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Liverworts of Alagoas State, Brazil

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RESUMO – (Hepáticas do Estado de Alagoas, Brasil). No presente trabalho, são compiladas as espécies de hepáticas ocorrentes no Estado de Alagoas, resultantes de informações disponíveis em catálogos e trabalhos anteriores e do inventário inédito de uma importante unidade de conservação do Nordeste, a Estação Ecológica (EsEc) Murici (9º11'05" - 9º16'48"S; 35º45'20" - 35º55'12"O). São referidas para Alagoas 116 espécies de hepáticas, tendo 106 delas ocorrido na EsEc Murici. Setenta e oito espécies são genuinamente novas ocorrências para o Estado de Alagoas, sete das quais são novas também para a região Nordeste do Brasil. São fornecidos dados sobre a distribuição geográfica das espécies no Brasil e no mundo, e adicionalmente, comentários taxonômicos e ecológicos das espécies que são novas ocorrências para o Nordeste.

Palavras-chave: Hepáticas, Floresta Atlântica, Nordeste do Brasil, brioflora

ABSTRACT – (Liverworts of Alagoas State, Brazil). A list of liverworts from Alagoas State was compiled and is presented here. The list is based on catalogues and previous papers as well as the results of an unpublished survey carried out at the Murici Ecological Station (EsEc), an important protected area of the Brazilian Northeast (9º11'05" - 9º16'48"S; 35º45'20" - 35º55'12"W). One-hundred and sixteen liverworts have been recorded for the state of Alagoas, of which 106 occur at EsEc Murici. Seventy-eight are new occurrences for Alagoas, and seven of these are also new occurrences for northeastern Brazil. Data on geographic distribution in Brazil and worldwide is given here, in addition to ecological and taxonomic comments on the species that are new occurrences for the Northeast region.

Key words: liverworts, Atlantic Forest, northeastern Brazil, bryophyte flora

Introduction

The bryophyte flora of Alagoas is one of the most poorly studied of the Brazilian Northeast. To date, no systematic survey has been performed and all references come from sparse and sporadic collections whose results have been put together in Yano's catalogues (1981; 1984; 1989; 1995; 2006).

Recently, Pôrto *et al.* (2006) carried out an inventory in four Atlantic Rain Forest remnants, recording 76 species of bryophytes - liverworts (31 spp.) and mosses (45 spp.) - while Yano & Peralta (2007) increased this number by publishing 36 new occurrences (26 mosses and 10 liverworts) for Alagoas. Yet species richness in Alagoas is still low when compared to other states like Pernambuco and Bahia, which house more than 300 spp. (Pôrto & Germano 2002; Bôas-Bastos, S.B.V., personal communication).

Additionally, Alagoas' bryophyte flora is now increased by the survey carried out at the Murici Ecological Station (EsEc), one of the main Atlantic Forest remnants of northeastern Brazil. EsEc Murici was created in 2001 with 6,116.43 ha and is considered a priority area for biodiversity conservation in Brazil and worldwide (Brasil – MMA 2000). The survey resulted in a list of 181 species, of which 106 are liverworts, 72 are mosses, and three await special taxonomic treatment. This paper focuses only on liverworts, while mosses will receive attention in another publication.

This paper presents a compilation of liverwort species occurring in Alagoas State, bringing together published information (catalogues) and results from the EsEc Murici survey. Moreover, it provides data about the species' geographic distribution in Brazil and in the world, as well as taxonomic and ecological comments on the new occurrences for the northeastern region.

Material and methods

EsEc Murici (9º11'05" - 9º16'48"S; 35º45'20" - 35º55'12"W) is part of Murici and Messias

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municipalities, 50 km from Maceió, capital of the state of Alagoas (Moura 2006). The elevation of the reserve ranges between 200-650 m, and the area has warm, humid wheather, with a dry summer and a wet autumn-winter season. The mean annual precipitation and temperature are 2,167.7 and 24 °C, respectively (National Institute of Meteorology, data for the period from 1961 to 1990). The vegetation cover is classified as Submontane Open Humid Atlantic Rain Forest (Veloso *et al.* 1991).

The botanical material studied consists of epiphyllic (leaf inhabiting), epiphytic (bark inhabiting) and epixyllic (decaying wood inhabiting) samples collected from the understory and canopy. The material was examined in the laboratory; identification and taxonomic and ecological commentaries were based on the following literature: Fulford (1963; 1966; 1968; 1976), Stotler (1970), Kron (1988), Reiner-Drewald & Goda (2000), Gradstein & Costa (2003), and Dauphin (2003). Occasionally the identification of specimens was confirmed by specialists. The following literature was consulted to compile the information on geographic distribution: Yano (1984; 1989; 1995; 2004; 2005; 2006), Bastos & Yano (2004; 2006), Câmara & Vital (2004), Câmara & Costa (2006), Costa & Silva (2003), Costa *et al.* (2005), Ganacevich & Mello (2006), Germano & Pôrto (2005), Gradstein & Costa (2003), Joyce *et al.* (2006), Molinaro & Costa (2001), Oliveira *et al*. (2006), Paixão & Mello (2006), Patrus & Starling (2006), Pôrto *et al.* (2006), Valente & Pôrto (2006a; 2006b), Vilas Bôas-Bastos, Bastos & Ballejos (2006), Yano & Bordin (2006), Yano & Câmara (2004), Yano & Costa (2000), and Yano & Peralta (2005; 2006; 2007). The taxonomic classification adopted was that presented by Crandall-Stotler & Stotler (2000). All samples studied are registered and deposited in the UFP-Geraldo Mariz Herbarium, at the Federal University of Pernambuco.

The Alagoas liverwort species listed that did not occur in EsEc Murici where found in Yano's catalogues (1981; 1984; 1989; 1995; 2006), Gradstein & Costa (2003), and Pôrto *et al*. (2006).

Results and discussion

One-hundred sixteen species of liverworts were recorded for Alagoas. Seventy-eight species are new occurrences for Alagoas state, occurring exclusively at EsEc Murici, and seven species are new occurrences for the Brazilian Northeast as well. The other 38 species had been previously cited in catalogues and other papers. The taxa are listed in alphabetical order by family and species and include locality, substrata and forest strata (understory or canopy) in the case of EsEc Murici, and geographic distribution in Brazil and in the world (Tab. 1).

Most of the species had typically Neotropical (59%), Pantropical (16%) and African-American (7%) geographic distributions. Lejeuneaceae is by far the richest family in the state, with 83 species. This obviously is because the flora presented here comes mainly from Atlantic Rain Forest. It is known that this family used to be predominant in the flora of tropical regions, especially in forest habitats (Gradstein *et al*. 2001).

Geographic distribution details, taxonomic and ecological comments and ilustrations of the main characters of the new occurrences for Northeast Brazil are presented below.

ANEURACEAE

Aneura pinguis (L.) Dumort., Comment. Bot. 115. 1822.
Fig. 1-2

Material examined: **BRAZIL**. **Alagoas**: Murici, 2/XII/2004, *Pôrto* (UFP 45851); ib. 2/XII/2004, *Pôrto* (UFP 45850).

Description: Schuster (1992).

Comments: this species was placed within *Riccardia* S.F. Gray genus until recent decades. However, it can be distinguished from this genus because of at least two clear characters on gametophytes: 1) thallus less ramified, darker and wider, reaching up to 8 mm while *Riccardia* spp. reaches no more than 3 mm wide and; 2) many minutely dispersed oil bodies inside the cells. *Aneura pinguis* is easily recognized in the field even when sterile, due to its conspicuous and lustrous thallus, green to yellowish-green in color. Of the *Aneura* Dumort. species occurring in Brazil, *A. pinguis* is the only one with 10-18 (20) cell thickness in the middle (transversal section); the others are thinner, up to 9 cells thick. In Brazil, this species was only known for the North, Central and Southeast regions. It is sub-cosmopolitan and occurs at altitudes that vary from sea level to 800 m. It was found growing on decaying wood in EsEc Murici.

LEJEUNEACEAE

Aphanolejeunea asperrima Steph., Sp. Hepat. 5: 859. 1916.
Fig. 3-6

Material examined: **BRAZIL**. **Alagoas**: Murici, 2/XII/2004, *Pôrto* (UFP 45822); ib. 2/XII/2004, *Pôrto* (UFP 45823); ib. 2/XII/2004, *Pôrto* (UFP 45825); ib. 2/XII/2004, *Pôrto* (UFP 45829); ib. 2/XII/2004, *Pôrto* (UFP 45830); ib. 2/XII/2004, *Pôrto* (UFP 45833); ib. 2/XII/2004, *Pôrto* (UFP 45845); ib. 2/XII/2004, *Pôrto* (UFP 45831); ib. 2/XII/2004, *Pôrto* (UFP 45842); ib. 2/XII/2004, *Pôrto* (UFP 45844).

Table 1. Liverworts of Alagoas state. Information on substrate (Leaves - LV, live bark - LB and decaying wood - DW) and forest strata occurrence concern only the EsEc Murici survey. Sub-canopy is defined here as strata above 4 meters high. New references for Northeast Brazil are preceded by an asterisk.

Taxa	Locality	Substrata	Forest strata	World distribution	Distribution in Brazil
MARCHANTIOPHYTA					
ANEURACEAE					
**Aneura pinguis* (L.) Dumort.	EsEc Murici	DW	understory	Subcomsmopolitan	AM, MG, MS, RJ, SP
Riccardia amazonica (Spruce) S.W. Arnell	EsEc Murici	DW	understory	Africa and America	AC, AM, AP, ES, MS, PA, PE, RJ, RS, SP
BRYOPTERIDACEAE					
Bryopteris diffusa (Sw.) Nees	EsEc Murici, Messias, União dos Palmares, and Boca da Mata	LB	understory	Neotropical	AL, AM, BA, CE, ES, MG, MT, PA, PE, PR, RJ, RS, SC, SE, SP
Bryopteris filicina (Sw.) Nees	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AL, AM, BA, CE, ES, GO, MG, MS, MT, PA, PE, PR, RJ, RR, RS, SC, SP
CEPHALOZIELLACEAE					
Cylindrocolea rhizantha (Mont.) R.M. Schust.	EsEc Murici	DW	understory	Neotropical	AC, BA, ES, PE, RJ, SP
CORSINIACEAE					
Cronisia paradoxa Berk.	Junqueiro	-	-	Neotropical	AL, BA, CE, ES, GO, MT, SP
GEOCALYCACEAE					
Lophocolea liebmanniana Gottsche	EsEc Murici	LB, DW	understory	Neotropical	AC, AM, PA, PE, MT, SP
L. martiana Nees	EsEc Murici	DW	understory	Africa and America	AM, AP, BA, CE, ES, MG, PA, PE, PR, RJ, RS, SC, SE, SP
JUBULACEAE					
Frullania apiculata (Reinw. *et al*.) Nees	EsEc Murici	LB, DW	understory, sub-canopy, canopy	Pantropical	AM, BA, GO, PA, PE, RJ, SP
F. brasiliensis Raddi	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	ES, GO, MG, PE, RJ, RS, SC, SP, BA, CE
F. breuteliana Gottsche	EsEc Murici	LB, LV	understory, sub-canopy, canopy	Neotropical	RJ, PE, RS, SP
F. caulisequa (Nees) Nees	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AL, AC, BA, CE, ES, MG, PA, PE, RJ, RO, RR, RS, SC, SE, SP
F. dusenii Steph.	EsEc Murici	LB	canopy	Neotropical	ES, PE, RJ, RR, RS, SC, SE, SP
Frullania ericoides (Nees) Mont.	EsEc Murici	LB, DW	understory	Pantropical	AC, AM, BA, CE, ES, GO, MG, MS, MT, PA, PB, PE, PR, RJ, RS, SE, SP
F. kunzei (Lehm. & Lindenb.) Lehm. & Lindenb.	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AC, AM, BA, CE, ES, MG, MT, PA, PB, PE, PR, RJ, RR, RS, SE, SP
F. riojaneirensis (Raddi) Ångstr.	EsEc Murici	LB, LV	understory, sub-canopy, canopy	Pantropical	BA, CE, ES, GO, MG, MS, MT, PA, PB, PE, PR, RJ, RS, SE, SP
F. serrata Gottsche	Serra Grande	-	-	Asia, Africa and Brazil	AL, RS, SC
LEJEUNEACEAE					
Acanthocoleus aberrans (Lindenb. & Gottsche) Kruijt.	Marechal Deodoro	-	-	Africa and America	AL, DF, MG, PR, RS, RJ, SC, SP
Acrolejeunea torulosa (Lehm. & Lindenb.) Schiffn.	Barra de São Miguel	-	-	Neotropical	AC, AL, AM, BA, ES, GO, MA, MT, MS, PA, RJ, RO, RR, SP
Anoplolejeunea conferta (Meissn.) A. Evans	EsEc Murici	LB, LV	understory, sub-canopy, canopy	Neotropical	BA, ES, MG, PA, PE, RJ, RS, SP

continue

Table 1 (continuation)

Taxa	Locality	Substrata	Forest strata	World distribution	Distribution in Brazil
**Aphanolejeunea asperrima* Steph.	EsEc Murici	LV	understory	Neotropical	MG, SC
**A. camillii* (Lehm.) R.M. Schust.	EsEc Murici	LV	understory	Neotropical	AM, MG, PA, RJ
A. truncatifolia Horik.	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Pantropical	AM, BA, ES, GO, MG, MS, MT, PA, PE, RJ, RS, SC, SP
Archilejeunea fuscescens (Hampe ex Lehm.) Fulford	EsEc Murici and Serra Grande	LB	canopy	South America and Costa Rica	AC, AL, AM, BA, PA, PE, RJ, RR
A. parviflora (Nees) Schiffn.	EsEc Murici	DW	understory	Neotropical	AC, AM, BA, MG, MS, PA, PE, RJ, RO, RR, RS, SP
Caudalejeunea lehmaniana (Gottsche) A. Evans	EsEc Murici, Marechal Deodoro, and Serra Grande	LB, LV	understory	Africa and America	AL, AM, BA, CE, ES, MT, PA, PE, PR, RS, RO, RR, SC, SE SP
Ceratolejeunea coarina (Gottsche) Steph.	EsEc Murici	DW, LV	understory	Neotropical	AC, AM, AP, BA, MA, PA PR, SP
C. confusa R.M. Schust.	EsEc Murici	LB, DW	understory, sub-canopy, canopy	Costa Rica, East Índias, Chocó, and Brazil	AM, PE, SP
C. cornuta (Lindenb.) Schiffn.	EsEc Murici and Serra Grande	LB, DW, LV	understory, sub-canopy, canopy	Pantropical	AC, AL, AM, AP, BA, CE, PA, PE, PR, RJ, RO, SC, SP
C. cubensis (Mont.) Schiffn.	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AC, AM, AP, BA, CE, ES, PA, PB, PE, RJ, RO, SP
C. dussiana (Steph.) G. Dauphin	EsEc Murici	LB	understory	Neotropical	BA, PA
C. falax (Lehm. & Lindenb.) Bonner	EsEc Murici	LB, LV	understory, sub-canopy, canopy	Neotropical	AM, MG, PE, RJ, RO, SP
C guianensis (Nees & Mont.) Steph.	EsEc Murici and Serra Grande	LB, LV	understory, sub-canopy, canopy	Neotropical	AM, AL, BA, PA, PE
C. laetefusca (Austin) R.M. Schust.	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AC, AM, BA, ES, MG, PA, PE, RJ, RR, SP
C. minuta Dauphin	EsEc Murici	LB	understory	Brazil and Guianas	BA, PA, PE
Cheilolejeunea acutangula (Nees) Grolle	EsEc Murici	LB	understory	Neotropical	AM, BA, ES, GO, MG, MT, PA, PE, RJ, SC, SP
C. adnata (Kunze) Grolle	EsEc Murici and Serra Grande	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AC, AL, AM, BA, ES, MG, MT, PA, PE, PR, RR, SC, SP
C. clausa (Nees. & Mont.) R.M. Schust.	EsEc Murici	LB, DW	understory, sub-canopy, canopy	Neotropical	AC, AM, BA, CE, GO, MG, MS, MT, PA, PE, PR, RJ, SP
C. discoidea (Lehm. & Lindenb.) Kachr. & R.M. Schust.	EsEc Murici	LB	canopy	Neotropical	BA, ES, MG, MS, MT, RS, SP
C. holostipa (Spruce) Grolle & R.-L. Zhu	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	BA, ES, MG, PA, PR, RJ, SP
C. oncophylla (Ångstr.) Grolle & E. Reiner	EsEc Murici	LB, DW	understory	Neotropical	BA, MG, PR, RJ, RR, SP
C. rigidula (Mont.) R.M. Schust.	EsEc Murici, Marechal Deodoro, and Serra Grande	LB, DW, LV	understory, sub-canopy, canopy	Africa and America	AC, AL, AM, AP, BA, CE, ES, GO, MG, MS, MT, PA, PB, PE, PR, RJ, RR, SC, SE, SP
C. trifaria (Reinw. *et al.*) Mizut.	EsEc Murici and Serra Grande	LB, DW, LV	understory, sub-canopy, canopy	Pantropical	AC, AL, AM, BA, ES, GO, MG, MS, MT, PA, PB, PE, PR, RJ, RR, SP
Cololejeunea cardiocarpa (Mont.) A. Evans	EsEc Murici	LV	understory	Pantropical	AM, BA, ES, GO, MG, MS, MT, PA, PB, PE, PR, RJ, RO, RR, SC, SP
**C. lanciloba* Steph.	EsEc Murici	LV	understory	Pantropical	AM
C. obliqua (Nees & Mont.) Schiffn.	EsEc Murici and Serra Grande	LV	understory	Neotropical	AC, AL, AM, PA, PE, PR, RJ, SC, SP

continue

Table 1 (continuation)

Taxa	Locality	Substrata	Forest strata	World distribution	Distribution in Brazil
Cololejeunea subcardiocarpa Tixier	EsEc Murici and Serra Grande	DW, LV	understory, sub-canopy, canopy	Neotropical	AC, AL, AM, BA, ES, MG, MT, PE, PR, RJ, SC, SP
C. submarginata Tixier	Marechal Deodoro	-	-	Neotropical	AL, AM, GO, MT
Colura tortifolia (Nees & Mont.) Steph.	EsEc Murici	LV	understory, sub-canopy, canopy	Neotropical	AC, CE, PA, PE, RJ, SP
Cyclolejeunea convexistipa (Lehm. & Lindenb.) A. Evans	EsEc Murici and Serra Grande	LB, LV	understory, sub-canopy, canopy	Neotropical	AL, AM, AP, BA, CE, PA, SP
C. luteola (Spruce) Grolle	EsEc Murici	LB, LV	understory	Neotropical	AM, BA, MG, MT, PA, PE, RJ, RR, SP
Diplasiolejeunea brunnea Steph.	EsEc Murici, Marechal Deodoro, and Serra Grande	LB, LV	understory, sub-canopy, canopy	Neotropical	AC, AL, AM, BA, CE, MT, PA, RJ, SP
D. cavifolia Steph.	EsEc Murici	LB, LV	understory, sub-canopy, canopy	Pantropical	CE, PE, PR, SC, SP
D. cobrensis Gottsche ex Steph.	Marechal Deodoro	-	-	Pantropical	AL, BA, PE, RO
D. latipuensis Tixier	EsEc Murici	LV	understory	Guiana and Brazil	BA, SP
D. pellucida (Meissn.) Schiffn.	EsEc Murici and Serra Grande	LV	understory, sub-canopy, canopy	Neotropical	AL, AM, BA, PA, RJ, SC, SP
D. rudolphiana Steph.	EsEc Murici	LB, LV	understory, sub-canopy, canopy	Pantropical	AC, AM, BA, ES, PB, PE, RJ, SC, SE, SP
Drepanolejeunea bidens (Steph.) A. Evans	Serra Grande	-	-	Neotropical	AL, AM, MG, PB, PE, RR, SP
**D. campanulata* (Spruce) Steph.	EsEc Murici	LB, LV	understory, sub-canopy, canopy	North Andes and Southeastern Brazil	RJ, SC, SP
**D. crucianella* (Tayl.) A. Evans	EsEc Murici	LV	understory	Neotropical	AM, PA
D. fragilis Bischl.	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AM, BA, ES, PA, PE, RJ, RR, SP
D. mosenii (Steph.) Bischl.	EsEc Murici	LB, LV	understory, sub-canopy, canopy	Neotropical	AM, BA, ES, MS, PE, PR, RJ, RS, SC, SP
Frullanoides corticalis (Lehm. & Lindenb.) van Slageren	EsEc Murici	LB	understory, canopy	Neotropical	BA, MG, MT, RJ, RR, SP
Harpalejeunea oxyphylla (Nees & Mont.) Steph.	EsEc Murici	DW, LV	understory	Neotropical	AM, BA, PA, PB, PE, RJ, SP
H. stricta (Lindenb. & Gottsche) Steph.	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AC, BA, PA, PE, RJ, SP
**H. tridens* (Besch. & Spruce) Steph.	EsEc Murici	LB, DW	understory, sub-canopy, canopy	East Índias, South America and Brazil	SP
Lejeunea cancellata Nees & Mont.	Serra Grande	-	-	Cuba, USA, Argentina and Brazil	AL, BA, CE, AS, MS, MT, RJ, SC, SP
L. caulicalyx (Steph.) E. Reiner & Goda	EsEc Murici	LB, DW	understory	Neotropical	AC, BA, CE, ES, MS, MT, PA, PE, PR, RJ, RR, SP
L. cerina (Lehm. & Lindenb.) Gottsche	EsEc Murici	LB	understory, canopy	Neotropical	AC, ES, PE, RJ, SP
L. controversa Gottsche	EsEc Murici	LB, DW	understory	Neotropical	AC, MS, PA, SP
L. elliotti Spruce	EsEc Murici	LB, DW	understory	Neotropical	BA
L. filipes Spruce	EsEc Murici	LB, LV	understory, sub-canopy, canopy	Dominica, Peru, Argentina, and Brazil	BA, MS, SP
L. flava (Sw.) Nees	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Pantropical	AC, AM, BA, CE, ES, GO, MG, MS, MT, PA, PB, PE, PR, RJ, RR, RS, SP
L. grossiretis (Steph.) E. Reiner & Goda	EsEc Murici	DW	understory	Brazil	BA, MG, RJ, SP

continue

Table 1 (continuation)

Taxa	Locality	Substrata	Forest strata	World distribution	Distribution in Brazil
Lejeunea grossitexta (Steph.) E. Reiner & Goda	EsEc Murici	DW, LV	understory	Brasil, Paraguai, and northern Argentina	ES, MG, PE, PR, RJ, SC, SP
L. immersa Spruce	EsEc Murici	LV	understory	Neotropical	AM, BA, PA, PE
L. laetevirens Nees & Mont.	Barra de São Miguel, EsEc Murici, Maceió, Penedo, and Serra Grande	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AC, AL, AM, BA, CE, ES, MS, MT, PA, PB, PE, RJ, RR, SP
L. magnolia Lindenb. & Gottsche	EsEc Murici and Serra Grande	LB, DW, LV	understory, sub-canopy, canopy	Africa and America	AC, AL, BA, CE, ES, MS, MT, PA, PE, RJ, SP
L. phyllobola Nees & Motn.	EsEc Murici and Penedo	LB, DW	understory, sub-canopy, canopy	Africa and America	AC, AL, AM, BA, CE, ES, MS, PA, RJ, RS, SP
L. puiggariana Steph.	EsEc Murici	LB, LV	understory, sub-canopy, canopy	Brazil and northern Argentina	MS, MT, PE, SP
L. tapajosensis Spruce	EsEc Murici	LB, DW	understory	Brazil and Argentina	AC, BA, ES, PA, PE
Lepidolejeunea involuta (Gottsche) Grolle	EsEc Murici	LB, LV	understory, canopy	Neotropical	AM, ES, PA, PE, PR, RO, RR, SP
Leptolejeunea elliptica (Lehm. & Lindeb.) Schiffn.	EsEc Murici and Serra Grande	LB, LV	understory, sub-canopy, canopy	Neotropical	AL, BA, ES, MG, PE, RJ, RS, SC, SP
Leucolejeunea xanthocarpa (Lehm. & Lindenb.) A. Evans	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Pantropical	BA, ES, MG, PE, RJ, RS, SC, SP
Lopholejeunea subfusca (Nees) Schiffn.	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Pantropical	AC, AM, BA, CE, ES, MG, MS, MT, PA, PB, PE, RJ, RO, RR, SC, SP
Microlejeunea epiphylla Bischl.	EsEc Murici	LB, LV	understory, sub-canopy, canopy	Neotropical	AP, BA, ES, MG, MS, PA, PB, PE, SP
Neurolejeunea breutelli (Gottsche) A. Evans	EsEc Murici	LV	understory	Neotropics and North America	BA, ES, MG, PA, PE, RJ, RS, SC, SP
Odontolejeunea lunulata (Weber) Schiffn.	EsEc Murici	LV	canopy	Neotropics and East Africa	AC, AP, AM, BA, CE, ES, MG, MT, PA, PE, PR, RR, RS, SP
Prionolejeunea denticulata (Weber) Schiffn.	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AM, CE, PA, PE, RJ
Pycnolejeunea contigua (Nees) Grolle	EsEc Murici	LB, LV	understory, sub-canopy, canopy	Pantropical	AM, BA, CE, ES, ES, MG, PA, PE, RR, RS, SC, SP
P. macroloba (Nees & Mont.) Schiffn.	EsEc Murici and Junqueiro	LB	understory	Neotropical	AL, AM, BA, CE, ES, PA, PE, SP
Rectolejeunea berteroana (Gottsche ex Steph.) A. Evans	EsEc Murici	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AC, AM, BA, ES, PA, PE, PR, RJ, SC, SP
R. emarginuliflora (Gottsche) A. Evans	EsEc Murici	LB	understory	Neotropical	BA, SP
R. flageliformis A. Evans	EsEc Murici	DW, LV	understory	Neotropical	BA, PE, SP
Schiffneriolejeunea polycarpa (Nees) Gradst.	EsEc Murici and Serra Grande	LB	canopy	Pantropical	AC, AL, AM, BA, CE, ES, GO, MG, MS, MT, PA, PB, PE, RJ, RR, RS, SC, SE, SP
Stictolejeunea squamata (Willd. ex Weber) Schiffn.	EsEc Murici and Serra Grande	LB, DW	understory	Neotropical	AC, AL, AM, AP, BA, ES, MG, PA, PE, RJ, RS, SP
Symbiezidium barbiflorum (Lindenb. & Gottsche) A. Evans	EsEc Murici and Serra Grande	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AC, AL, AM, BA, ES, PA, PE, RJ, SC, SP
Taxilejeunea obtusangula (Spruce) A. Evans	Serra Grande	-	-	Neotropical	AL, AM, RR
Vitalianthus bischlerianus (Pôrto & Grolle) R.M. Schust. & Giancotti	EsEc Murici	LB, LV	understory	Neotropical	BA, PE, PR, RJ, SC, SP

continue

Table 1 (continuation)

Taxa	Locality	Substrata	Forest strata	World distribution	Distribution in Brazil
Xylolejeunea crenata (Nees & Mont.) X.-L. He & Grolle	EsEc Murici	LB, DW	understory	Neotropical	AM, BA, MA, MG, PA, PE, RJ, RO, RR, SP
LEPIDOZIACEAE					
Arachniopsis diacantha (Mont.) Howe	EsEc Murici	LB, DW	understory	Pantropical	AC, AM, BA, ES, PA, PE, PR, RJ, RS, SP
Bazzania heterostipa (Steph.) Fulford	EsEc Murici	DW	understory	Brazil	ES, MG, PE, PR, RJ, RS, SC, SP
METZGERIACEAE					
Metzgeria albinea Spruce	EsEc Murici	DW, LV	understory	Pantropical	BA, CE, ES, MG, PA, PE, PR, RJ, RS, SC, SP
M. conjugata Lindb.	EsEc Murici	LB	canopy	Subcomsmopolitan	CE, ES, MG, PE, PR, RJ, RS, SP
M. dichotoma (Sw.) Nees	EsEc Murici and Serra Grande	LV	understory	Neotropical	AL, GO, MG, PB, PE, RJ, RS, SP
M. myriopoda Lindb.	EsEc Murici	LV	understory	Neotropics and North America	ES, PE, MG, RJ, RS, SC, SP
PLAGIOCHILACEAE					
Plagiochila disticha (Lehm. & Lindenb.) Lindenb.	EsEc Murici and Serra Grande	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AC, AL, AM, AP, CE, DF, ES, MG, MS, MT, PA, PB, PE, RJ, RR, RS, SC, SP
P. distinctifolia Lindenb.	EsEc Murici	LB	canopy	Neotropical	AM, PA, PE, MG, RJ
P. gymnocalycina (Lehm. & Lindenb.) Lindenb.	EsEc Murici	LB	understory	Neotropical	AC, MG, PE, RJ, SC, SP
P. martiana (Nees) Lindenb.	EsEc Murici and Serra Grande	LB, DW, LV	understory, sub-canopy, canopy	Neotropical	AC, AL, CE, DF, ES, MG, MS, MT, PE, PR, RJ, RS, SC, SP
P. montagnei Nees	EsEc Murici	LB, DW	understory, sub-canopy, canopy	Neotropical	AC, AM, AP, BA, ES, PA, PE, PR, RJ, SP
RADULACEAE					
Radula flaccida Lindenb. & Gottsche	EsEc Murici	LV	understory	Africa and America	AC, AM, BA, MG, PA, PR, RR, SP
R. kegelii Gottsche ex Steph.	EsEc Murici	LB, DW	understory	Neotropical	AL, AM, AP, BA, BA, ES, MG, MT, PA, PR, RJ, RS, SC, SP
R. ligula Steph.	EsEc Murici	DW	understory	Brazil and Argentina	PR, RJ, RS, SC
R. recubans Tayl.	EsEc Murici, Marechal Deodoro and Serra Grande	LB, DW	understory	Neotropics and subtropical America	AC, AL, PA, PE, RJ, RS, SP
RICCIACEAE					
Riccia vitalii Jovet-Ast.	Arapiraca	-	-	Costa Rica and Brazil	AL, AM, BA, CE, ES, GO, MA, MS, PB, PE, PI, RN, SE, TO

Description: Gradstein & Costa (2003).

Comments: this species is characterized by well developed lobules in most leaves, reaching 2/5 to 2/3 of lobe length and with the first lobule tooth falcate, consisting of two slightly elongated cells; the surface of lobes, lobules, and perianths is covered with conical papillae. The marginal cells of lobes and lobules are conically protuberant. *Aphanolejeunea asperrima* resembles *A. microscopica* (Tayl.) A. Evans, but the latter has greater lobules that reach 2/3 to 4/5 of lobe length. *Aphanolejeunea asperrima* has only been recorded for Patagonia and Brazil, where it has been found growing on leaves at altitudes that vary from 1450-2000 m. In Brazil it was previously known to the South and Southeastern regions. It was found growing on leaves in the understory at EsEc Murici.

Aphanolejeunea camillii (Lehm.) R.M. Schust., Hepat. Anthocer. N. Amer. 4: 1297. 1980.
Fig. 7-10

Material examined: **BRAZIL**. **Alagoas**: Murici, 2/XII/2004, *Pôrto* (UFP 45844); ib. 2/XII/2004, *Pôrto* (UFP 45827).

Description: Gradstein & Costa (2003).

Comments: this species is characterized by elliptic, rhombic, or lanceolate leaves that are wider in the middle, nearly symmetrical, and with an acute apex that ends in one cell. The lobules are reduced in most leaves, but are occasionally developed and can reach 1/4 of lobe length. *Aphanolejeunea camillii* resembles *A. paucifolia* (Spruce) E. Reiner, but it is clearly distinguished by the leaves - those of the latter are asymmetrical, wider at the base, and with an apex that ends in a row of 3-4 cells; in addition, the lobules are always reduced. It is common in the Neotropics, occurring from Mexico to Paraguay and northern Argentina. In Brazil it is known to occur in the North and Southeast regions. It was found growing on leaves in the understory in the EsEc Murici.

Cololejeunea lanciloba Steph., Hedwigia 34: 250. 1895.
Fig. 11-16

Material examined: **BRAZIL**. **Alagoas**: Murici, 3/XII/2004, *Pôrto* (UFP 45828).

Description: Tixier (1991), as *Cololejeunea evansii* P. Tixier.

Comments: this species is characterized by leaves with a hyaline margin of rectangular cells and with plane lobules parallel to the stem frequently bilobate and with a rounded apex. *Cololejeunea lanciloba* has highly variable gametophytic characters, even concerning lobule shape; the latter fact causes problems in distinguishing it from *Cololejeunea latilobula* (Herzog) Tixier, according Dr. Tamás Pócs who is presently revising the genera for the Neotropics (pers. comm.). The only reliable distinction between them is that *C. lanciloba* has narrowly ligulate to acute lobules usually with 1-2 lateral teeth while *C. latilobula* always has broad, obtuse, ligulate lobules. *Cololejeunea lanciloba* is Pantropical and grows on leaves in areas with altitudes up to 50 m. In Brazil it was restricted to Amazonas state, where it was recorded by the first name, *Cololejeunea tonkinensis* Steph. It was found growing on leaves in the understory at EsEc Murici.

Drepanolejeunea campanulata (Spruce) Steph., Sp. Hepat. 5: 328. 1913.
Fig. 17-21

Material examined: **BRAZIL**. **Alagoas**: Murici, 2/XII/2004, *Pôrto* (UFP 45826).

Description: Bischler (1964).

Comments: this species is characterized by the presence of a conspicuous tooth 2-3 cells long on the ventral lobe margin, positioned just above the junction with the keel. This species resembles *Drepanolejeunea lichenicola* (Spruce) Steph., but the pre-apical lobule teeth of the latter are longer, curved, and usually cross the apical teeth, whereas in *D. campanulata* the teeth are short and inconspicuous. *Drepanolejeunea campanulata* was previously known to Ecuador, Peru, and Southeast Brazil. It was found growing on leaves and bark in the understory, sub-canopy, and canopy at EsEc Murici.

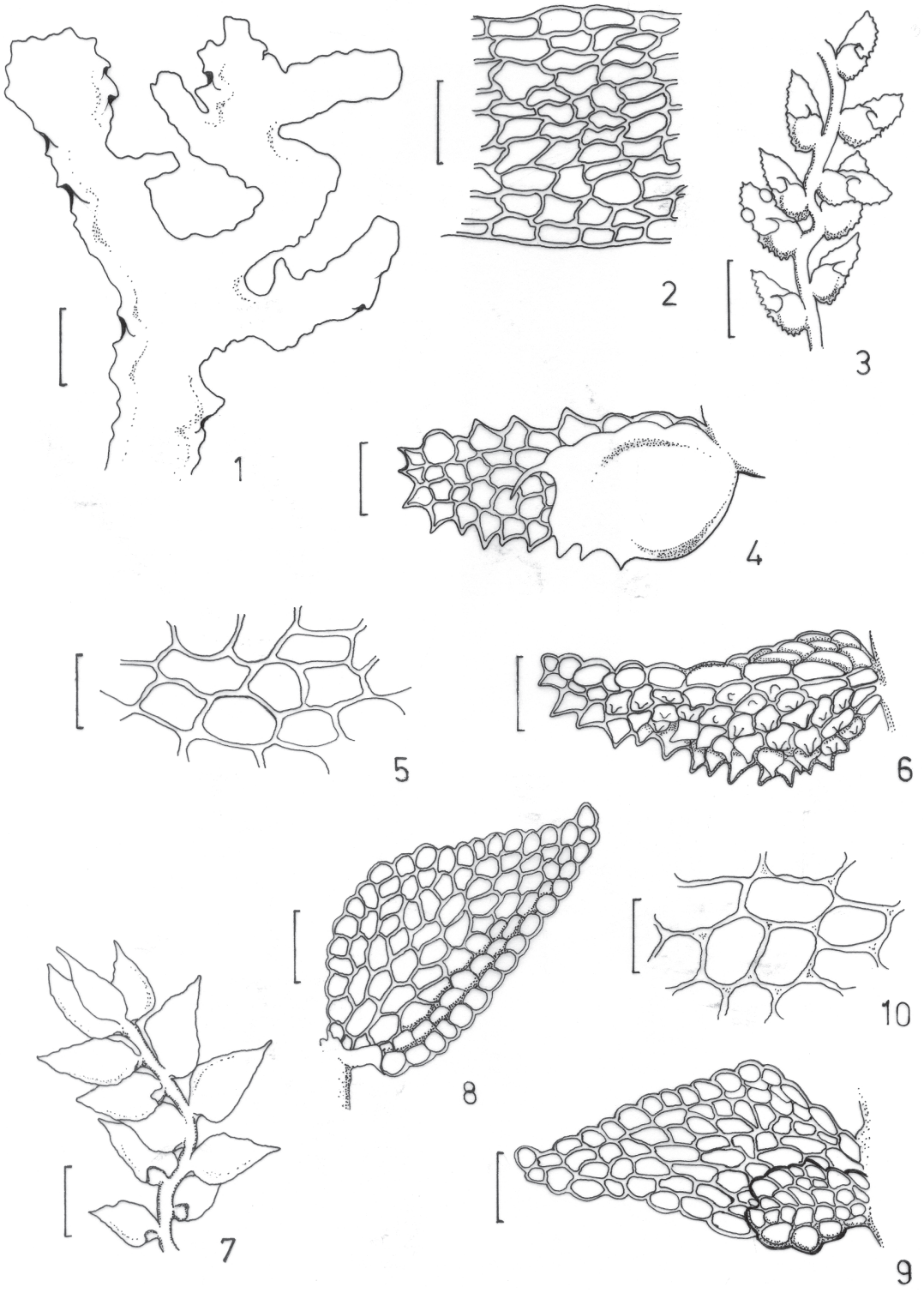
Drepanolejeunea crucianella (Tayl.) A. Evans, Bull. Torrey Bot. Club 30: 33. 1903.
Fig. 22-26

Material examined: **BRAZIL**. **Alagoas**: Murici, 2/XII/2004, *Pôrto* (UFP 45822); ib. 2/XII/2004, *Pôrto* (UFP 45824); ib. 2/XII/2004, *Pôrto* (UFP 45833); ib. 2/XII/2004, *Pôrto* (UFP 45841); ib. 2/XII/2004, *Pôrto* (UFP 45845).

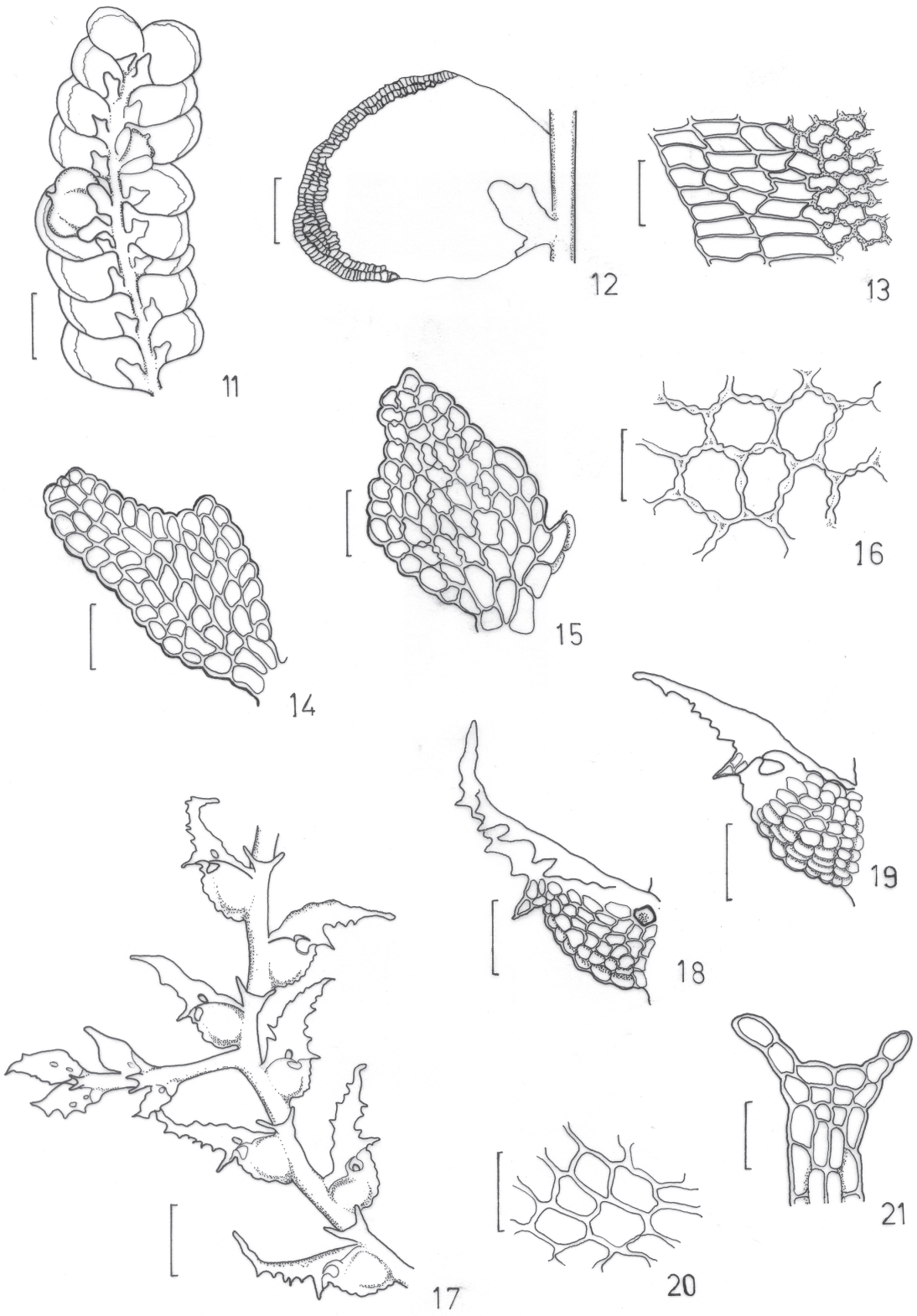
Description: Bischler (1964).

Comments: this species can be easily recognized due to the presence of conspicuous teeth that are 2-6 cells long and 1-3 cells wide at the base in both the dorsal and ventral leaf margins. This species resembles *Drepanolejeunea palmifolia* (Nees) Steph., but the latter has teeth only on dorsal margins. *Drepanolejeunea crucianella* generally occurs in lowland forests, growing on leaves. It has a Neotropical distribution and in Brazil it was previously restricted to Amazonas and Pará, in the North region. It was found growing on leaves in the understory at EsEc Murci.

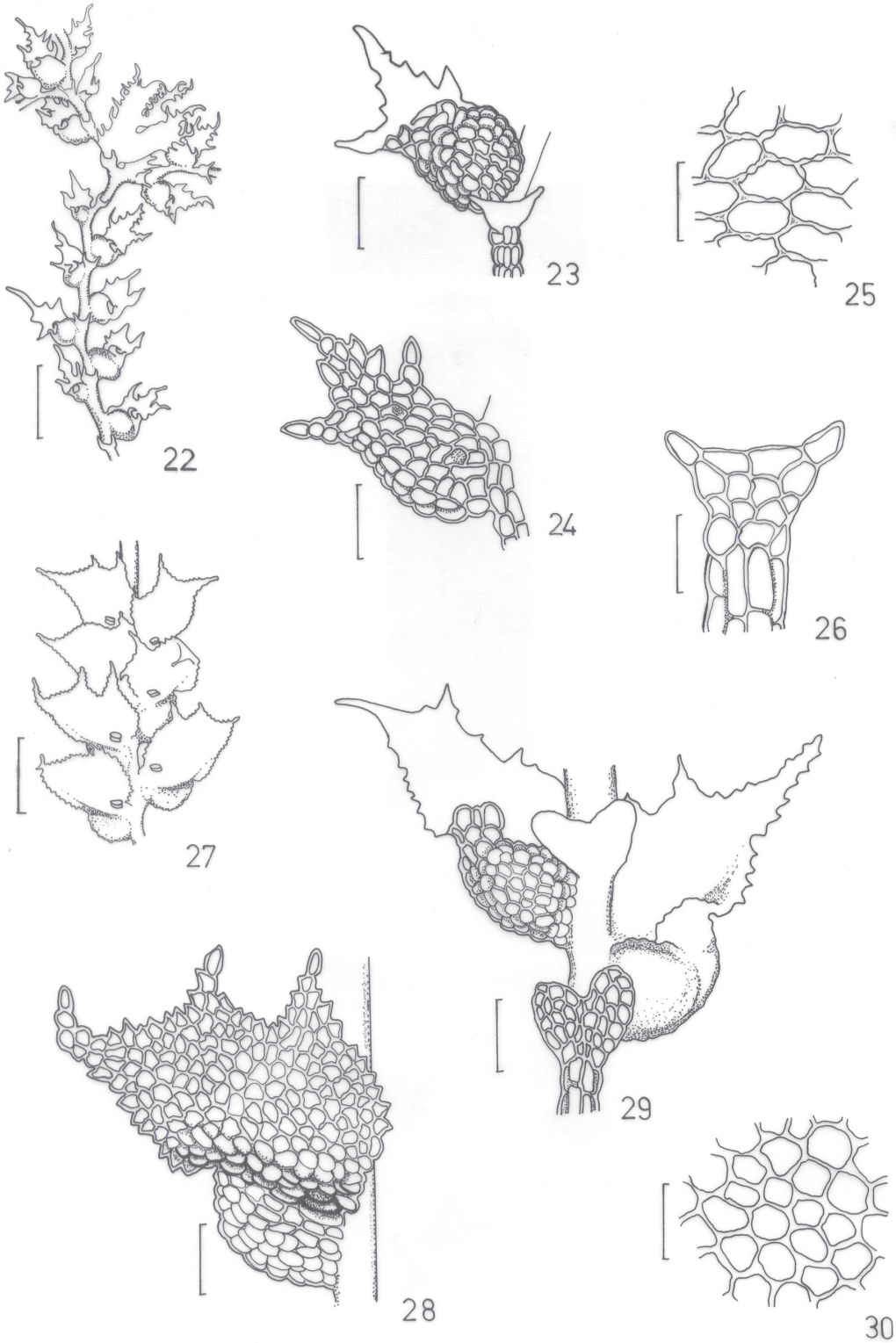
Harpalejeunea tridens (Besch. & Spruce) Steph., Sp. Hepat. 5: 263. 1913.
Fig. 27-30



Figures 1-10. 1-2. *Aneura pinguis* (L.) Dumort. 1. Habit, dorsal view. 2. Cross section of main axis. Figures 3-6. *Aphanolejeunea asperrima* Steph. 3. Habit, ventral view. 4, 6. Leaves. 5. Median cells of leaf. Figures 7-10. *Aphanolejeunea camillii* (Lehm.) R.M. Schust. 7. Habit, ventral view. 8, 9. Leaves. 10. Median cells of leaf. (Bars = Fig.1: 3 cm; Fig. 2: 96 µm; Fig. 3,7: 200 µm; Fig. 4,6,8,9: 48 µm; Fig 5,10: 20 Ám)



Figures 11-21. 11-16.*Cololejeunea lanciloba* Steph. 11. Habit, ventral view. 12. Leaf, ventral view. 13. Marginal cells of leaf. 14, 15. Lobules. 16. Median cells of leaf. Figures 17-21. *Drepanolejeunea campanulata* (Spruce) Steph. 17. Habit, ventral view. 18. Leaf, dorsal view. 19. Leaf, ventral view. 20. Median cells of leaf. 21. Underleaf. (Bars = Fig. 11: 600 µm; Fig. 12: 200 µm; Fig. 17: 100 µm; Fig. 13,14,15,18,19: 48 µm; Fig. 21: 30 µm; Fig. 16,20: 20 µm).



Figures 22-30. 22-26. *Drepanolejeunea crucianella* (Tayl.) A. Evans. 22. Habit, ventral view. 23. Leaf, ventral view. 24. Leaf, dorsal view. 25. Median cells of leaf. 26. Underleaf. Figures 27-30. *Harpalejeunea tridens* (Besch. & Spruce) Steph. 27. Habit, ventral view. 28. Leaf, dorsal view. 29. Detailed gametophyte, ventral view. 30. Median cells of leaf. (Bars: Fig. 22: 200 µm; Fig. 23,24,28,29: 48 µm; Fig.25,26,30: 20 µm; Fig. 27: 168 µm).

Material examined: **BRAZIL**. **Alagoas**: Murici, 2/XII/2004, Pôrto (UFP 45849); ib. 25/III/2006, *Alvarenga* (UFP 45846); ib. 25/III/2006, *Alvarenga* (UFP 45847); ib. 25/III/2006, *Alvarenga* (UFP 45848).

Description: Evans (1902), as *Harpalejeunea heterodonta* A. Evans.

Comments: this species has leaf margins typically crenate, with an acute to piliferous apex that ends in a row of 3-4 cells; there is also one or more additional teeth along the dorsal margin. This species was found growing on bark and leaves in lowland rain forests. In Brazil it was previously referred only to São Paulo, in the Southeast region. It occurred on bark and decaying wood in the understory, sub-canopy and canopy at EsEc Murici.

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