

Additions to the catalogue of Hepaticae and Anthocerotae of Colombia

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Abstract – Nine species of Hepaticae and one of Anthocerotae are reported for the first time from Colombia, based on recent collections. Notes on geographical distribution are provided, as well as a description and illustration of the perianth of *Aphanolejeunea longifolia* Jovet-Ast. The diagnostic characters of critical new reports are also illustrated.

Hepaticae / Anthocerotae / Liverworts / New Reports / Colombia

Resumen – Nueve especies de hepáticas y una de Anthocerotales son registradas por primera vez para Colombia. Se aporta información sobre su distribución geográfica. Se describe e ilustra el perianto de *Aphanolejeunea longifolia* Jovet-Ast. Los caracteres diagnósticos de los registros más importantes son ilustrados. Las adiciones provienen de colecciones recientes.

Hepáticas / Antocerotófitos / Nuevos registros / Colombia

INTRODUCTION

The Colombian liverwort flora is a very rich one. About 60% of all tropical American species and almost one sixth of the world's liverworts occur in Colombia. Since the publication of the Catalogue of Hepaticae and Anthocerotae of Colombia (Uribe & Gradstein, 1998) several additional species of liverworts have been reported for Colombia: *Harpalejeunea grandis* Grolle & Reiner (Grolle & Reiner-Drehwald, 1999); *Kymatocalyx rhizomatica* (Herzog) Gradst. & Vaña (Gradstein & Vaña, 1999); *Symphyogyna podophylla* (Thunb.) Mont. & Nees (Uribe, 1999); *Plagiochila patriciae* Heinrichs & H. Anton (Heinrichs, 2002); *Ceratolejeunea dussiana* (Lindenb.) Schiffn., *Drepanolejeunea palmifolia* (Nees) Steph., *Frullania kunzei* (Lehm. & Lindenb.) Lehm. & Lindenb., *Lejeunea boryana* Mont., *Metalejeunea cucullata* (Reinw. et al.) Grolle, *Pictolejeunea sprucei* Grolle, *Xylolejeunea crenata* (Spruce) Schiffn. and *Pteropsiella serrulata* Spruce ex Steph. (Pinzón et al., 2003); *Bromeliophila helenae* Gradst. (Benavides & Callejas,

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2004), *Cololejeunea surinamensis* Tixier, and *D. polyrhiza* (Nees) Grolle (Benavides, 2004).

The following list provides a short description of diagnostic characters, information on the geographical distribution and a brief statement of substrate and habitat for each of the nine additional species reported here for the first time from Colombia. All specimens are kept in COL.

RESULTS

LOPHOCOLEACEAE

Lophocolea martiana subsp. *bidentula* (Nees) Gradst. Fig. 1

Distribution: Santander, San José de Suaita, forests at la Meseta, 1800-2000 m, Uribe 3896, 3913 (COL). General distribution: tropical America.

Discussion: Plants with entire leaf margins or with a short tooth on the upper margin; leaf apex undivided or emarginate, a blunt tooth sometimes occurring at one corner. *Lophocolea martiana* subsp. *bidentula* differs from *L. aberrans* Lindenb. & Gottsche by its mostly 3 mm broad leafy stems, and the faintly verruculose vs. papillose cuticle in *L. aberrans* (Fulford, 1976; Gradstein & Costa, 2003). *Lophocolea* is usually filed within Geocalycaceae. However, Hentschel *et al.* (2006) reinstated Lophocoleaceae as a result of phylogenetic analyses of *rbcL* sequences, with Geocalycaceae and Lophocoleaceae in separate lineages.

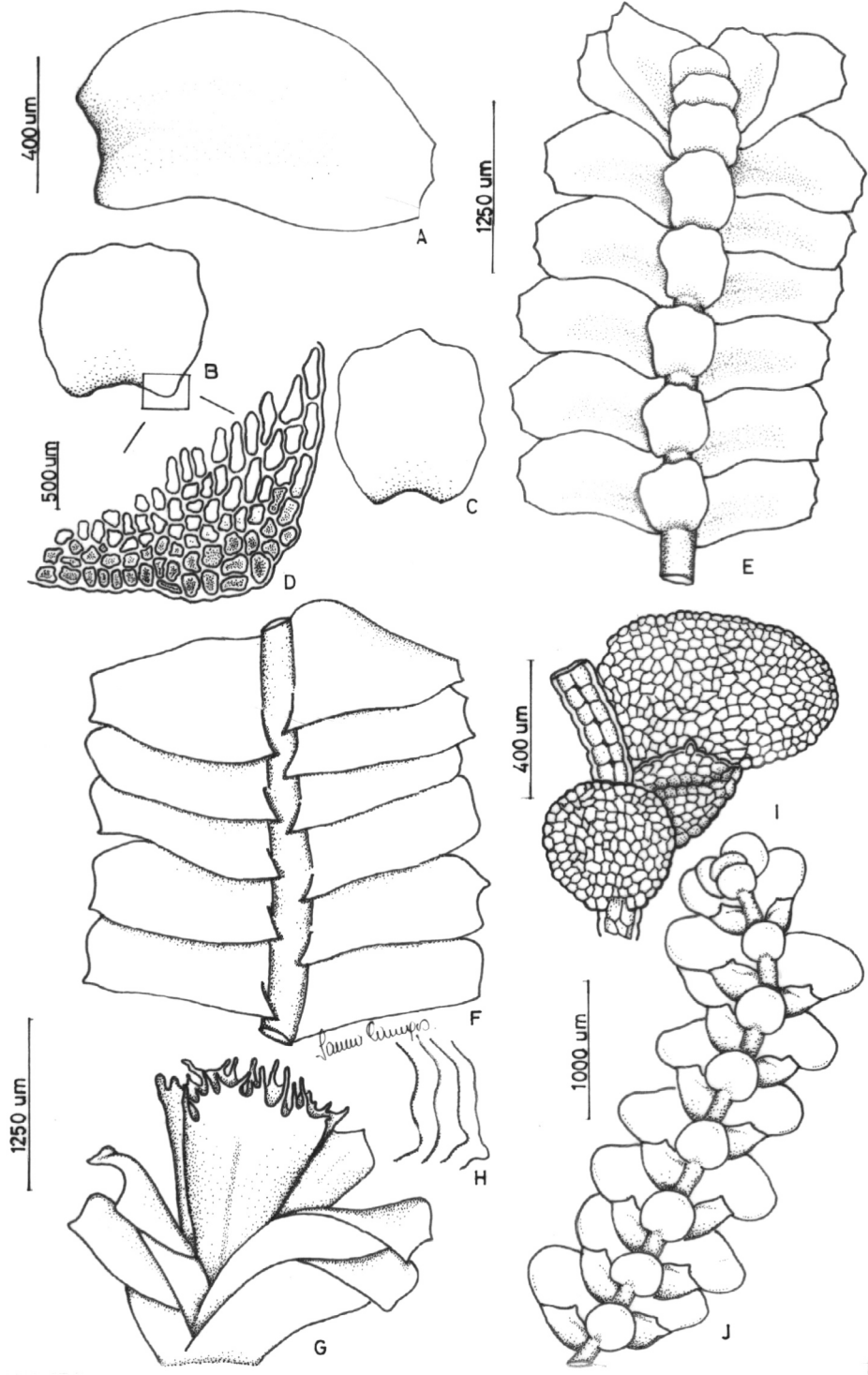
FRULLANIACEAE

Frullania confertiloba Steph. Fig. 2

Distribution: Santander, Km 18 on the road to Tona, between las Golondrinas and El Brasil, 1675-1715 m, Uribe 4278, 4280 (COL). General distribution: tropical America.

Discussion: This species is characterized by its broadly obovate to orbicular foliose, up to 3 mm long stylus. Its can be distinguished from *F. riojaneirensis* (Raddi) Aongstr. and *F. bogotensis* Steph. because they have a filiform stylus, less than 1 mm long. Yuzawa (1991) reported as type of this species a specimen of Micholitz, supposedly collected in Colombia, Santander, Saujil (= San Gil). Nevertheless, Uribe & Gradstein (1998) excluded this species because according to Sayre (1975) Micholitz collected in the Philippines and Indonesia, not in Colombia. *Frullania* has often been included in Jubulaceae, however, molecular data show that Jubulaceae and Frullaniaceae form separate lineages, with Jubulaceae (*Jubula*, *Nipponolejeunea*) placed sister to Lejeuneaceae (Heinrichs *et al.*, 2005).

Fig. 1. *Bazzania heterostipa* (Steph.) Fulford: **A.** Leaf. **B-C.** Underleaves. **D.** Basal portion of underleaf showing chlorophyllose cells. **E.** Part of shoot, ventral view. – *Lophocolea martiana* subsp. *bidentula* (Nees) Gradst.: **F.** Part of shoot, dorsal view. **G.** Perianth. **H.** Leaf apices. – *Orizolejeunea saccatiloba* (Steph.) Gradst.: **I.** Leaf and underleaf, showing two cells ventral merophyte. **J.** Part of shoot, ventral view.



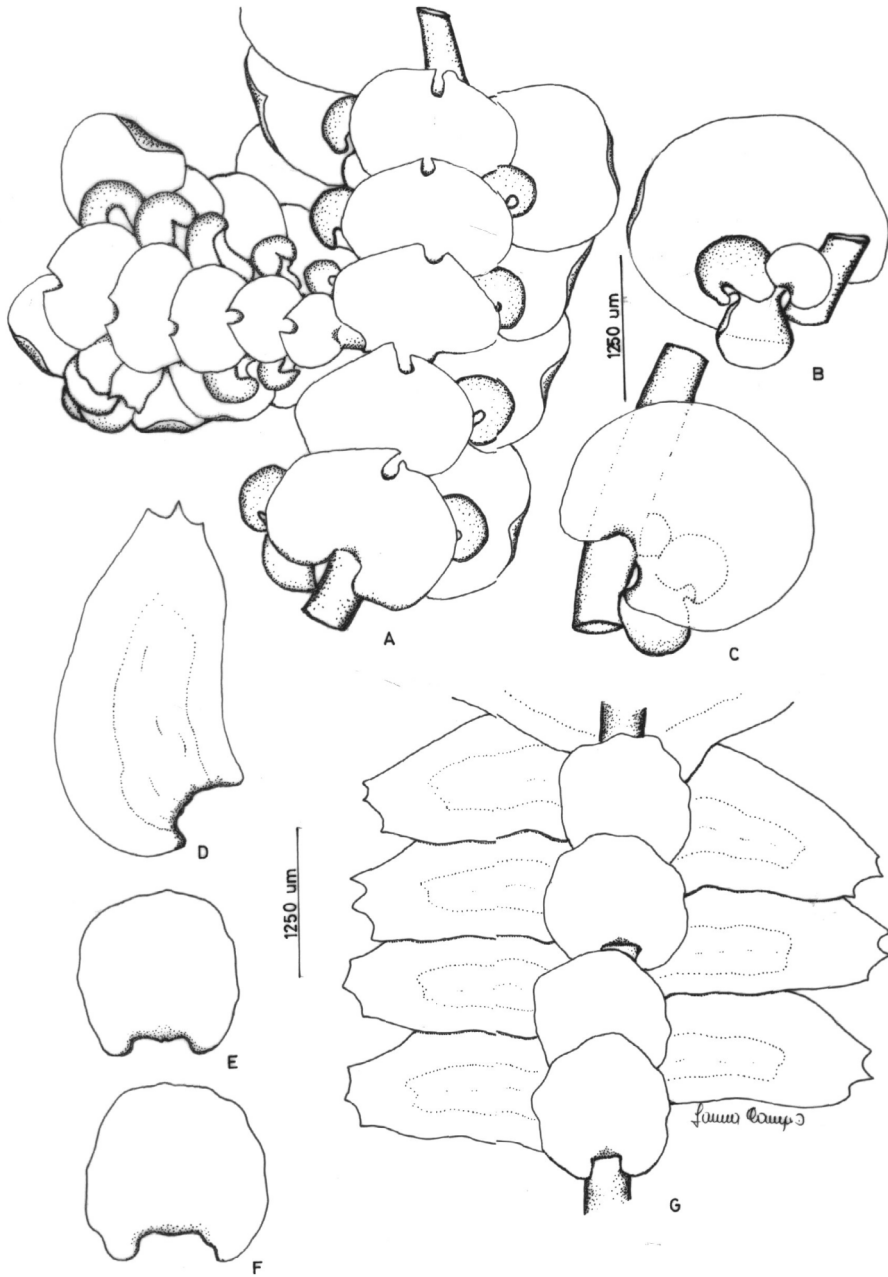


Fig. 2. *Frullania confertiflora* Steph.: **A.** Portion of stem with lateral branch, ventral view. **B.** Stem-leaf, ventral view. **C.** Stem leaf, dorsal view, showing insertion line; – *Bazzania spruceana* Steph.: **D.** Leaf. **E-F.** Underleaves. **G.** Part of shoot, ventral view.

LEPIDOZIACEAE***Bazzania heterostipa*** (Steph.) Fulford

Fig. 1

Distribution: Santander, San José de Suaita, forests at la Meseta, 1700-2000 m, *Uribe* 3783, 3804, 3807, 3809, 3814, 3828, 3929 (COL). General distribution: reported only from Brazil.

Discussion: This species has predominantly 3-toothed leaves with a conspicuous vitta, one or two cells long leaf teeth, and in the lower part chlorophyllose underleaves. It can be distinguished from *B. nitida* (Weber) Grolle by its approximate to imbricate underleaves, which are undivided or divided into 2-4 obtuse lobes; in *B. nitida* the underleaves are distant and divided into 4 slender, acute, often spreading teeth (Fulford, 1963).

Bazzania spruceana Steph.

Fig. 2

Distribution: Santander, San José de Suaita, forests at la Meseta, 1700-1800 m, *Uribe*, 3760, 3789, 3793, 3795 (COL). – Boyacá, Santa María, vereda Caño Negro, road from finca Santa Rosita to cuchilla Palo Negro, 2650-2910 m, *Uribe* 4119 (COL). General distribution: reported from Perú and Brazil.

Discussion: According to Fulford (1963) this species is characterized by its mostly tridentate, ascendent leaves with a conspicuous vitta, and subquadrate to ovate, chlorophyllose underleaves [hyaline in *B. tayloriana* (Mitten) Fulford]. The lateral margins and the apex of the underleaves of *B. spruceana* are variously lobed (apex 2-4 lobed and lateral margin entire in *B. tayloriana*).

LEJEUNEACEAE***Aphanolejeunea ephemeroides*** R. M. Schust.

Fig. 4

Distribution: Santander, Tona, km 18 on the road to Tona, between Golondrinas and El Brasil, 1675-1715 m, *Uribe* 4236 (COL). General distribution: North America: (Florida), Central America: Costa Rica and Cuba.

Discussion: The leaves of this species are more or less papillose and have dentate margins. The leaves at the base of the plants are reduced, (4-) 6-8 cells long and 3-5 cells wide. *Aphanolejeunea ephemeroides* has a lobule covering to 3/4 leaf lamina, whereas *A. gracilis* Jovet-Ast, has a lobule covering more than 3/4 leaf lamina (Lücking, 1995; Schuster, 1980).

Aphanolejeunea longifolia Jovet-Ast

Fig. 4

Distribution: Santander, Tona, km 18 on the road to Tona, between Golondrinas and El Brasil, 1675-1715 m, *Uribe* 4252, 4268 (COL). General distribution: Central America (El Salvador, Costa Rica and Guadeloupe).

Discussion: This species has entire leaf margins, a lobule with a one celled apical tooth, and leaves appressed to the substrate. In *Aphanolejeunea costaricensis* A.Lücking the margins are crenulate to dentate. In addition *A. longifolia* has a lobule that is 1/3 as long as the lobe and only 1/2 as wide as the lobe whereas *A. costaricensis* has a lobule that is as wide as the leaf lobe (Lücking, 1995). Clavate-obovoid, 5-keeled (keels crenulated) smooth, 830 × 430 µm large perianths are found in lateral positions on short branches.

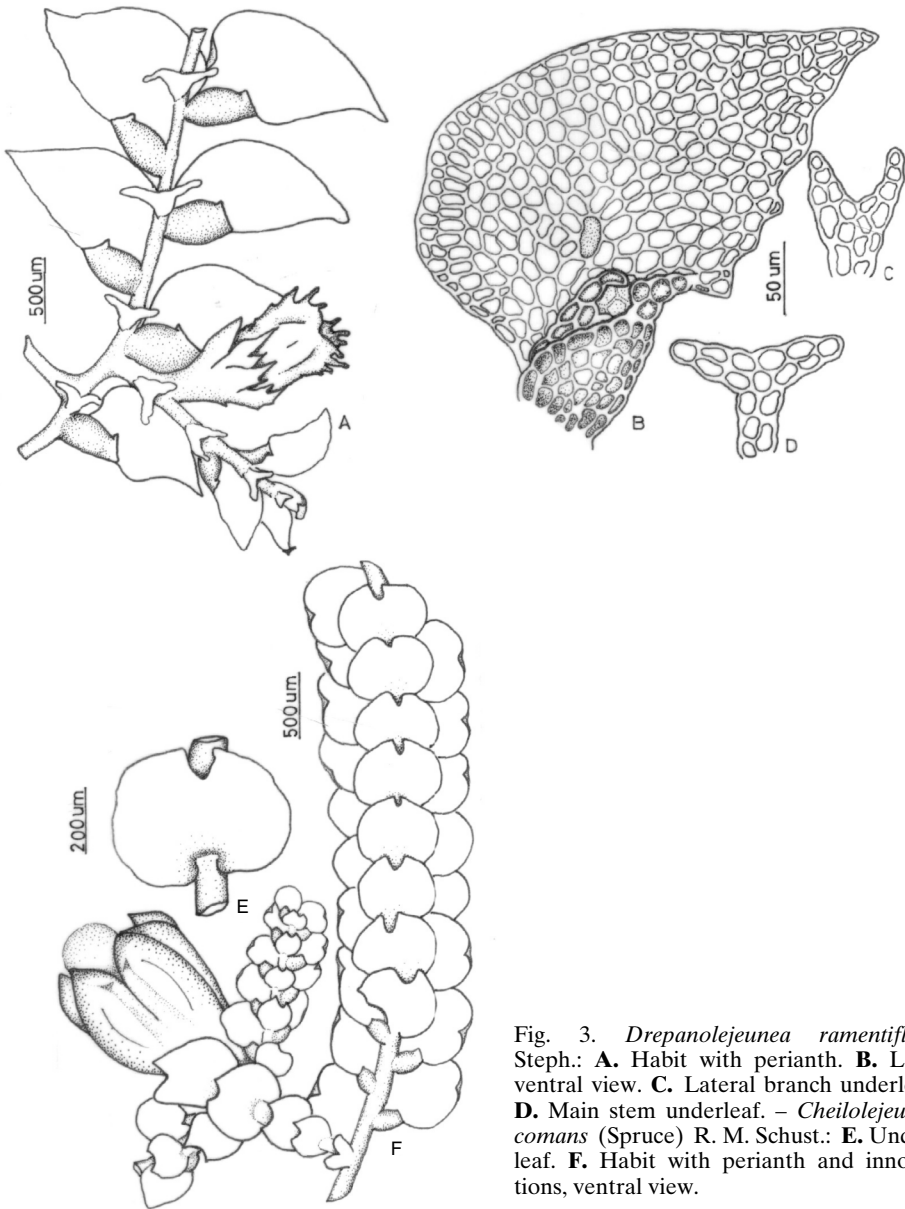


Fig. 3. *Drepanolejeunea ramentiflora* Steph.: **A.** Habit with perianth. **B.** Leaf, ventral view. **C.** Lateral branch underleaf. **D.** Main stem underleaf. – *Cheilolejeunea comans* (Spruce) R. M. Schust.: **E.** Underleaf. **F.** Habit with perianth and innovations, ventral view.

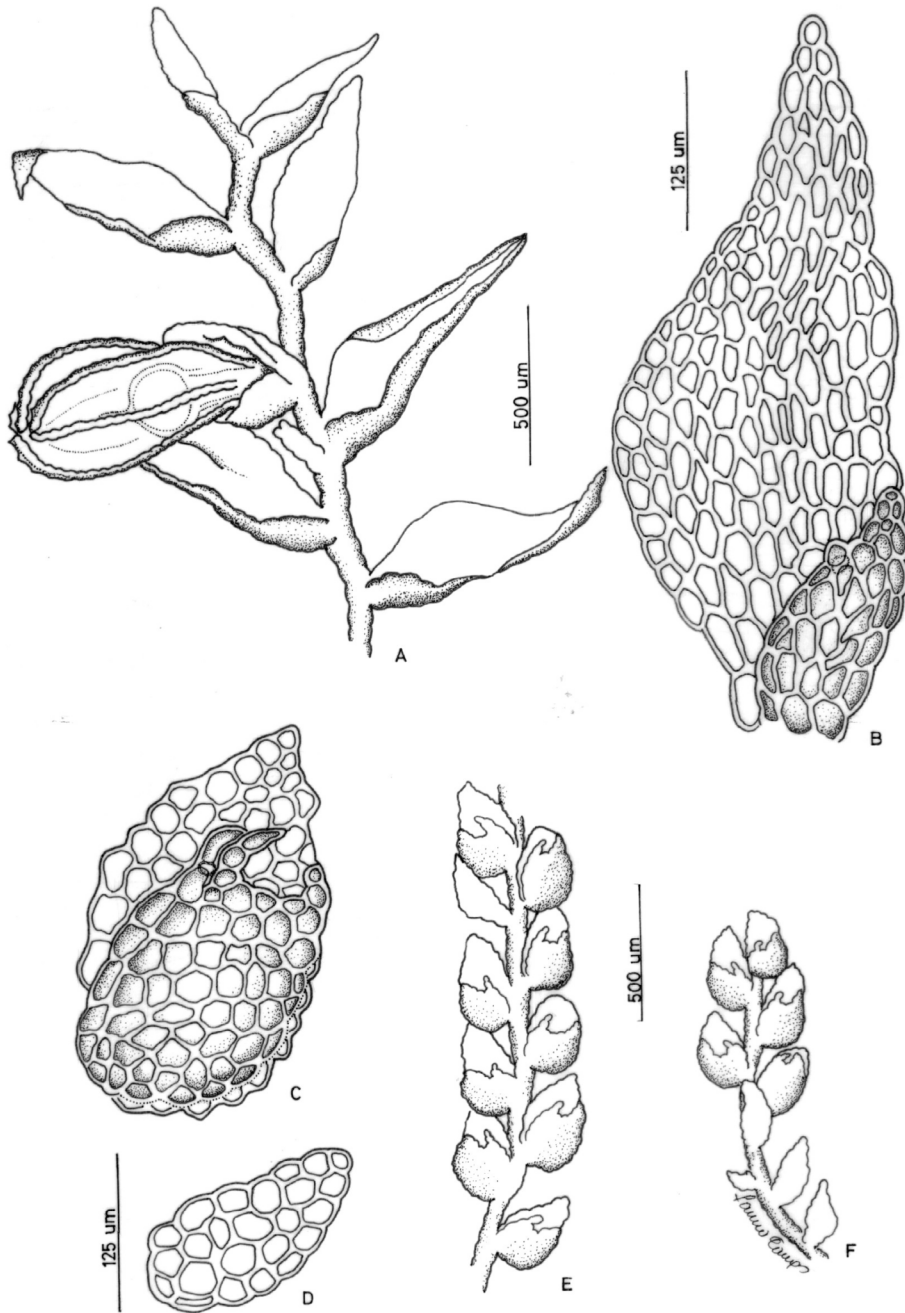


Fig. 4. *Aphanolejeunea longifolia* Jovet-Ast: **A.** Habit with perianth. **B.** Leaf, ventral view. – *Aphanolejeunea ephemeroides* R. M. Schust.: **C.** Leaf, ventral view, showing lobule and tooth. **D.** Reduced leaf. **E.** Stem, ventral view. **F.** Portion of stem showing reduced leaves at the basal part.

Cheilolejeunea comans (Spruce) R. M. Schust.

Fig. 3

Distribution: Santander, Km 18 on the road to Tona, between Golondrinas and El Brasil, 1675-1715 m, *Uribe 4284, 4275* (COL). – Santander, Floridablanca, road from Bucaramanga to Cúcuta, 1620 and 1871 m, *Uribe 4315* (COL). General distribution: tropical South America: Venezuela, Bolivia, Argentina and Brazil.

Discussion: This species can be distinguished from *Cheilolejeunea oncophylla* (Aongstr.) Grolle & M.E.Reiner by its larger underleaves, which are 3-4.5 (*C. oncophylla*, 1.5-3) times wider than the stem. The underleaves have acute segments and rounded-auriculate bases, and lack papillose leaf cells (Reiner-Drehwald, 1998; Gradstein & Costa, 2003).

Drepanolejeunea ramentiflora Steph.

Fig. 3

Distribution: Boyacá, Santa María, vereda Caño Negro, road from finca Santa Rosita to cuchilla Palo Negro, 1700-1800 m, *Uribe 4163* (COL). General distribution: Known only from the type locality in Costa Rica.

Discussion: *Drepanolejeunea ramentiflora* has leaves forming an angle from 60° to 75° with the stem. Unlike *D. biocellata* A.Evans, *D. ramentiflora* has plane leaves, smooth keels, underleaves 5 times as wide as the stem, and perianth keels with long horn-like projections (Bischler, 1964).

Lejeunea monimiae (Steph.) Steph.

Fig. 5

Distribution: Boyacá, Santa María, vereda Caño Negro, road from finca Santa Rosita to cuchilla Palo Negro, 1700-1800 m, *Uribe 4166* (COL). General distribution: reported from Brazil and northern Argentina.

Discussion: The plants have thin-walled leaf cells and a more or less rectangular lobe. Unlike *L. geophila* Spruce, *L. monimiae* has underleaves 2-3 times wider than the stem; in *L. geophila* these are only twice as wide as the stem. Furthermore perianths are pyriform, and 0.5-0.7 mm long vs. 0.8-1.1 mm in *L. geophila* (Reiner-Drehwald, 2000, Gradstein & Costa, 2003).

Lejeunea raddiana Lindenb.

Fig. 5

Distribution: Huila, Acevedo, Macizo Colombiano, basin river Suaza. PNN Cueva de los Güacharos, El Pesebre, 2100 m, *Castillo 2131k* (COL). – Boyacá, Santa María, vereda Caño Negro, road to finca Santa Rosita to cuchilla Palo Negro, 700 - 1800 m, *Uribe 4139* (COL). General distribution: reported from Brazil and Bolivia.

Discussion: This species has contiguous (not imbricate) underleaves, with segment tips of 1-2 cells. *Lejeunea raddiana* can be distinguished from *L. bermudiana* (A. Evans) R.M.Schust., by the absence of a subapical tooth at the leaf apex and the sharply elongated perianth wing cells (Gradstein & Costa, 2001).

Orizolejeunea saccatiloba (Steph.) Gradst.

Fig. 1

Distribution: Santander, Suaita, San José de Suaita, forests at la Meseta, 1700-1800 m, *Uribe 3746A* (COL). General distribution: Tropical America.

Discussion: The species is characterized by large, truncate lobules with a short, blunt apex and distal hyaline papilla and small, undivided underleaves. The stems have a hyalodermis and a 2 cells wide ventral merophyte (Gradstein & Costa, 2003). This species differs from the two other species in the genus by its undivided underleaves (Lücking, 1995).

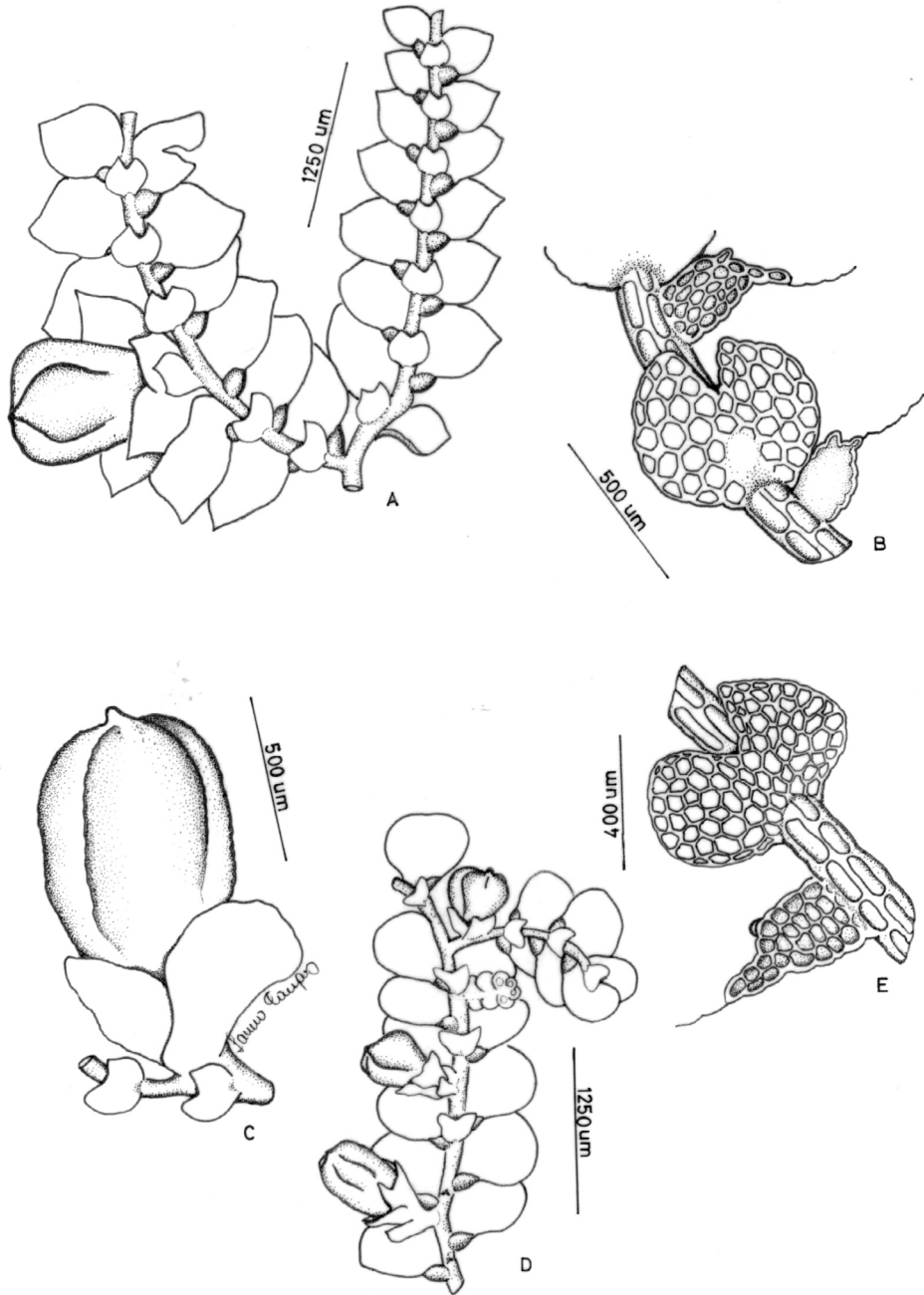


Fig. 5. *Lejeunea raddiana* Lindenb.: **A.** Habit with perianth. **B.** Portion of stem with underleaf and lobules. **C.** Perianth, ventral view. – *Lejeunea monimiae* (Steph.) Steph.: **D.** Habit, with female and male branch, ventral view. **E.** Portion of stem with underleaf and lobule.

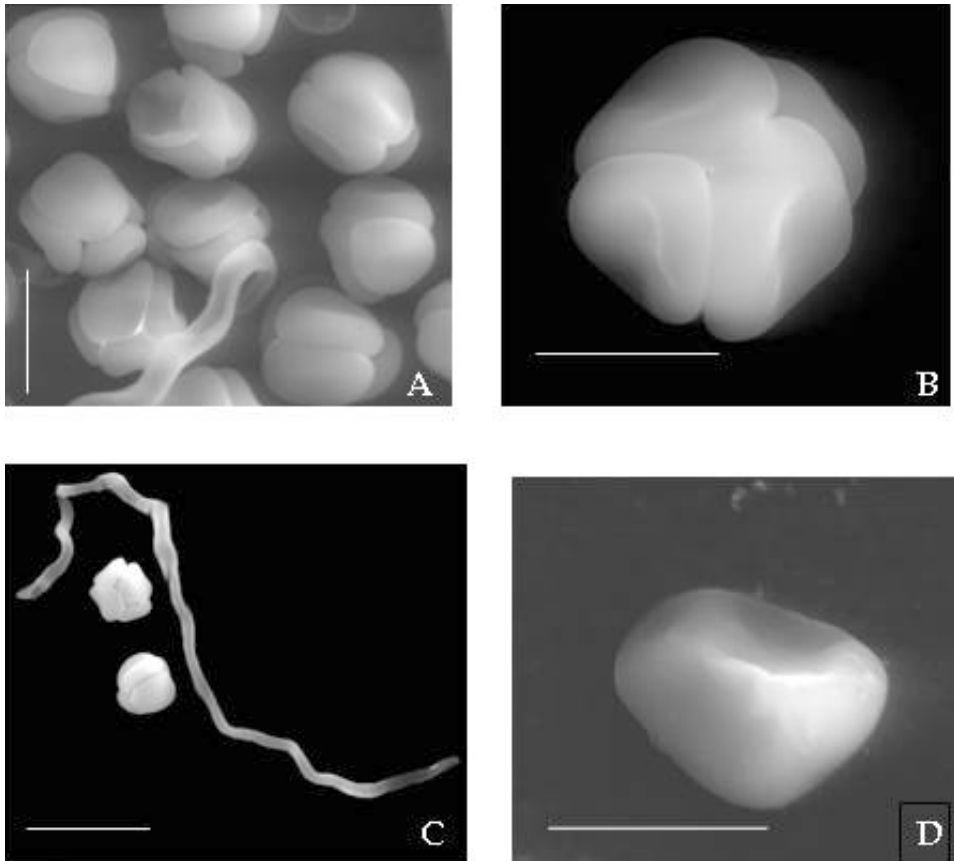


Fig. 6. *Leiosporoceros dussii* (Steph.) Hässel.: **A.** Spore tetrads and pseudoelater, scale 20 μ m. **B.** Spore tetrad, polar view, scale 20 μ m. **C.** Spore tetrads and pseudoelater, scale = 60 μ m. **D.** Proximal spore surface, scale 20 μ m.

ANTHOCEROTALES - LEIOSPOROCEROTACEAE

Leiosporoceros dussii (Steph.) Hässel

Fig. 6

Distribution: Tolima department, alt. 2600 m; Ibagué, Juntas, finca El Silencio, *L. V. Campos 180, 204, 205* (COL). General distribution: Recorded from Mexico, West Indies (Jamaica, Guadeloupe, Martinique), Panamá and Ecuador (Dauphin *et al.*, 2006).

Discussion: The genus *Leiosporoceros* is characterized by its small spores (19–22 μ m), which are ovoid or kidney-shaped, smooth and yellow, and originate from a tetragonal bilateral altemo-opposite tetrad, unlike the other Anthocerotales, which usually have isodiametric tetrahedral tetrads; except *Hattorioceros* (J. Haseg.) J. Haseg. (Hasegawa, 1988). The pseudoelaters are long, orange, smooth, unevenly thickened and without helicoidal thickening bands. The

placement of *Leiosporoceros* among Anthocerotales has been highly inconsistent in published classifications. Hässel de Menéndez (1986, 1988) segregated *Leiosporoceros* into an autonomous family and order. In contrast, Hasegawa (1988) and Schuster (1992) argued for its placement as a subgenus of *Phaeoceros*. More recently, Duff *et al.* (2004) presented a molecular phylogenetic analysis based on nucleotide sequence data from the plastid *rbcL* gene, whose results supported the proposal of Hässel de Menéndez (1986, 1988) to consider the genus *Leiosporoceros* isolated from other Anthocerotales. Recently, first Stotler & Crandall Stotler (2005) and then Frey & Stech (2005) elevated the monotypic genus *Leiosporoceros* to the new class Leiosporocerotopsida. The position of *Leiosporoceros* deserves more research (Villarreal, pers. comm.)

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