. Jujuy: Dpto. El Carmen. sobre ruta 9, Abra de Sta. Laura, M.E.Reiner 1267, 17-XI-1986, M.E.Reiner 1273, 21-XI-1986. Dpto. Capital. camino entre Mina 9 de Octubre y ruta 56, M.E.Reiner 1321, 1323, 1324, 1325 y 1326, U.Drehwald s/n, 22-XI-1986. 30 km S Mina 9 de Octubre, U.Drehwald S 185, 188, 190 y 192, 22-XI-1986. Prov. Salta: ``In der Flussaue am Río Seco zwischen Orán und San Andrés, leg. Lorentz s/n, 17-IX-1873" (G 20088). Dpto. Anta. Parque Nacional El Rey, alrededores de la hostería, M.E.Reiner 1173, 1177 y 1178, U.Drehwald S 14 y S 16, 14-XI-1986; camino entre el río La Sala y Pozo Verde, M.E.Reiner 1185 y 1208, U.Drehwald S 33, S 34, S 35 y S 52, 15-XI-1986; Sendero Sta. Elena, M.E.Reiner 1227, 16-XI-1986. Dpto. La Caldera. sobre ruta 9, Abra de la Sierra, M.E.Reiner 1236, 17-XI-1986; sobre ruta 9 entre Salta y Jujuy, Abra de Sta. Laura, U.Drehwald S 95, 17-XI-1986. Prov. Misiones: Dpto. Gral. M. Belgrano. ruta 14 entre el empalme con ruta 17 y Macaca, U.Drehwald 2507, 10-IX-1987; San Antonio, bosque cerca de la pista de aterrizaje, U.Drehwald A.288, U.Drehwald 2664, 12-XII-1987, U.Drehwald 2702 y 2703, U.Drehwald A.303, 305 y 311, 14-XII-1987; bosque ± 6 km S Bernardo de Irigoyen, U.Drehwald 2717, 15-XII-1987; Bernardo de Irigoyen, Salto Andrecito, U.Drehwald 2762, U.Drehwald A.327, 16-XII-1987. Dpto. San Pedro. ruta 14, ± 5 km E San Pedro, M.E.Reiner 1676, U.Drehwald 2586 y 2591, U.Drehwald A.B 6, 11-IX-1987. Dpto. Cainguas. Dos de Mayo, ruta 14. U.Drehwald s/n.

13. ***Lopholejeunea subfusca*** (Nees) Schiffn. (Fig. 7 E-H)

Schiffner, Bot. Jahrb. Syst. 23: 593. 1897. *Jungermannia subfusca* Nees, Enum. Pl. Crypt. Jav.: 36. 1830. Typus: Java. Blume, s.n. & s.d.

Plantas secas verdosas, pardas a negruzcas, brillantes; crecen formando tapices densos, muy planos y adheridos al sustrato; 0,5-1 cm long. x 1-1,2 mm lat.; irregularmente pinnadas, ramas de tipo *Lejeunea* generalmente fértiles; suelen encontrarse ramas microfilas, en las cuales el lóbulo alcanza la mitad del tamaño del lobo. **Tallo** en sección transversal 90-115 μm (6 células) de ancho x 80-85 μm (6 células) de alto; corteza de 12 células rectangulares de 13-17 x 23-30 μm; médula de 12-16 células irregulares de 9-17 x 15-23 μm; pared celular ±

gruesa, uniforme.
Hojas imbricadas, ampliamente extendidas. **Lobo** aovado, falcado, 450-600 μm long. x 400-540 μm lat.; plano; ápice ampliamente redondeado; márgenes enteros; base libre dorsal redondeada, cubre el tallo o lo excede un poco. **Células** basales del lobo alargadas, 16-20 x 26-30 μm; centrales ± isodiamétricas, 13-24 x 19-27 μm; pared celular con trígonos pequeños a medianos, 0-1 espesamiento intercelular oval; células marginales cuadradas a rectangulares de 6-10 x 9-14 μm. **Lóbulo** aovado, 130-200 μm long. x 80-150 μm lat.; región basal fuertemente inflada; margen libre cerca del tallo involuto, hacia el ápice plano y adpreso al lobo; diente apical de 1 célula, poco definido, papila hialina en la base del mismo y en la cara interna del lóbulo; quilla suavemente arqueada. Ocasionalmente reducido, aovado-rectangular, quilla ± recta, margen libre plano. **Anfigastrios** continuos a levemente imbricados; reniformes, 500-610 μm ancho x 350-450 μm alto; 5-5,6 x el ancho del tallo; márgenes enteros; inserción recta a levemente arqueada; merofito ventral 4 células de ancho.
Autoica. Androecio terminal en ramas o intercalar en el eje principal o en ramas; 2-6 pares de brácteas perigoniales desigualmente bilobadas, infladas, imbricadas, quilla fuertemente arqueada, ápice del lobo y lóbulo redondeado; bractéolas en toda la extensión del androecio, imbricadas, similares a los anfigastrios. **Ginoecio** terminal en el eje principal o en ramas; sin innovaciones; un par de brácteas periqueciales, ampliamente extendidas; lobo aovado, 0,7-1 mm long. x 0,6-0,9 mm lat.; plano; ápice ampliamente redondeado; márgenes enteros a levemente dentados, dientes de 1-3 células de alto; lóbulo reducido a un pequeño pliegue ± rectangular; bractéola reniforme, 0,9-1 mm ancho x 0,7-0,9 mm alto; márgenes enteros; libre hasta la base. **Periantio** obcordado, 650-750 μm ancho x 900-1100 μm alto; cubierto por la bractéola o la excede apenas; 2 quillas laterales, 2 quillas ventrales, en vista dorsal plano a levemente cóncavo; las quillas, y ocasionalmente la superficie entre éstas, con lacinias simples o ramificadas, muy abundantes y grandes; en vista dorsal el periantio es liso o puede presentar una corta quilla (hasta 200 μm) con lacinias; rostro corto (2-4 células, 15-30 μm de alto) y poco notorio entre las lacinias.

Habitat: epífita sobre corteza de árbol; forma matas densas y planas sobre el sustrato. Fue hallada en una sola oportunidad a ± 200 m s.n.m.
Ilustraciones: Schuster 1980 (fig. 650); Thiers & Gradstein 1989 (fig. 15); Vanden Berghen 1984 (fig. 22-23).
Distribución geográfica: especie pantropical; crece en regiones tropicales y subtropicales de América, Africa, Asia, Australia y del Pacífico. *Argentina (Misiones).
Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Iguazú. Parque Nacional Iguazú, Cataratas, Circuito Inferior, U.Drehwald 440, 6-VIII-1986.

14. ***Marchesinia brachiata*** (Sw.) Schiffn.
(Fig. 9 A-C)

Schiffner, in Engler & Prantl, Nat. Pflanzenfam. 1,3: 128. 1893. *Jungermannia brachiata* Sw., Nova Gen. Spec. Pl. Prodr.: 144. 1788. Typus: Jamaica, leg. Swartz.

Plantas secas verdosas a castañas brillantes; 1,5-2 cm long. x 1,8-2,5 mm lat.; irregularmente pinnadas, ramas de tipo *Lejeunea*, escasas; hojas extendidas o algo enroscadas sobre sí mismas, no sobre el eje. **Tallo** en sección transversal redondeado, 150-190 μm (7-8 células) de ancho x 130-150 μm (7 células) de alto; células corticales algo mayores o iguales a las medulares; corteza de 14-17 células (sin diferencia entre dorsales y ventrales) de 16-27 x 23-33 μm; médula de 25-30 células irregulares de 13-23 x 16-30 μm; pared celular entre las células medulares de 3-4 μm, algo más gruesa que entre las corticales, castaña clara a oscura.
Hojas imbricadas a continuas; ampliamente extendidas. **Lobo** aovado, 1-1,2 mm long. x 0,7-1 mm lat.; cóncavo; base libre dorsal ampliamente redondeada, cubre 3/4 el tallo o lo excede un poco; ápice apiculado, región apical con unos pocos dientes ± notorios. **Células** del lobo isodiamétricas a ± alargadas en la base y centro, y cuadradas en el margen; pared celular

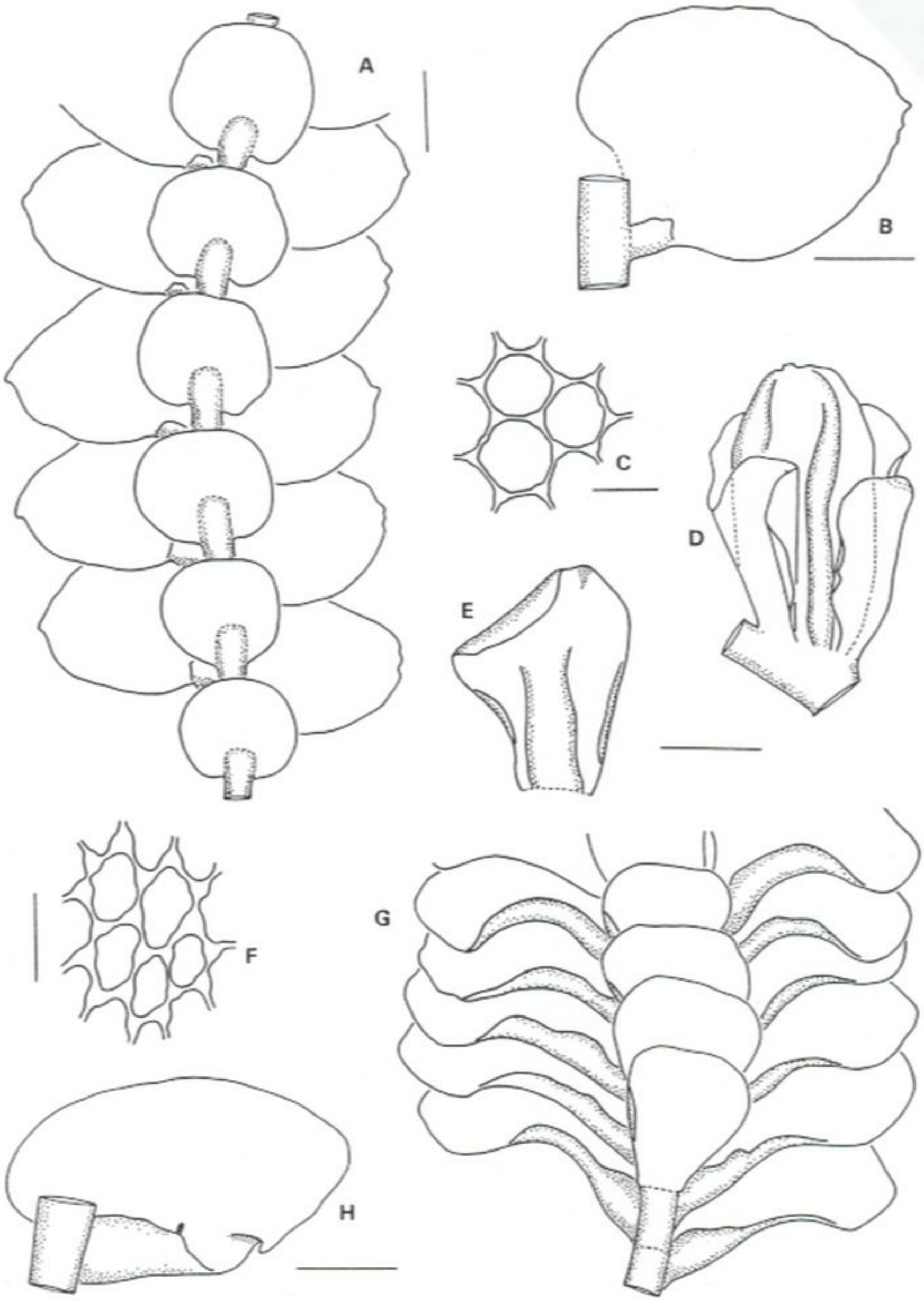

Fig. 9. A-C: ***Marchesinia brachiata***. A, aspecto general, vista ventral; B, lobo y lóbulo; C, células centrales del lobo. (M.E.Reiner 1145). D-H: ***Mastigolejeunea auriculata***. D, periantio con brácteas periqueciales, vista ventral; E, bractéola periquecial; F, células centrales del lobo; G, aspecto general, vista ventral; H, lobo y lóbulo. (U.Drehwald 2235). Escalas: A = 500 µm; B, D, E, G, H = 400 µm; C, F = 25 µm.

delgada con trígonos pequeños y 0-1 espesamiento intercelular, castaña clara a oscura. Células basales de 23-33 x 33-43 µm, centrales de 19-27 x 23-40 µm, marginales de 13-17 x 16-20 µm. **Lóbulo** aovado a rectangular, 160-270 µm long. x95-150 µm lat.; inflado; margen libre recto y plano; quilla recta o arqueada; con 2(3) dientes, diente proximal de 1-2 células, a veces curvado hacia el lobo; diente distal de 1-2(3) células de alto x 1(2) de ancho en la base; papila hialina 1-2 células por debajo del diente distal, en la cara interna del lóbulo. **Anfigastrios** continuos a distantes; redondeados a reniformes, 0,5-0,9 mm ancho x 0,5-0,7 mm alto; 3,4-4,6 x el ancho del tallo; ápice redondeado a truncado; márgenes enteros; inserción en forma de una profunda U invertida; merofito ventral de 8 células.

Plantas estériles.

No se observó ningún tipo de reproducción asexual.

Habitat: sobre roca; ± 200 m s.n.m.

Observaciones: La descripción de *M. brachiata* en Evans 1907a: 546, corresponde a plantas mayores a las halladas en Misiones.

Ilustraciones: Evans 1907a (pl. 32).

Distribución geográfica: América tropical, *Argentina (Misiones).

Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Iguazú. Parque Nacional Iguazú, Cataratas, paseos inferiores, camino embarcadero a Isla San Martín, M.E.Reiner 883, 25-VII-1986. Dpto. Ldor. Gral. San Martín. Gruta India, Salto 3 de Mayo, M.E.Reiner 1145, 9-VIII-1986.

15. ***Mastigolejeunea auriculata*** (Wils.) Schiffn. (Fig. 9 D-H)

Schiffner, in Engler & Prantl, Nat. Pflanzenfam. 1,3: 129. 1893. *Jungermannia auriculata* Wils., in Wilson & Hooker, Drummond Musci Amer. (Exsicc.) n. 170. 1841. Typus: U.S.A. Louisiana: New Orleans, Drummond s.n., Musci Amer. Exsic. n° 170.

Plantas secas generalmente muy oscuras, pardas a castañas o verde amarronadas; 1,2-2,2 cm long. x 1,6-2,4 mm lat. Ramificación pinnada; ramas de tipo *Lejeunea*. **Tallo** en sección transversal redondeado, 150-220 µm (12 células) de ancho x 215 µm (11 células) de alto; no se diferencian corteza y médula; capa externa de 28 células de 23-27 x 26-33 µm, células internas irregulares de 16-20 x 16-30 µm; pared celular ± gruesa, castaña clara hasta muy oscura.

Hojas imbricadas; cuando secas curvadas sobre el eje, cuando húmedas oblicuamente extendidas y subescuarrosas. **Lobo** aovado-oval, 1000-1250 µm long. x 700-880 µm lat.; cóncavo; ápice redondeado, obtuso a subagudo; margen entero, lado ventral repando y continuo con la quilla; base dorsal libre redondeada, cubre el tallo o lo excede un poco. **Células** del lobo alargadas, basales de 10-17 x 24-33 µm; centrales de 10-15 x 14-24 µm; marginales rectangulares a cuadradas, de 7-9 x 9-15 µm; pared celular gruesa con trígonos con 2 lados convexos y 1 lado cóncavo, en ocasiones confluentes; entre las células basales puede haber espesamientos intercelulares. **Lóbulo** sub-rectangular a triangular-aovado, 360-480 µm long. x 200-270 µm lat.; inflado principalmente a lo largo de la quilla; margen apical ± sinuado, irregular, adpreso al lobo; diente apical amplio y redondeado, papila hialina proximal; quilla de 420-520 µm, recta a levemente arqueada en la base. **Anfigastrios** imbricados; redondeados a obdeltoides, 700-950 µm ancho x 615-950 µm alto; zona central gibosa, sin rizoides; margen lateral generalmente incurvado; ápice irregular, truncado y ocasionalmente algo retuso; inserción ± recta, bases algo cuneadas; merofito ventral de 5-7 células de ancho.

Autoica o dioica. **Androecio** en el eje o ramas; generalmente intercalar porque el eje continúa creciendo en forma vegetativa. 5-7 pares de brácteas perigoniales desigualmente bilobadas, menores que los lobos vegetativos y la quilla más arqueada que en éstos. Brácteolas en toda la extensión del androecio, de igual forma pero un poco menores que los anfigastrios. **Ginoecio** terminal en el eje principal, en ramas o en innovaciones; con 1-2 innovaciones que pueden volver a ser fértiles. Lobo de las brácteas periqueciales aovado, 1000-1220 µm long. x 570-620 µm lat.; margen entero, algo sinuado; ápice redondeado. Lóbulo oblongo-rectangu-

lar, 740-820 µm long. x 270-380 µm lat.; ápice ampliamente redondeado; margen libre algo sinuado y ondulado a recto. Bractéola libre; obovada, 615-700 µm ancho x 900-1050 µm alto; ápice truncado. **Periantio** emerge 1/3 de las brácteas; oblongo, 570-780 µm ancho x 1050-1450 µm alto; en corte transversal trígono, 1 quilla ventral elevada, superficie dorsal lisa; rostro corto, 35 µm (4 células) de alto.
No se observó ningun tipo de reproducción asexual.

Habitat: epífita sobre corteza de árboles. Entre 200 y 250 m s.n.m.
Ilustraciones: Evans 1902 (pl. 17: 10-19); Schuster 1980 (Fig. 645: 9-10; 646-647).
Distribución geográfica: especie pantropical. *Argentina (Misiones).
Material estudiado: PARAGUAY. Dpto. Caaguazú. sobre ruta 7, a 30 km E Cnel. Oviedo, Parque Guayaqui, M.E.Reiner 1443, 1450 y 1453, U.Drehwald 2346, 2352 y 2359, 3-IX-1987. ARGENTINA. Prov. Misiones. Dpto. Iguazú. Parque Nacional Iguazú, Cataratas, Circuito Superior, M.E.Reiner 780, 21-VII-1986. Parque Nacional Iguazú, Circuito Inferior, M.E.Reiner 1068, U.Drehwald 440, 6-VIII-1986. Parque Nacional Iguazú, Sendero Macuco, M.E.Reiner 781, U.Drehwald 303, 22-VII-1986; U.Drehwald 385 y 390, 28-VII-1986. Parque Nacional Iguazú, Puerto Canoas, U.Drehwald A.31, 1-VIII-1986. Parque Nacional Iguazú, sobre ruta 101, picada frente a la Seccional Yacuiba, U.Drehwald A.52, 3-VIII-1986. Dpto. Montecarlo. Arroyo cerca del ACA Montecarlo, sobre el Paraná, U.Drehwald 268, 21-VII-1986. Dpto. Ldor. Gral. San Martín. Gruta India, Salto 3 de Mayo, U.Drehwald 497, 9-VIII-1986. Dpto. San Ignacio. Jardín América, Salto del Tabay, U.Drehwald 2037, 20-VII-1987; U.Drehwald 2234 y 2235, 25-VII-1986. San Ignacio, U.Drehwald A.106, 1-X-1986. Arroyo Yabebiry, U.Drehwald A.66, 28-IX-1986; U.Drehwald A.157, 5-X-1986. Dpto. Candelaria. Loreto, U.Drehwald 663, 2-X-1986.

16. ***Odontolejeunea lunulata*** (Web.) Schiffn. (Fig. 10 A-D)

Schiffner, in Engler & Prantl, Nat. Pflanzenfam. 1,3: 128. 1893. *Jungermannia lunulata* Weber, Hist. Musc. Hep. Prodr. : 33. 1815. Typus: "E regionibus tropicis in foliis Musae cuiusdam", Sprengel s.n.

Plantas epifilas; crecen adpresas al sustrato y adheridas al mismo por discos rizoidíferos secundarios; cuando secas verdosas a amarillentas; hojas convolutas ventralmente; 1-1,7 cm long. x 2-2,7 mm lat.; irregularmente pinnadas a bipinnadas, ramas de tipo *Lejeunea*. **Tallo** en sección transversal oval, 120-150 µm (10 células) de ancho x 100-110 µm (9 células) de alto; corteza de 11 células rectangulares de 13-17 x 26-40 µm, pared celular ± delgada; médula de 45 células irregulares de 9-10 x 9-17 µm, pared celular uniformemente mediana a gruesa.
Hojas imbricadas, ampliamente extendidas cuando húmedas. **Lobo** asimétricamente aovado, 1,4-1,5 mm long. x 0,8-1,1 mm lat.; base libre dorsal suavemente redondeada, cubre el tallo; márgenes dentados, margen superior plano, el margen ventral incurvado; ápice obtuso. **Células** centrales del lobo alargadas a isodiamétricas, 19-23 x 26-30 µm, pared celular delgada con trígonos y (0)-1 espesamiento intercelular; células marginales cuadradas, de 13-20 x 16-20 µm. **Lóbulo** oval, 570-580 µm long. x 350-370 µm lat.; inflado; margen superior libre redondeado, plano, con (2)-3 dientes ± equidistantes, dientes de 1-2-(3) células de alto sobre una base de 2 células, dientes rectos o curvados hacia el lobo; 3 células por debajo del diente distal, en la cara interna del lóbulo, se encuentra la papila hialina; quilla arqueada. **Anfigastrios** distantes; redondeados, 400-570 µm ancho x 390-500 µm alto, 3,3-4,3 x el ancho del tallo; márgenes enteros a dentados, con 5-16 dientes formados por una pequeña célula cónica; ápice a veces incurvado; se encuentran unidos al tallo por un grupo de células alargadas; inserción en forma de una U invertida, bases decurrentes; con discos rizoidíferos de los cuales nacen numerosos rizoides que generalmente forman un disco rizoidífero secundario; merofito ventral de 2 células.
Autoica. Androecio terminal en ramas con o sin hojas vegetativas en la base; 1,2-1,7 mm long. x 0,4-0,5 mm lat.; 6-10 pares de brácteas imbrica-

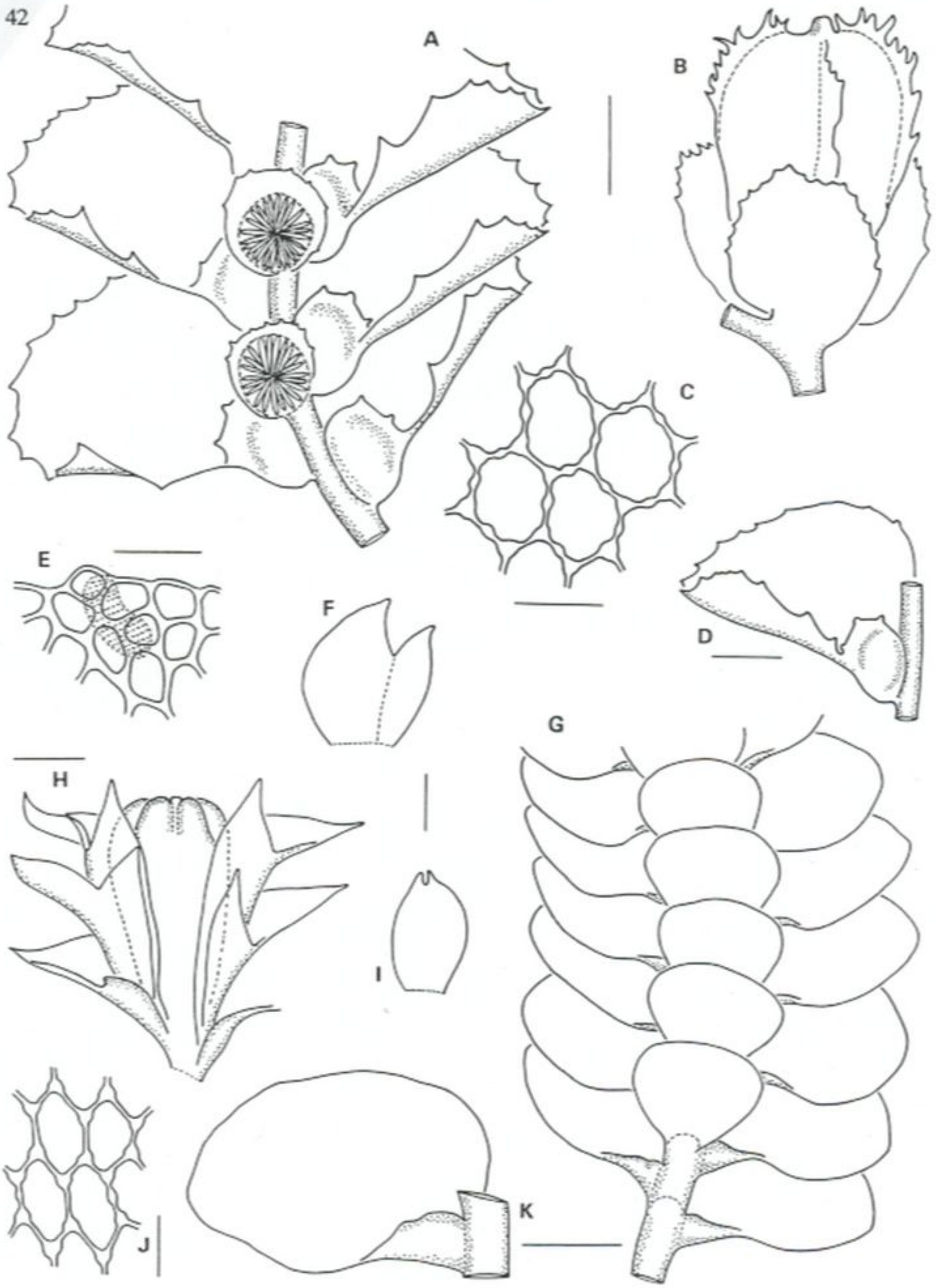

Fig. 10. A-D: ***Odontolejeunea lunulata***. A, aspecto general, vista ventral; B, periantio, brácteas y bractéola periqueciales, vista ventral; C, células centrales del lobo; D, lobo y lóbulo. (U.Drehwald s/n, Salto Encantado). E-K: ***Schiffneriolejeunea polycarpa***. E, región apical del lóbulo; F, bráctea periquecial; G, aspecto general, vista ventral; H, periantio con brácteas periqueciales, vista ventral; I, bractéola periquecial; J, células centrales del lobo; K, lobo y lóbulo. (U.Drehwald 2684). Escalas: A, B, D, G, H, K = 400 µm; C, E, J = 25 µm; F, I = 500 µm.

das, desigualmente bilobadas, infladas; bractéolas en toda la extensión de la espiga, redondeadas, márgenes enteros. **Ginoecio** terminal en el eje principal, ramas o en innovaciones; 1-2 innovaciones que pueden volver a ser fértiles; el primer elemento de la innovación es un anfigastrio; un par de brácteas periqueciales, lobo aovado, plano, 600-700 µm long. x 480-520 µm lat., márgenes dentados; lóbulo generalmente reducido, nulo hasta un pequeño rectángulo de 80-150 µm long. x 30-50 µm lat.; bractéola redondeada a oval, gibosa, 510-650 µm ancho x 580-680 µm alto, márgenes con 11-21 dientes formados por una pequeña célula cónica. **Periantio** obcordado, 670-770 µm ancho x 900-1300 µm alto; cuando maduro excede ½ las brácteas; trígono, 2 quillas laterales y una quilla ventral ± obtusa, en vista dorsal cóncavo; quillas laterales con un ala de 1-3 células de ancho desde el rostro hasta 2/3 de su longitud, alas con dientes de 2-3 células de ancho en la base hasta 4 células de alto; quilla ventral con o sin ala, ocasionalmente con algunos dientes; rostro de 40-70 µm (4 células) de alto.

Reproducción asexual: ocasionalmente se encuentran ramas modificadas: cladodas, éstas poseen 3-5 pares de hojas, el par inferior dirigido hacia la base de la rama, el ápice de las primeras hojas es agudo, márgenes con numerosos dientes, lóbulo reducido; hacia el ápice de la rama las hojas van tomando las características típicas de las plantas normales.

Habitat: epifila sobre hojas de *Actinostemon concolor* (Spr.) Müll. Arg. Pueden llegar a cubrir casi totalmente las hojas sobre las cuales crecen.

Crece entre 0-3000 m s.n.m. (Teeuwen 1989). En Misiones fue hallada en una sola oportunidad en Salto Encantado.

Observaciones: generalmente se encuentran plantas femeninas con numerosos periantios; algunas plantas son autoicas.

Ilustraciones: Teeuwen 1989 (pl. 2-3).

Distribución geográfica: América tropical, *Argentina (Misiones). Africa tropical, Madagascar.

Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Ldor. Gral. San Martín. Salto Encantado, U.Drehwald s.n., 22-VII-1987.

17. ***Schiffneriolejeunea polycarpa*** (Nees) Gradst. (Fig. 10 E-K)

Gradstein, J. Hattori Bot. Lab. 38: 335. 1974. *Jungermannia polycarpa* Nees in Martius, Fl. Brasil. 1,1: 350. 1833. Typus: Brasil. "in Minis Generalibus ad arborum cortices" leg. Martius.

Plantas secas verde oliváceas; 0,6-1,5 cm long. x 1,5-2,4 mm lat. Ramificación pinnada a bipinnada (tripinnada); ramas en su mayoría de tipo *Lejeunea*, se encuentran algunas de tipo *Frullania*; las ramas pueden llegar a alcanzar el mismo tamaño que el eje; ramas fértiles suelen elevarse sobre el plano del tallo cuando se humedecen. **Tallo** en sección transversal redondeado, 130-180 µm (7-10 células) de ancho x 125-150 µm (6-9 células) de alto; corteza de 16-18 células, médula de 20-35 células; células irregulares de 10-20 x 16-27 µm, las células corticales dorsales pueden ser algo mayores que las medulares; pared celular castaña clara a oscura en la corteza.

Hojas imbricadas; ampliamente extendidas cuando húmedas, curvadas sobre el eje cuando secas. **Lobo** aovado-oval, 0,8-1,3 mm long. x 0,6-0,9 mm lat.; algo cóncavo; base dorsal libre ampliamente redondeada, cubre ½ tallo o lo sobrepasa apenas; margen entero; ápice obtuso a redondeado. **Células** del lobo alargadas, pared celular castaña clara con trígonos cordados: dos lados convexos y un lado cóncavo, entre las células centrales puede haber espesamientos intercelulares; basales de 13-20 x 33-37 µm; centrales de 13-17 x 23-33 µm; marginales rectangulares a cuadradas, de 9-14 x 9-17 µm. **Lóbulo** aovado a triangular, 200-350 µm long. x 140-230 µm lat., inflado; quilla de 250-400 µm, recta a suavemente arqueada, en su unión con el lobo forma un ángulo muy amplio; margen apical recto a redondeado en su unión con el tallo; diente apical de 1 célula, poco definido, papila hialina proximal en la base del diente y del lado interno del lóbulo; línea entre el diente y el margen ventral libre del lobo oblicua. **Anfigastrios** continuos a imbricados; reniformes a obdeltoides, 460-750 µm ancho x 390-520

µm alto; 3,4-5,5 x el ancho del tallo; ápice truncado; inserción en forma de una corta U invertida, bases apenas decurrentes; rizoides en la base; merofito ventral de 6 células.
Autoica. Androecio terminal a intercalar sobre ramas; 6-17 pares de brácteas perigoniales imbricadas; lobo aovado, ápice redondeado; lóbulo inflado, quilla muy arqueada, ápice agudo; 2 anteridios por bráctea; bractéolas en toda la extensión del androecio, algo más cuadradas que los anfigastrios. **Ginoecio** terminal en el eje principal o ramas de 1°-2° orden, sin innovaciones. Por debajo del periantio se encuentran 3-4 pares de hojas que varían gradualmente desde la forma vegetativa hacia las brácteas. Lobo de la bráctea aovado, 1,3 mm long. x 0,6 mm lat., margen entero, ápice agudo hasta acuminado y extendido lateralmente. Lóbulo rómbico, 1 mm long. x 0,3 mm lat., ápice agudo, quilla ± recta no alada. Bractéola ovalada, 1 mm alto x 0,6 mm ancho, bífida en el extremo superior. **Periantio** piriforme, igual de alto o excedido algo por las brácteas, de 615-660 µm ancho x 900-1200 µm alto, 5 quillas cortas (1/5 de la long. del periantio), redondeadas y lisas: 2 ventrales, 2 laterales y 1 dorsal; rostro corto y algo hundido. No se observó ningún tipo de reproducción asexual.

Habitat: epífita sobre corteza de árboles, generalmente sobre *Araucaria angustifolia* (Bert.) O. Ktze. Fue hallada entre 500 y 800 m s.n.m.
Ilustraciones: Evans 1908 (pl. 7: 1-11, como *Ptychocoleus polycarpus*); Jones 1990 (fig. 4 a-d).
Distribución geográfica: pantropical, *Argentina (Misiones).
Material estudiado: ARGENTINA. Prov. Misiones: Dpto. Gral. M. Belgrano. San Antonio, bosque cerca de la pista de aterrizaje, U.Drehwald 2662 y 2666, 11-XII-1987; U.Drehwald A.284, 285, 287, 292 y 294, 12-XII-1987; U.Drehwald 2684 y 2695, 13-XII-1987; U.Drehwald A.317, 16-XII-1987. Dpto. San Pedro. ruta 14, ± 5 km E San Pedro, U.Drehwald 2584, 11-IX-1987.

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