



## SERRA DO CURICURIARI, AMAZONAS STATE, BRAZIL: THE FIRST BRYOFLORESTIC ANALYSIS FOR A BRAZILIAN MOUNTAIN IN THE AMAZONIAN FOREST

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### Abstract

This study aims to investigate the richness of mosses and liverworts at Serra do Curicuriari, in the Amazonas State, Brazil. The study area and the bryophytes were collected in 1979, during a botanical expedition of the “Projeto Flora Amazônica”, in different types of vegetation. In total, 36 families, 99 genera, and 234 species were recorded (158 liverworts and 76 mosses). A considerable number of floristic novelties are reported: nine species are new records to Brazil; 31 species are new records to northern Brazil; and 14 species are new records for Amazonas State. Over 48% of the bryophytes have a Neotropical distribution, about 8% are Afro-American and Pantropical, and only 3% are endemic (five liverworts and two mosses). The results represent an increase in knowledge of the Brazilian bryoflora, being relevant for the conservation of bryophyte diversity in the Amazon Forest, and representing a contribution toward the targets of the Global Strategy for Plant Conservation.

**Key words:** Liverworts, Mosses, Amazon mountain, Brazil

### Introduction

This paper presents results of a bryological inventory of the Serra do Curicuriari, São Gabriel da Cachoeira County, Amazonas State, in 1979. The exploration took place as part of the inventories of the “Projeto Flora Amazônica” and was done by the following bryologists, W. R. Buck (New York Botanical Garden), R. M. Schuster (University of Massachusetts) and Olga Yano (Instituto de Botânica de São Paulo).

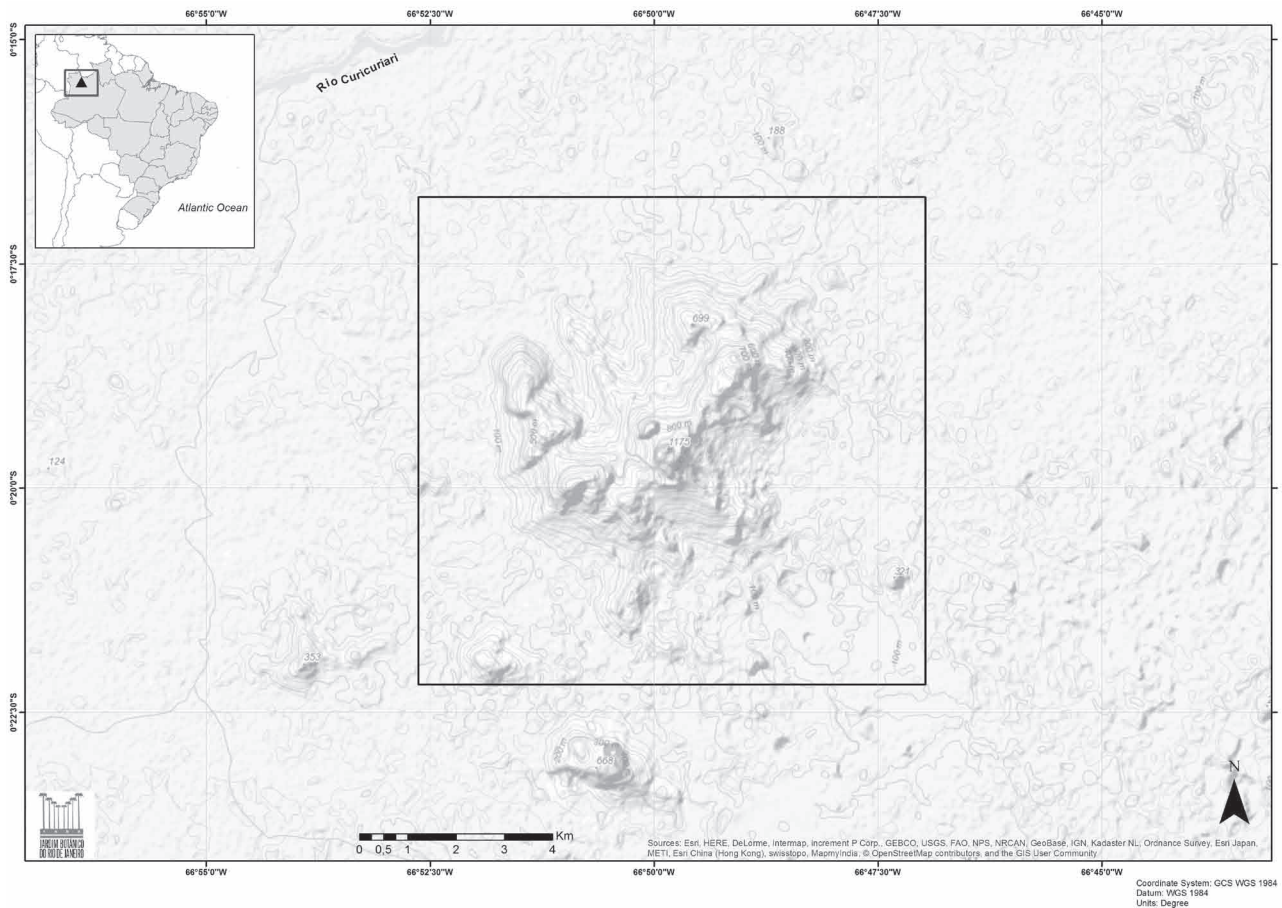
The Serra de Curicuriari, also known as “Serra da Bela Adormecida”, is located between the Curicuriari and Marié rivers in the county of São Gabriel da Cachoeira, in the Middle Rio Negro, Amazonas State. The region is part of the formation of the Guyana Shield and has different types of forests, *campinarana* and lowland land (50–100 m), sub-montane (100–500 m), montane (500–1000 m), and upper montane (1000–1400 m). Several species of cryptogams are known only in this region of the Serra de Curicuriari in the Upper Rio Negro (**Fig. 1**).

The collection at Serra do Curicuriari was done during the 1979 expedition at altitudes of 0–450 m, and the samples are mainly housed at FM, NY, and SP herbaria. To date, all the mosses have been identified, but many of the liverworts still lack identifications. This paper is the first to present the results of one bryological expedition to one mountain of the Amazon Forest in Brazil.

The Amazon domain in Brazil shelters a great diversity of bryophytes in the country, and currently 188 genera and 570 species of bryophytes are recorded for the Amazon forest. The Amazon Rainforest is the second largest domain in terms of numbers of species after the Atlantic Rainforest, 379 genera and 1337 species (Costa & Peralta 2015). Several floristic surveys of the bryophytes of Amazon Rainforest have been published, Griffin (1979), Lisboa (1976, 1984, 1985, 1994), Lisboa & Ilkiu-Borges (1997), Lisboa & Maciel (1994), Santiago (1997), Ilkiu-Borges *et al.* (2004a,b,c),

Moraes & Lisboa (2005), Zartman & Ilkiu-Borges (2007), Yano (1992), Yano & Câmara (2004). However, until now there has been no study published on the bryoflora of the Amazon mountains in Brazil.

The aims of this paper are to provide an overview of the bryophyte flora of Serra do Curicuriari, incorporating new reports of bryophyte taxa, and analyzing the distribution of the bryophytes. It is the first effort to contribute to the information about bryophytes in the northern Amazon mountain forest in Brazil.



**FIGURE 1.** Location of the Serra do Curicuriari, Amazonas State, Brazil.

## Amazon Plant Project

The Programa Flora was created in 1975 by the CNPq (Brazilian National Science Foundation), and one of the five Brazilian regions, the Amazon Region (Projeto Flora Amazônica), was selected to start the project. The goal was to conduct a basic survey of the vegetation, through inventories and intensive collecting in little-known areas. A total of 26 expeditions were organized in the Amazon Forest and approximately 47,000 samples were gathered (MCT/CNPq 1987). One of the expeditions was carried out in the localities of the Rio Negro and Serra Curicuriari, followed by a survey of the Uamatã River and Represa Balbina region, in the period from June to September of 1979, having the researchers William R. Buck and Rudolph M. Schuster (American bryologists—**Fig. 2**) and Olga Yano (Brazilian bryologist).

According to Crum & Buck (1992), in the beginning (1977), the *Projeto Flora Amazônica* was initiated as a program of systematic collecting making use of specialists in vascular plants, bryophytes, fungi, and lichens. Over 5,000 bryophyte collections were made in the region (Prance *et al.*, 1984), and the fifth expedition (1979) included the bryologists William R. Buck (U.S.A.), Rudolf M. Schuster (U.S.A.), and Olga Yano (Brazil). This expedition, moving up the Rio Negro from Manaus to São Gabriel da Cachoeira by ship, emphasized riverside habitats, except for a trek to the summit of Serra Curicuriari, an isolated granitic outlier of the Guayana Highland, and a region considered rich in species of higher plants (Ducke, 1938). Recently, though, Lisboa & Yano (1987) reported a number of mosses new to Amazonian Brazil on the basis of Buck's collections from Serra Curicuriari.



**FIGURE 2.** Photo of R. M. Schuster in the field at Serra do Curicuriari (photograph by W. R. Buck).

### **The Field Museum Project**

In 2015, The Field Museum invited specialists to identify bryophytes from tropical America, and the first author was invited to identify liverwort collections made by Rudolph Schuster in 1979, in Serra do Curicuriari, Amazonas State, one of the localities in which the “Projeto Flora Amazônica” did inventories. Then we added the data of the moss collections done by William R. Buck (New York Botanical Garden) and Olga Yano (Instituto de Botânica de São Paulo) in the same inventory and housed at NY and SP, respectively. Both liverwort and moss collections have duplicates housed at NY and SP, and for some liverwort collections it was necessary to check identifications.

### **Bryology in the Amazon**

According to Mota (2010), bryophyte surveys in the lowland Amazon forest have taken place mostly in Brazil, while in the Amazonian-Andean countries the studies have primarily concentrated on the species-rich montane and sub-montane bryoflora, giving the following literature for Colombia (Uribe & Gradstein 1998; Pinzón *et al.* 2003; Benavides *et al.* 2006); Bolivia (Fuentes & Muñoz 2002; Gradstein *et al.* 2003; Acebey *et al.* 2003); Ecuador (Churchill 1994; León-Yáñez *et al.* 2006); Peru (Menzel 1984; Menzel & Schultze-Motel 1992; Majestyk & Janovec 2011); Guyana, Suriname and French Guiana (Florschütz-de Waard & Bekker 1987; Florschütz-de Waard 1990; Boggan *et al.* 1992; Buck 2003).

In Brazil, inventories started in the 1970s and a great number were carried out in eastern Amazon, in the surroundings of Belém and Ilha do Marajó (Lisboa 1984, 1985; Lisboa 1994; Lisboa & Ilkiu-Borges 1997; Lisboa & Maciel 1994); while inventories in the Serra dos Carajás and scattered localities in the south of Pará initiated information available from southeastern Amazonian (Ilkiu-Borges *et al.* 2004a,b,c; Moraes & Lisboa 2005); and in central Amazonia, they are concentrated in *terra firme* forests and *campinarana* (Lisboa 1976; Griffin III 1979; Zartman & Ilkiu-Borges 2007), or *terra firme* and savanna forest in the State of Roraima (Yano 1992; Santiago 1997). For the mountains of Brazilian Amazonia there are no inventories, beyond this survey done in 1979 in the “Projeto Flora Amazônica”.

## Material and Methods

The samples of liverworts housed at F were identified to species level based on the literature (Fulford 1966–1978; Gradstein & Costa 2003; Gradstein & Ilkiu-Borges 2009; Gradstein *et al.* 2001; Zartman & Ilkiu-Borges 2007; Pócs *et al.* 2014), and the identifications of Curicuriari liverworts housed at NY were updated. Shortly after the 1979 expedition, Buck divided all the Schuster collections (including his “micropackets” of particularly interesting material) so that a full set would remain at NY. However, through time, the NY collection was partially determined by both staff and visiting bryologists, whereas the Schuster set (i.e., that currently at the Field Museum) remained untouched.

The Curicuriari mosses housed at NY and SP were only updated as they were identified. A total of 500 samples of liverworts from Field Museum herbarium (F) were recently studied and 175 samples of mosses from NY and 72 from SP were already identified, needing just to be updated.

## Results and discussion

The bryophyte species of Serra do Curicuriari are listed in Table 1. A total of 234 bryophyte species in 99 genera and 36 families are listed. Liverworts are represented by 14 families in 55 genera and 158 species. The most common families in terms of numbers of species for liverworts were the Lejeuneaceae (104 species), Lepidoziaceae (16), and Plagiochilaceae (11), together accounting for 55% of the total species number.

As expected the family Lejeuneaceae presents the highest number of species (104 species, or 44% of total species number), with *Lejeunea* Libert (1820: 372) (15 species), *Cololejeunea* (Spruce 1884: 291) Stephani (1891: 208–209) (10 spp.), *Cheilolejeunea* (Spruce 1884: 251) Stephani (1890: 284) (9 spp.), and *Ceratolejeunea* (Spruce 1884: 198) Jack & Stephani (1892: 16) (5 spp.) being the most representative genera. There are ca. 50 species on living leaves, as is expected for lowland vegetation. The dominance of the family Lejeuneaceae is a typical pattern for tropical forests.

Mosses are represented by 22 families in 42 genera and 76 species, of which the most important were Calymperaceae (17 species), Pilotrichaceae (13 species), Dicranaceae (7 species), and Sematophyllaceae (6 species), accounting for 18% of the total number of moss species. These families are among the most common in tropical America (Gradstein *et al.* 2001) and for the Amazon domain in Brazil (Costa & Peralta 2015), but the family Fissidentaceae (4 species) that is very common in the Amazon Forest is not well-represented in Serra do Curicuriari. Families like Pottiaceae and Bryaceae appear poorly represented.

Most of the bryophyte taxa are Neotropical elements (49%), following by the Afro-American and Pantropical elements (8% each), Worldwide and North South American elements (6% and 5%, respectively), Guiana Highlands and Endemic elements (3% each), and others (19%). In general, the geographical distribution of the bryophyte taxa in Serra do Curicuriari agrees with that of other areas in tropical America.

Despite the high diversity of species, the number of endemic species is not high, only seven taxa are considered endemic (*Allorgella schnellii*, *Cheilolejeunea neblinensis*, *Diplasiolejeunea glaziovii*, *Drepanolejeunea palmifolia*, *Prionolejeunea recurvula*, *Sphagnum amazonicum*, and *Sphagnum curicuriariense*), mostly considered rare and restricted to the Amazon Forest.

*Allorgella schnellii* Tixier (1995: 230) was only known from the type specimen from Amazonas (Manaus, *Schnell* 9312), growing on living leaves and it is considered a typical small epiphyllous taxon.

*Cheilolejeunea neblinensis* Ilkiu-Borges & Gradstein (2008: 522) was previously only known from the type locality in Venezuela (Cerro de la Neblina, Dept. Río Negro, Amazonas), growing together with other species of Lejeuneaceae, probably on branches or trunks of trees (Ilkiu-Borges & Gradstein 2008). In the Serra do Curicuriari the species was collected from tree trunks, here cited as the second time for Brazil, from the Middle Rio Negro.

*Diplasiolejeunea glaziovii* Tixier (1985: 27) was, until recently, only known from the type specimen (Glaziou without locality, probably Rio de Janeiro State where he worked in Brazil), and according to Dong *et al.* (2012) may be conspecific with *D. cavifolia* Steph., a species that occurs in Brazil in the Atlantic Rainforest (Costa & Peralta 2015). It grows on tree trunks and is here cited for the first time for the Amazon Forest in the northern region of Brazil.

*Drepanolejeunea palmifolia* (Nees 1833: 366) Schiffner (1893: 126). is a widespread species in Brazil, occurring in the Amazon Forest, *cerrado* (savanna), Atlantic rainforest, and *pantanal* (wetlands), growing on tree trunks, mainly in lowland rain forests, 0–500 m.

**TABLE 1.** Species list of the liverworts and mosses of Serra do Curicuriari, Amazonas State, Brazil. **Bold** = new to northern region (22 liverworts and 9 mosses). \*\*\*= new record to Brazil (seven liverworts and three mosses). ### = Endemic to Brazil (four liverworts and three mosses).

LIVERWORTS (14 families, 55 genera, 158 species)			
FAMILY	SPECIES	VOUCHER	DISTRIBUTION
<b>ANASTROPHYLLACEAE (1/1)</b>	<i>Anastrophyllum piligerum</i> (Nees) Steph.	Schuster 79-15-797 p.p. (F)	Pantropical
<b>ANEURACEAE (1/1)</b>	<i>Riccardia amazonica</i> (Spruce) Schiffl. ex Gradst. & Hekking	Schuster 79-15-551 (F) Schuster 79-15-551 (NY)	Afro-American
<b>CALYPOGEIACEAE (2/6)</b>	<i>Calypogeia laxa</i> Gottsche & Lindenb.	Schuster 79-15-799 p.p. (F)	Neotropical
	<i>Calypogeia peruviana</i> Nees & Mont.	Schuster 79-15-645 p.p. (NY)	Neotropical
	*** <i>Calypogeia</i> cf. <i>rhombifolia</i> (Spruce) Steph.	Schuster 79-15-682 p.p. (F)	Dominica, Colombia, Venezuela, Ecuador, Peru
	<i>Mnioloma nephrostipum</i> (Spruce) R.M.Schust.	Schuster 79-15-636 p.p. (F)	Northern Amazonia, Guayana Highland
	<i>Mnioloma parallelogramma</i> (Spruce) R.M.Schust.	Schuster 79-15-646 p.p. (F) Schuster 79-15-646 p.p. (NY)	Neotropical
	*** <i>Mnioloma venezuelanum</i> (Fulford) R.M. Schust.	Schuster 79-15-645 p.p. (F)	Venezuela
<b>CEPHALOZIACEAE (2/3)</b>	*** <i>Fuscocephaloziopsis crassifolia</i> (Lindenb. & Gottsche) Vaňá & L.Söderstr.	Schuster 79-15-636 p.p., 79-15-646 p.p., 79-15-799 p.p., 79-15-811 p.p. (F); Schuster 79-15-646 p.p. (NY)	Neotropical
	<i>Odontoschisma longiflorum</i> (Taylor) Trevis.	Schuster 79-15-736, 79-15-773, 79-15-816 p.p. (F)	Neotropical
	<i>Odontoschisma variabile</i> (Lindenb. & Gottsche) Trevis.	Schuster 79-15-731 p.p., 79-15-744 p.p., 79-15-745 p.p., 79-15-754 p.p., 79-15-803 p.p. (F)	Worldwide
<b>FRULLANIACEAE (1/4)</b>	<i>Frullania</i> aff. <i>apiculata</i> (Nees) Dumort.	Schuster 79-15-589 p.p., 79-15-794 p.p. (F)	Pantropical
	<i>Frullania caulisequa</i> (Nees) Nees	Schuster 79-15-607 p.p., 79-15-787 (F); Schuster 79-15-787, 79-15-803 p.p. (NY)	Neotropical
	<i>Frullania kunzei</i> (Lehm. & Lindenb.) Lehm. & Lindenb.	Schuster 79-15-796 p.p. (F)	Neotropical
	<i>Frullania</i> sp.	Schuster 79-15-592 p.p. (F)	
<b>HERBERTACEAE (1/1)</b>	<i>Herbertus bivittatus</i> Spruce	Buck 2447 (NY); Schuster 79-15-797 p.p. (F)	Neotropical
<b>LEJEUNEACEAE (30/104)</b>	<i>Acrolejeunea emergens</i> (Mitt.) Steph.	Schuster 79-15-564 p.p., 79-15-605 p.p., 79-15-638 p.p. (F)	Neotropical, Africa and India
	<i>Anoplolejeunea conferta</i> (C.F.W.Meissn. ex Spreng.) A.Evans	Schuster 79-15-589 p.p., 79-15-638 p.p., 79-15-669 p.p., 79-15-793, 79-15-794 p.p., 79-15-796 p.p., 79-15-800 p.p., 79-15-812 p.p. (F); Schuster 79-15-793 p.p. (NY)	Neotropical
	<i>Archilejeunea crispistipula</i> (Spruce) Steph.	Schuster 79-15-529 (F)	Amazonia (Brazil, Peru, Colombia, Venezuela), Guyana
	<i>Archilejeunea juliformis</i> (Nees) Gradst.	Schuster 79-15-562 p.p., 79-15-577, 79-15-807 p.p. (F)	Costa Rica and South America
	<i>Archilejeunea</i> cf. <i>juliformis</i> (Nees) Gradst.	Schuster 79-15-749 (F)	Costa Rica and South America
	<i>Archilejeunea ludoviciana</i> subsp. <i>porelloides</i> (Spruce) Gradst.	Schuster 79-15-733 p.p., 79-15-739 p.p., 79-15-743 p.p., 79-15-748, 79-15-752, 79-15-758, 79-15-765, 79-15-767, 79-15-781 p.p., 79-15-833 (F); Schuster 79-15-733 p.p., 79-15-742 p.p., 79-15-743 p.p., 79-15-758 p.p. (NY)	Northern South America (Brazil, Venezuela, Ecuador, Peru)

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TABLE 1. (Continued)

FAMILY	SPECIES	VOUCHER	DISTRIBUTION
	<i>Archilejeunea</i> sp.	Schuster 79-15-747 p.p. (F)	
	<i>Bryopteris filicina</i> (Sw.) Nees	Buck 2473, 2495 (NY); Schuster 79-15-527, 79-15-540, 79-15-567 p.p., 79-15-647 p.p., 79-15-712 (F)	Neotropical
	<i>Ceratolejeunea confusa</i> R.M.Schust.	Schuster 79-15-615 p.p., 79-15-739 p.p. (F)	Costa Rica, West Indies, Chocó, Brazil (Amazon Basin)
	<i>Ceratolejeunea cornuta</i> (Lindenb.) Steph.	Schuster 79-15-568 p.p., 79-15-569, 79-15-617 p.p., 79-15-641 p.p., 79-15-672 p.p., 79-15-732 p.p., 79-15-768 p.p., 79-15-774 p.p., 79-15-784, 79-15-594 p.p., 79-15-605 p.p., 79-15-614 p.p., 79-15-629 p.p., 79-15-633 p.p., 79-15-643 p.p., 79-15-673 p.p., 79-15-674 p.p., 79-15-731 p.p., 79-15-741, 79-15-744 p.p., 79-15-772 p.p., 79-15-800 p.p., 79-15-812 p.p., 79-15-824 p.p. (F); Schuster 79-15-729 p.p., 79-15-798 p.p. (NY)	Neotropical
	<i>Ceratolejeunea cubensis</i> (Mont.) Schiffn.	Schuster 79-15-640, 79-15-733 p.p., 79-15-754 p.p. (F)	Neotropical
	<i>Ceratolejeunea laetefusca</i> (Austin) R.M.Schust.	Schuster 79-15-539, 79-15-542, 79-15-549, 79-15-603, 79-15-675, 79-15-530 p.p. (F)	Neotropical
	<i>Ceratolejeunea</i> sp.	Schuster 79-15-588 p.p., 79-15-598 p.p., 79-15-620 p.p., 79-15-709 p.p., 79-15-729 p.p., 79-15-796 p.p., 79-15-798 p.p., 79-15-599 p.p., 79-15-657 p.p. (F)	
	<i>Cheilolejeunea adnata</i> (Kunze ex Lehm.) Grolle	Schuster 79-15-535 p.p., 79-15-674 p.p. (F)	Neotropical
	<i>Cheilolejeunea aneogyna</i> (Spruce) A.Evans	Schuster 79-15-586 (F)	Brazil and Suriname
	<i>Cheilojeunea beyrichii</i> (Lindenb.) M.E.Reiner	Schuster 79-15-791, 79-15-795 p.p., 79-15-804 p.p., 79-15-805 p.p., 79-15-814, 79-15-818 p.p. (F)	Neotropical
	<i>Cheilolejeunea fragrantissima</i> (Spruce) R.M.Schust.	Schuster 79-15-809 (F)	Northern South America
	<i>Cheilolejeunea holostipa</i> (Spruce) Grolle & R.L.Zhu	Schuster 79-15-589 p.p. (F); Schuster 79-15-589 p.p. (NY)	Neotropical
	### <i>Cheilolejeunea neblinensis</i> Ilk.- Borg. & Gradst.	Schuster 79-15-705 (F)	Endemic (Neblina mountain)
	<i>Cheilolejeunea</i> cf. <i>rigidula</i> (Mont.) R.M.Schust.	Schuster 79-15-711 (F)	Neotropical and Africa
	<i>Cheilolejeunea trifaria</i> (Reinw., Blume & Nees) Mizut.	Schuster 79-15-560 p.p., 79-15-638 p.p., 79-15-630 p.p. (F)	Pantropical
	<i>Cheilolejeunea</i> sp.	Schuster 79-15-536 p.p. (F)	
	<i>Cololejeunea camillii</i> (Lehm.) A.Evans	Schuster 79-15-572 p.p., 79-15-574 p.p., 79-15-601 p.p., 79-15-644 p.p., 79-15-659, 79-15-661 p.p., 79-15-702 p.p., 79-15-726, 79-15-764 p.p., 79-15-626 (F); Schuster 79-15-581a p.p., 79-15-559 p.p., 79-15-644 p.p., 79-15-702a p.p. (NY)	Neotropical (Mexico to Paraguay and northern Argentina)
	<i>Cololejeunea diaphana</i> A.Evans	Schuster 79-15-584 p.p., 79-15-630 p.p. Schuster 79-15-762 (F)	U.S.A. and Neotropical
	<i>Cololejeunea gracilis</i> (Jovet-Ast) Pócs	Schuster 79-15-625 p.p. (F); Schuster 79-15-644 p.p. (NY)	Neotropical
	<i>Cololejeunea microscopica</i> (Taylor) Schiffn.	Schuster 79-15-699 p.p. (F)	Neotropical and Africa
	<i>Cololejeunea minutissima</i> (Sm.) Steph.	Schuster 79-15-602 p.p. (F)	Pantropical

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**TABLE 1.** (Continued)

FAMILY	SPECIES	VOUCHER	DISTRIBUTION
	<i>Cololejeunea obliqua</i> (Nees & Mont.) Schiffn.	Schuster 79-15-571 p.p., 79-15-581 p.p., 79-15-622 p.p., 79-15-659 p.p., 79-15-665 p.p., 79-15-667 p.p., 79-15-677 p.p., 79-15-702 p.p., 79-15-782 p.p. (F); Schuster 79-15-559 p.p., 79-15-571 p.p., 79-15-702a p.p., 79-15-780 p.p. (NY)	Neotropical
	<i>Cololejeunea platyneura</i> (Spruce) A.Evans	Schuster 79-15-613 p.p., 79-15-622 p.p., 79-15-686 p.p., 79-15-688 p.p., 79-15-692 p.p., 79-15-699 p.p., 79-15-707 p.p., 79-15-709 p.p., 79-15-713 p.p., 79-15-718 p.p. (F)	Pantropical
	*** <i>Cololejeunea pseudofloccosa</i> (Horik.) Benedix	Schuster 79-15-573 p.p. (F)	Indomalaysia
	<i>Cololejeunea surinamensis</i> Tixier	Schuster 79-15-764 p.p., 79-15-771 (F)	Northern South America (Suriname and Brazil)
	<i>Cololejeunea</i> sp.	Schuster 79-15-582 p.p. (F)	
	<i>Colura</i> cf. <i>cylindrica</i> Herzog	Schuster 79-15-676 p.p. (F)	Neotropical
	<i>Colura tortifolia</i> (Nees & Mont.) Trevis.	Schuster 79-15-764 p.p., 79-15-780, 79-15-782 p.p. (F); Schuster 79-15-780 (NY)	Neotropical
	<i>Cyclolejeunea convexistipa</i> (Lehm. & Lindenb.) A.Evans	Schuster 79-15-630 p.p. (F)	Neotropical
	<i>Cyclolejeunea luteola</i> (Spruce) Grolle	Schuster 79-15-776, 79-15-777, 79-15-778 (F); Schuster 79-15-766 p.p. (NY)	Neotropical
	<i>Cyclolejeunea peruviana</i> (Lehm. & Lindenb.) A.Evans	Schuster 79-15-622 p.p., 79-15-672 p.p., 79-15-677a p.p., 79-15-679 p.p., 79-15-699 p.p. (F)	Neotropical
	<i>Dibrachiella parviflora</i> (Nees) X.Q.Shi, R.H.Zhu & Gradst.	Schuster 79-15-557 p.p. (F)	Neotropical
	<i>Diplasiolejeunea brunnea</i> Steph.	Schuster 79-15-564 p.p., 79-15-617 p.p., 79-15-622 p.p., 79-15-692 p.p., 79-15-709 p.p., 79-15-713 p.p. (F)	Neotropical
	<b>Diplasiolejeunea cavifolia</b> Steph.	Schuster 79-15-592 p.p. (F)	Pantropical
	### <b>Diplasiolejeunea glaziovii</b> Tixier	Schuster 79-15-574 p.p., 79-15-581 p.p., 79-15-584 p.p., 79-15-644 p.p. (F); Schuster 79-15-581a p.p., 79-15-584 p.p. (NY)	Brazil (SE)
	<i>Diplasiolejeunea pellucida</i> (C.F.W.Meissn. ex Spreng.) Schiffn.	Schuster 79-15-573 p.p., 79-15-574 p.p., 79-15-582 p.p., 79-15-584 p.p., 79-15-585 p.p., 79-15-590, 79-15-593 p.p., 79-15-601 p.p., 79-15-621 p.p., 79-15-625 p.p., 79-15-644 p.p., 79-15-661 p.p., 79-15-677 p.p., 79-15-686 p.p., 79-15-688 p.p., 79-15-691 p.p., 79-15-694 p.p., 79-15-702 p.p., 79-15-718 p.p. (F); Schuster 79-15-589 p.p., 79-15-644 p.p. (NY)	Neotropical
	<i>Diplasiolejeunea rudolphiana</i> Steph.	Schuster 79-15-565 (F)	Pantropical
	<i>Drepanolejeunea anoplantha</i> (Spruce) Steph.	Schuster 79-15-785 p.p., 79-15-795 p.p., 79-15-804 p.p., 79-15-812 p.p. (F)	West Indies, tropical South America
	<i>Drepanolejeunea bidens</i> (Prantl.) A.Evans	Schuster 79-15-807 p.p. (F); Schuster 79-15-807 p.p. (NY)	Neotropical
	<b>Drepanolejeunea biocellata</b> A.Evans	Schuster 79-15-592 p.p., 79-15-819 p.p., 79-15-585 p.p. (F); Schuster 79-15-589 p.p. (NY)	Neotropical
	<i>Drepanolejeunea</i> cf. <i>inchoata</i> (C.F.W.Meissn.) Steph.	Schuster 79-15-584 p.p. (NY)	Neotropical (mountains)
	<b>Drepanolejeunea lichenicola</b> (Spruce) Steph.	Schuster 79-15-617 p.p., 79-15-630 p.p., 79-15-819 p.p. (F)	Neotropical

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TABLE 1. (Continued)

FAMILY	SPECIES	VOUCHER	DISTRIBUTION
	### <i>Drepanolejeunea palmifolia</i> (Nees) Schiffn.	Schuster 79-15-750 p.p., 79-15-756 p.p., 79-15-788 p.p., 79-15-801 p.p., 79-15-803 p.p., 79-15-816 p.p. (F); Schuster 79-15-801 p.p. (NY)	Brazil (common in Amazonas)
	<i>Drepanolejeunea polyrhiza</i> (Nees) Grolle & R.L.Zhu	Schuster 79-15-664 p.p., 79-15-666, 79-15-667 p.p., 79-15-676 p.p., 79-15-677a p.p., 79-15-679 p.p., 79-15-685 p.p., 79-15-691 p.p., 79-15-708 p.p., 79-15-724 p.p. (F)	Amazonia (French Guiana, Venezuela, Brazil)
	<i>Echinocolea</i> (?)	Schuster 79-15-653a p.p. (F)	
	<i>Harpalejeunea oxyphylla</i> (Nees & Mont.) Steph.	Schuster 79-15-637, 79-15-641 p.p. (F)	Neotropical
	<i>Harpalejeunea stricta</i> (Lindenb. & Gottsche) Steph.	Schuster 79-15-530 p.p., 79-15-607 p.p., 79-15-632 p.p., 79-15-785 p.p. (F)	Neotropical
	<i>Lejeunea adpressa</i> Nees	Schuster 79-15-558, 79-15-572 p.p., 79-15-588 p.p., 79-15-589 p.p., 79-15-606 p.p., 79-15-613 p.p., 79-15-625 p.p., 79-15-686 p.p., 79-15-692 p.p., 79-15-708 p.p., 79-15-709 p.p., 79-15-725, 79-15-541, 79-15-650, 79-15-682 p.p. (F)	Neotropical
	<i>Lejeunea boryana</i> Mont.	Schuster 79-15-700 (F)	West Indies, Venezuela, Guianas, Brazil (Amazonia)
	<i>Lejeunea capensis</i> Gottsche.	Schuster 79-15-688 p.p. (F)	Neotropical and Africa
	<i>Lejeunea controversa</i> Gottsche	Schuster 79-15-611, 79-15-639, 79-15-701 p.p. (F)	Neotropical
	<i>Lejeunea flava</i> (Sw.) Nees	Schuster 79-15-530 p.p., 79-15-630 p.p., 79-15-645 p.p., 79-15-683 p.p. (F); Schuster 79-15-645 p.p. (NY)	Pantropical
	<b><i>Lejeunea cf. grossitexta</i></b> (Steph.) M.E.Reiner & Goda	Schuster 79-15-733 p.p. (F)	Southeastern and southern Brazil, Paraguay and northern Argentina
	<i>Lejeunea obtusangula</i> Spruce	Schuster 79-15-658 p.p., 79-15-715 (F)	Neotropical
	<i>Lejeunea laetevirens</i> Nees & Mont.	Schuster 79-15-781 p.p. (F)	Neotropical
	<i>Lejeunea pterigonia</i> (Lehm. & Lindenb.) Mont.	Schuster 79-15-596 p.p. (F)	Neotropical
	<i>Lejeunea quinque-umbonata</i> Spruce	Schuster 79-15-552, 79-15-697 (F)	Neotropical
	<b><i>Lejeunea raddiana</i></b> Lindenb.	Schuster 79-15-614 p.p., 79-15-597 p.p., 79-15-747 p.p., 79-15-772 p.p. (F)	Southeastern and southern Brazil, Bolivia
	<i>Lejeunea reflexistipula</i> (Lehm. & Lindenb.) Lehm. & Lindenb.	Schuster 79-15-605 p.p., 79-15-668b p.p. (F)	Neotropical, southwards to Argentina
	<i>Lejeunea setiloba</i> Spruce	Schuster 79-15-538, 79-15-548, 79-15-573 p.p., 79-15-574 p.p., 79-15-627 #2 p.p., 79-15-677a p.p., 79-15-719, 79-15-720a, 79-15-722, 79-15-545, 79-15-566 p.p. (F); Schuster 79-15-720 p.p. (NY)	Neotropical
	<b><i>Lejeunea sporadica</i></b> Besch. Et Spruce	Schuster 79-15-633 p.p. (F)	West Indies, Guiana and Brazil
	<i>Lejeunea</i> sp.	Schuster 79-15-564 p.p., 79-15-641 p.p., 79-15-656, 79-15-669 p.p. (F)	
	<i>Leptolejeunea exocellata</i> (Spruce) A.Evans	Schuster 79-15-593 p.p., 79-15-696 p.p. (F)	Neotropical
	<i>Lopholejeunea subfusca</i> (Nees) Schiffn.	Schuster 79-15-535 p.p., 79-15-674 p.p. (F)	Pantropical
	<i>Macrocolura sagittistipula</i> (Spruce) R.M.Schust.	Schuster 79-15-744 p.p., 79-15-751 p.p. (F)	Neotropical

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**TABLE 1.** (Continued)

FAMILY	SPECIES	VOUCHER	DISTRIBUTION
	<i>Mastigolejeunea auriculata</i> (Wilson & Hook.) Schiffn.	Schuster 79-15-761 p.p. (F)	Pantropical
	<i>Mastigolejeunea plicatiflora</i> (Spruce) Steph.	Schuster 79-15-749 (NY)	Northern South America
	<i>Microlejeunea bullata</i> (Taylor) Steph.	Schuster 79-15-638 p.p. (F)	Neotropical
	<i>Neurolejeunea seminervis</i> (Spruce) Schiffn.	Schuster 79-15-740, 79-15-757, 79-15-761 p.p., 79-15-774 p.p. (F)	Amazonia and Central America
	<i>Odontolejeunea lunulata</i> (F.Weber) Schiffn.	Buck 2427 (NY); Schuster 79-15-571 p.p., 79-15-581 p.p., 79-15-601 p.p., 79-15-621 p.p., 79-15-659 p.p., 79-15-664 p.p., 79-15-665 p.p., 79-15-667 p.p., 79-15-676 p.p., 79-15-677 p.p., 79-15-679 p.p., 79-15-682 p.p., 79-15-685 p.p., 79-15-687, 79-15-688 p.p., 79-15-692 p.p., 79-15-694 p.p., 79-15-696 p.p., 79-15-709 p.p., 79-15-713 p.p., 79-15-718 p.p., 79-15-782 p.p. (F); Schuster 79-15-571 p.p., 79-15-581a p.p. (NY)	Neotropical and Africa
	<i>Otigoniolejeunea huctumalcensis</i> (Lindenb. & Gottsche) Y.M.Wei, R.L.Zhu & Gradst.	Schuster 79-15-562 p.p., 79-15-717 p.p. (F); Schuster 79-15-711 (NY)	Neotropical
	### <i>Otolejeunea schnellii</i> (Tixier) R.L.Zhu & M.L.So	Schuster 79-15-584 p.p. (NY)	Endemic, only known from Amazonas State, Manaus
	<i>Prionolejeunea aemula</i> (Gottsche) A.Evans	Schuster 79-15-602 p.p., 79-15-673 p.p., 79-15-657 p.p. (F); Schuster 79-15-597 p.p., 79-15-733 p.p., 79-15-822 (NY)	Neotropical
	<i>Prionolejeunea</i> cf. <i>denticulata</i> (F.Weber) Schiffn.	Schuster 79-15-732 p.p. (F)	Neotropical
	<i>Prionolejeunea muricato-serrulata</i> (Spruce) Steph.	Schuster 79-15-629 p.p. (F)	Neotropical
	### <i>Prionolejeunea recurvula</i> (Spruce) Steph.	Schuster 79-15-643 p.p. (F)	Endemic, only known from the upper Rio Negro (Brazil)
	<i>Prionolejeunea</i> sp.	Schuster 79-15-668a p.p., 79-15-783 (F)	
	<i>Pycnolejeunea contigua</i> (Nees) Grolle	Schuster 79-15-793 p.p. (NY)	Pantropical
	<i>Pycnolejeunea macroloba</i> (Nees & Mont.) Schiffn.	Schuster 79-15-727, 79-15-730, 79-15-734, 79-15-738, 79-15-739 p.p., 79-15-746, 79-15-751 p.p., 79-15-753, 79-15-763, 79-15-768 p.p. (F)	Neotropical
	<i>Pycnolejeunea papillosa</i> Xiao L.	Schuster 79-15-807 p.p. (NY - <b>paratype</b> )	Venezuela (holotype) and Brazil
	<i>Rectolejeunea flagelliformis</i> A. Evans	Schuster 79-15-525 (F) Schuster 79-15-577 (NY)	Neotropical
	<i>Rectolejeunea versifolia</i> (Schiffn.) L. Söderstr. et A. Hagborg	Schuster 79-15-556, 79-15-563, 79-15-589 p.p., 79-15-610, 79-15-632 p.p., 79-15-651, 79-15-714 (F)	Neotropical
	<i>Stictolejeunea squamata</i> (Willd. ex F. Weber) Schiffn.	Schuster 79-15-567 p.p., 79-15-698 p.p., 79-15-658 p.p. (F); Schuster 79-15-539, 79-15-548 (NY)	Neotropical
	<i>Symbiezidium barbiflorum</i> (Lindenb. & Gottsche) A.Evans	Schuster 79-15-737, 79-15-742 (F); Schuster 79-15-733 p.p. (NY)	Neotropical
	<i>Symbiezidium transversale</i> (Sw.) Trevis.	Schuster 79-15-742 p.p., 79-15-737 (NY)	Neotropical
	<i>Symbiezidium</i> sp.	Schuster 79-15-774 p.p. (F)	

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**TABLE 1.** (Continued)

FAMILY	SPECIES	VOUCHER	DISTRIBUTION
	<i>Taxilejeunea serpillifolioides</i> (Raddi) D.P.Costa.	Schuster 79-15-717 p.p. (F)	Neotropical
	<i>Taxilejeunea</i> sp.	Buck 2461 (NY)	
	<i>Thysananthus amazonicus</i> (Spruce) Schifffn.	Schuster 79-15-743 p.p. (F), 79-15-772 p.p. (F); Schuster 79-15-743 p.p., 79-15-758 p.p., 79-15-772 (NY)	Northern South America, Costa Rica, Cuba
<b>LEPIDOZIACEAE (8/16)</b>	*** <i>Bazzania bidens</i> (Gottsche & Lindenb.) Trevis.	Schuster 79-15-788 p.p. (F)	West Indies, Colombia, Venezuela, French Guiana, Peru
	*** <i>Bazzania</i> cf. <i>glaziovii</i> (Gottsche ex Steph.) Fulford	Schuster 79-15-568 p.p., 79-15-811 p.p. (F)	Colombia, British Guiana, Brazil
	<i>Bazzania gracilis</i> (Hampe & Gottsche) Steph.	Schuster 79-15-629 p.p., 79-15-792, 79-15-802, 79-15-824 p.p. (F)	Neotropical
	<i>Bazzania hookeri</i> (Lindenb.) Trevis.	Schuster 79-15-616 p.p., 79-15-622 p.p., 79-15-631 p.p., 79-15-634 p.p., 79-15-735 p.p., 79-15-750 p.p., 79-15-759 p.p., 79-15-769, 79-15-770, 79-15-801 p.p., 79-15-815 p.p., 79-15-816 p.p., 79-15-818 p.p., 79-15-821 (F); Schuster 79-15-622 p.p., 79-15-634 p.p., 79-15-801 p.p., 79-15-815 p.p. (NY)	Neotropical
	<i>Bazzania phyllobola</i> Spruce	Schuster 79-15-804 p.p., 79-15-805 p.p., 79-15-810, 79-15-813 (F)	Northern Andes, Guayana Highland, southern and southeastern Brazil
	<i>Kurzia capillaris</i> (Sw.) Grolle	Schuster 79-15-646 p.p., 79-15-789, 79-15-803 p.p., 79-15-806 (F); Schuster 79-15-646, 79-15-789 (NY)	Neotropical and Africa
	<i>Lepidozia cupressina</i> (Sw.) Lindenb.	Schuster 79-15-641 p.p., 79-15-804 p.p., 79-15-815 p.p., 79-15-817, 79-15-818 p.p. (F); Schuster 79-15-806, 79-15-815 p.p., 79-15-817 (NY)	Neotropical, Africa, western Europe
	<i>Lepidozia inaequalis</i> (Lehm. & Lindenb.) Lehm. & Lindenb.	Schuster 79-15-608, 79-15-622 p.p., 79-15-660, 79-15-824 p.p. (F); Schuster 79-15-622 p.p. (NY)	Northeastern to southern Brazil, Andes (Ecuador, Peru, Bolivia)
	<i>Micropterygium campanense</i> Spruce	Schuster 79-15-635, 79-15-636 p.p., 79-15-756 p.p. (F); Schuster 79-15-636 p.p. (NY)	Neotropical (Venezuela, Peru, Brazil)
	<i>Micropterygium leiophyllum</i> Spruce	Schuster 79-15-766 p.p. (NY)	Colombia, Venezuela, Peru, Bolivia, Brazil
	<i>Micropterygium pterygophyllum</i> (Nees) Trevis.	Schuster 79-15-735 p.p., 79-15-745 p.p., 79-15-755 p.p. (F)	Amazon Basin and southeastern Brazil
	<i>Mytilopsis albifrons</i> Spruce	Schuster 79-15-788 p.p., 79-15-808 (F)	Jamaica, Guayana Highland, northern Andes (Venezuela to Peru), Brazil
	<i>Pteropsiella metzgeriiformis</i> R.M.Schust.	Schuster 79-15-755 p.p., 79-15-759 p.p. (F)	Northern South America
	<i>Telaranea diacantha</i> (Mont.) J.J.Engel & G.L.Merr.	Schuster 79-15-799 p.p., 79-15-811 p.p. (F); Schuster 79-15-811 (NY)	Pantropical
	<i>Telaranea nematodes</i> (Austin) M.Howe	Schuster 79-15-636 p.p. (F); Schuster 79-15-645 p.p. (NY)	Neotropical, Africa, western Europe
	<i>Zoopsisidella integrifolia</i> (Spruce) R.M.Schust.	Schuster 79-15-759 p.p., 79-15-766, 79-15-799 p.p. (F); Schuster 79-15-766 p.p. (NY)	Neotropical

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TABLE 1. (Continued)

FAMILY	SPECIES	VOUCHER	DISTRIBUTION
<b>LOPHOCOLECEAE (4/6)</b>	<i>Cryptolophocolea martiana</i> (Nees) L.Söderstr., Crand.-Stotl. & Stotler	Buck 2474 (NY); Schuster 79-15-555, 79-15-570, 79-15-620 p.p., 79-15-623, 79- 15-645 p.p., 79-15-822 (F); Schuster 79-15-555, 79-15-645, 79-15- 570, 79-15-620, 79-15-623, 79-15-822 (NY)	Neotropical and Africa
	<i>Heteroscyphus combinatus</i> (Nees) Schiffn.	Schuster 79-15-629 p.p. (F)	Neotropical
	<i>Leptoscyphus porphyrius</i> (Nees) Grolle	Schuster 79-15-790 (F); Schuster 79-15- 790 p.p. (NY)	Neotropical
	<i>Lophocolea bidentata</i> (L.) Dumort.	Buck 2507 (NY); Schuster 79-15-609, 79- 15-648, 79-15-653, 79-15-684 (F); Schuster 79-15-648, 79-15-653 p.p., 79- 15-684 (NY)	Worldwide
	<i>Lophocolea liebmanniana</i> Gottsche	Schuster 79-15-595 (F); Schuster 79-15- 595 (NY)	Neotropical
<b>MARCHANTIACEAE (1/1)</b>	<i>Lophocolea</i> sp.	Schuster 79-15-544, 79-15-668b p.p. (F)	
	<i>Dumortiera hirsuta</i> (Sw.) Nees	Schuster 79-15-533, 79-15-537 (F)	Worldwide
<b>METZGERIACEAE (1/4)</b>	<i>Metzgeria albinea</i> Spruce	Schuster 79-15-560 p.p. (F)	Pantropical
	<i>Metzgeria ciliata</i> Raddi	Schuster 79-15-566 p.p., 79-15-606 p.p., 79-15-682 p.p. (F)	Pantropical
	<i>Metzgeria leptoneura</i> Spruce	Schuster 79-15-594 p.p., 79-15-598 p.p., 79-15-668a p.p. (F)	Worldwide
<b>PALLAVICINIACEAE (1/1)</b>	<i>Metzgeria myriopoda</i> Lindb.	Schuster 79-15-647 p.p. (F)	Neotropical
	<i>Symphyogyna brasiliensis</i> (Nees) Nees & Mont.	Schuster 79-15-547 (F)	Pantropical
<b>PLAGIOCHILACEAE (1/11)</b>	<i>Plagiochila adianthoides</i> (Sw.) Lindenb.	Schuster 79-15-624, 79-15-652, 79-15- 655, 79-15-706 p.p. (F); Schuster 79-15- 615 p.p., 79-15-624, 79-15-652, 79-15-790 p.p. (NY)	Neotropical
	<i>Plagiochila disticha</i> (Lehm. & Lindenb.) Lindenb.	Schuster 79-15-528, 79-15-649, 79-15- 663, 79-15-668b p.p., 79-15-671, 79-15- 704, 79-15-716, 79-15-729 p.p., 79-15- 775, 79-15-779, 79-15-786 (F); Schuster 79-15-528, 79-15-579, 79-15-591 p.p., 79-15-649, 79-15-671, 79-15-689, 79-15-704, 79-15-729 p.p., 79-15-775, 79- 15-779, 79-15-786 (NY)	Neotropical
	<i>Plagiochila cf. gymnocalycina</i> (Lehm. & Lindenb.) Mont. & Nees	Schuster 79-15-824 p.p. (F)	Neotropical
	<i>Plagiochila montagnei</i> Nees	Schuster 79-15-604 p.p., 79-15-689, 79- 15-698 p.p., 79-15-820 p.p. (F); Schuster 79-15-820 p.p. (NY)	Neotropical
	<i>Plagiochila crispabilis</i> Lindenb.	Schuster 79-15-526 p.p., 79-15-596 p.p., 79-15-612, 79-15-618 (F); Schuster 79-15- 526 p.p., 79-15-612, 79-15-618 (NY)	Neotropical
	<i>Plagiochila patula</i> (Sw.) Lindenb.	Schuster 79-15-553 p.p. (F); Schuster 79- 15-591 p.p. (NY)	Neotropical
	<i>Plagiochila raddiana</i> Lindenb.	Schuster 79-15-690 p.p. (NY)	Neotropical
	<i>Plagiochila rutilans</i> Lindenb.	Schuster 79-15-550, 79-15-567 p.p., 79- 15-576, 79-15-634 p.p., 79-15-668a p.p., 79-15-683 p.p., 79-15-690, 79-15-695 p.p., 79-15-701 p.p., 79-15-710, 79-15-798 p.p. (F); Schuster 79-15-550 p.p., 79-15-576, 79-15-587, 79-15-634 p.p., 79-15-690 p.p., 79-15-710, 79-15-786 p.p., 79-15-798 p.p. (NY)	Neotropical

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**TABLE 1.** (Continued)

FAMILY	SPECIES	VOUCHER	DISTRIBUTION
	<i>Plagiochila simplex</i> (Sw.) Lindenb.	Schuster 79-15-641 p.p., 79-15-615 p.p., 79-15-631 p.p.), 79-15-820 p.p. (F); Schuster 79-15-615 p.p., 79-15-820 p.p. (NY)	Neotropical
	<i>Plagiochila subplana</i> Lindenb.	Buck 2468, 2489 (NY); Schuster 79-15-526 p.p., 79-15-534, 79-15-554, 79-15-599 p.p., 79-15-604 p.p., 79-15-619, 79-15-643 p.p., 79-15-693, 79-15-597 p.p., 79-15-695 p.p., 79-15-698 p.p., 79-15-703, 79-15-720 (F); Schuster 79-15-526 p.p., 79-15-534, 79-15-550 p.p., 79-15-554, 79-15-591 p.p., 79-15-597 p.p., 79-15-619, 79-15-683, 79-15-695, 79-15-698 (NY)	Neotropical
	<i>Plagiochila</i> sp.	Schuster 79-15-579 p.p., 79-15-616 p.p. (F)	
RADULACEAE (1/8)	<i>Radula flaccida</i> Lindenb. & Gottsche	79-15-707 p.p., 79-15-708 p.p., 79-15-723 (F)	Neotropical and Africa
	<i>Radula gottscheana</i> Taylor	Schuster 79-15-580 (F)	Neotropical
	<i>Radula javanica</i> Gottsche	Schuster 79-15-530 p.p., 79-15-531, 79-15-543, 79-15-553 p.p., 79-15-557 p.p., 79-15-560 p.p., 79-15-566 p.p., 79-15-578, 79-15-579 p.p., 79-15-588 p.p., 79-15-682 p.p., 79-15-706 p.p. (F); Schuster 79-15-575, 79-15-589 p.p., 79-15-706, 79-15-720 p.p. (NY)	Pantropical
	<i>Radula kegelii</i> Gottsche ex Steph	Schuster 79-15-536 p.p., 79-15-575 (F)	Neotropical reaching southwards to Buenos Aires Prov., Argentina
	<i>Radula mammosa</i> Spruce	Schuster 79-15-681, 79-15-724 p.p. (F)	Neotropical
	<i>Radula</i> aff. <i>recubans</i> Taylor	Schuster 79-15-728 (F)	Tropical and subtropical America
	<i>Radula tectiloba</i> Steph.	Schuster 79-15-699 p.p. (F)	Tropical and subtropical America
	<i>Radula yanoella</i> R.M.Schust.	Schuster 79-15-627, 79-15-627 #2 p.p. (F)	Costa Rica and northern Brazil (Amazonas)
<b>MOSSES</b>			
(22 families, 44 genera, 76 species)			
<b>BRACHYTHECIACEAE (2/2)</b>	<i>Squamidium leucotrichum</i> (Taylor) Broth.	Yano 1877 (SP)	Neotropical
	<i>Zelometeorium patulum</i> (Hedw.) Manuel	Buck 2419 (NY); Yano 1857, 1868 (SP)	Neotropical
<b>BRYACEAE (1/1)</b>	<i>Rosulabryum billardieri</i> (Schwägr.) J.R.Spence	Buck 2434 (NY)	Worldwide
<b>CALYMPERACEAE (4/17)</b>	<i>Calymperes afzelii</i> Sw.	Buck 2421, 2497 (NY)	Pantropical
	<i>Calymperes lonchophyllum</i> Schwägr.	Buck 2438 (NY)	Pantropical
	<i>Calymperes nicaraguense</i> Renault & Cardot	Buck 2504 (NY)	Neotropical
	<i>Calymperes othmeri</i> Herzog	Buck 2429 (NY)	South America
	<i>Leucophanes molleri</i> Müll.Hal.	Yano 1900 (SP)	Africa, Central and South America
	<i>Octoblepharum albidum</i> Hedw.	Yano 1824 (SP)	Pantropical
	<i>Octoblepharum cocuiense</i> Mitt.	Buck 2451, 2483, 2534 (NY); Yano 1887, 1893, 1895, 1931 (SP)	Neotropical
	<i>Octoblepharum cylindricum</i> Mont.	Yano 1919, 1921 (SP)	Neotropical
	<i>Octoblepharum pulvinatum</i> (Dozy & Molk.) Mitt.	Buck 2456, 2541 p.p. (NY); Yano 1850, 2543 (SP)	Neotropical

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**TABLE 1.** (Continued)

FAMILY	SPECIES	VOUCHER	DISTRIBUTION
	<i>Octoblepharum stramineum</i> Mitt.	Yano 1891 (SP)	Neotropical
	<i>Syrrhopodon flexifolius</i> Mitt.	Buck 2442 (NY); Yano 1926 (SP)	Neotropical
	<i>Syrrhopodon helicophyllus</i> Mitt.	Yano 1920 (SP)	Neotropical
	<i>Syrrhopodon hornschuchii</i> Mart.	Buck 2446 (NY)	Neotropical
	<i>Syrrhopodon lepreurii</i> Mont.	Buck 2450, 2454, 2464, 2465 (NY); Yano 1891 (SP)	Neotropical
	<i>Syrrhopodon prolifer</i> Schwägr.	Buck 2482 (NY)	Pantropical
	<i>Syrrhopodon rupestris</i> Mitt.	Buck 2449 (NY); Yano 1892 (SP)	Neotropical
	<i>Syrrhopodon simmondsi</i> Steere	Yano 1927 (SP)	Neotropical
<b>DALTONIACEAE (1/1)</b>	<i>Leskeodon auratus</i> (Müll.Hal.) Broth.	Buck 2481 (NY)	Neotropical
<b>DICRANACEAE (4/7)</b>	<i>Campylopus richardii</i> Brid.	Buck 2448 (NY)	Worldwide
	<i>Holomitrium arboreum</i> Mitt.	Yano 1875 (SP)	Neotropical
	<i>Leucobryum crispum</i> Müll.Hal.	Buck 2558 (SP)	Neotropical
	*** <i>Leucobryum laevifolium</i> Broth.	Buck 2441 p.p. (NY, SP)	Venezuela and Brazil
	<i>Leucobryum martianum</i> (Hornsch.) Hampe ex Müll.Hal.	Buck 2460, 2503 (NY, SP), 2511, 2558 (SP); Yano 1888, 1925, 1928 (SP)	Neotropical
	<i>Leucoloma tortellum</i> (Mitt.) A.Jaeger	Yano 1902 (SP)	Neotropical
	*** <i>Ochrobryum stenophyllum</i> Besch.	Yano 1844 (SP)	Africa, Central and South America
<b>DIPHYSICIACEAE (1/1)</b>	<i>Diphyscium ulei</i> Müll.Hal.	Buck 2490 (NY)	Worldwide
<b>FISSIDENTACEAE (1/4)</b>	<i>Fissidens hornschuchii</i> Mont.	Buck 2476 (NY)	Neotropical
	<i>Fissidens inaequalis</i> Mitt.	Buck 2475 (NY)	Neotropical
	<i>Fissidens pallidinervis</i> Mitt.	Buck 2492 (NY); Yano 1851, 1853 (SP)	Worldwide
	<i>Fissidens pellucidus</i> Hornsch.	Buck 2426 (NY); Yano 1930 (SP)	Worldwide
<b>HOOKERIACEAE (1/1)</b>	<i>Crossomitrium patrisiae</i> (Brid.) Müll.Hal.	Schuster 79-15-665 p.p., 79-15-682 p.p. (F); Yano 1912, 1929 (SP)	Neotropical
<b>HYPNACEAE (3/3)</b>	<i>Chryso-hypnum diminutivum</i> (Hampe) W.R.Buck	Yano 1915 (SP)	Neotropical
	<i>Phyllodon truncatulus</i> (Müll.Hal.) W.R.Buck	Buck 2457, 2496, 2502 (NY); Yano 1894 (SP)	Africa, Central and South America
	<i>Vesicularia vesicularis</i> (Schwägr.) Broth.	Yano 1904 (SP)	Neotropical
<b>LEUCOMIACEAE (1/1)</b>	<i>Leucomium strumosum</i> Spruce ex Mitt.	Buck 2493 (NY); Yano 1854 (SP)	Africa, Central and South America
<b>METEORACEAE (1/1)</b>	<i>Meteorium deppei</i> (Hornsch. ex Müll.Hal.) Mitt.	Buck 2452 (NY)	Neotropical
<b>NECKERACEAE (2/3)</b>	<i>Neckeropsis undulata</i> (Hedw.) Reichardt	Buck 2470 (NY); Yano 1835, 1909, 1917 (SP)	Neotropical
	*** <i>Porotrichum lancifrons</i> (Hampe) Mitt.	Yano 1830 (SP)	Neotropical
	<i>Porotrichum substriatum</i> (Hampe) Mitt.	Buck 2440 (NY); Yano 1842 (SP)	Africa, Central and South America
<b>ORTHOTRICHACEAE (1/1)</b>	<i>Groutiella wagneriana</i> (Müll.Hal.) H.A.Crum & Steere	Yano 1820 (SP)	Neotropical
<b>PILOTRICHACEAE (7/13)</b>	<i>Brymela parkeriana</i> (Hook. & Grev.) W.R.Buck	Buck 2463 (NY); Yano 1868, 1869, 1870, 1872 (SP)	Northern South America
	### <i>Callicostella microcarpa</i> Åongstr.	Schuster 79-15-653 p.p. (NY)	<b>Brazil</b>
	<i>Callicostella rufescens</i> (Mitt.) A.Jaeger	Yano 1936 (SP)	Neotropical
	<i>Hypnella cymbifolia</i> (Hampe) A.Jaeger	Yano 1914 (SP)	Northern South America
	<i>Lepidopilum amplirete</i> (Sull.) Mitt.	Yano 1883 (SP)	Neotropical
	<i>Lepidopilum brevifolium</i> Mitt.	Yano 1831 (SP)	Northern South America
	<i>Lepidopilum pallidonitens</i> (Müll. Hal.) Paris	Yano 1834 (SP)	Northern South America

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**TABLE 1.** (Continued)

FAMILY	SPECIES	VOUCHER	DISTRIBUTION
	<i>Lepidopilum polytrichoides</i> (Hedw.) Brid.	Buck 2422, 2472 (NY); Yano 1859 (SP)	Neotropical
	<i>Lepidopilum scabrisetum</i> (Schwägr.) Steere	Buck 2478, 2487 (NY)	Neotropical
	<i>Lepidopilum tortifolium</i> Mitt.	Buck 2506 (NY); Yano 1847 (SP)	Neotropical
	<i>Pilotrichum evanescens</i> (Müll.Hal.) Crosby	Buck 2423 (NY)	Neotropical
	<i>Thamniopsis cruegeriana</i> (Müll. Hal.) W.R. Buck	Buck 2466 (NY)	Northern South America
	<i>Trachyxiophium saxicola</i> (R.S.Willians) Vaz-Imbassahy & D.P.Costa	Yano 1878 (SP)	Bolivia and Brazil
<b>POTTIACEAE (1/1)</b>	<i>Trichostomum brachydontium</i> Bruch	Yano 1922 (SP)	Worldwide
<b>PTEROBRYACEAE (1/2)</b>	<i>Orthostichopsis praetermissa</i> W.R.Buck	Buck 2453 (NY); Yano 1840, 1901 (SP)	Northern South America
	<i>Orthostichopsis tetragona</i> (Sw. ex Hedw.) Broth.	Buck 2428 (NY); Yano 1860 (SP)	Neotropical
<b>PYLAISIADELPHACEAE (2/3)</b>	<i>Isopterygium tenerum</i> (Sw.) Mitt.	Buck 2469 (NY)	Worldwide
	<i>Isopterygium tenerifolium</i> Mitt.	Yano 1827 (SP)	Neotropical
	<i>Pterogonidium pulchellum</i> (Hook.) Müll.Hal.	Yano 1825 (SP)	Neotropical
<b>RHIZOGONIACEAE (1/1)</b>	<i>Pyrrhobryum spiniforme</i> (Hedw.) Mitt.	Buck 2467 (NY)	Neotropical and Africa
<b>SEMATOPHYLLACEAE (4/6)</b>	<i>Acroporium longirostre</i> (Brid.) W.R.Buck	Yano 1879 (SP)	Neotropical
	<i>Acroporium pungens</i> (Hedw.) Broth.	Buck 2436, 2462 (NY)	Neotropical and Africa
	<i>Sematophyllum subpinnatum</i> (Brid.) E.Britton	Buck 2420, 2484 (NY)	Neotropical and Africa
	<i>Sematophyllum subsimplex</i> (Hedw.) Mitt.	Buck 2479, 2486 (NY); Schuster 79-15- 615 p.p. (NY)	Neotropical and Africa
	<i>Taxithelium planum</i> (Brid.) Mitt.	Buck 2431, 2458, 2471 (NY)	Neotropical
	<i>Trichosteleum papillosum</i> (Hornsch. in Martius) A.Jaeger	Buck 2443 (NY)	Neotropical and Africa
<b>SPHAGNACEAE (1/3)</b>	### <i>Sphagnum amazonicum</i> H.A.Crum & W.R.Buck	Buck 2501 (NY - <b>Holotype</b> ); Yano 1899 (SP)	<b>Brazil</b>
	### <i>Sphagnum curicuriariense</i> H.A.Crum & W.R.Buck	Buck 2500 (NY - <b>Holotype</b> ); Yano 1882, 1890 (SP)	<b>Brazil</b>
	<i>Sphagnum magellanicum</i> Brid.	Yano 1885 (SP)	South America and widely distributed in the Northern Hemisphere
<b>STEREOPHYLLACEAE (1/1)</b>	<i>Pilosium chlorophyllum</i> (Hornsch. in Martius) Müll.Hal.	Buck 2424 (NY); Yano 1849 (SP)	Neotropical, New Zeland and Madagascar
<b>THUIDIACEAE (2/3)</b>	<i>Thuidium delicatulum</i> (Hedw.) Bruch & Schimp.	Buck 2432, 2485, 2498 (NY)	Worldwide
	<i>Thuidium tomentosum</i> Besch.	Buck 2461 (NY); Yano 1829, 1858, 1873, 1898 (SP)	Neotropical
	<i>Pelekium scabrosulum</i> (Mitt.) Touw	Yano 1916, 1923 (SP)	Bolivia and Brazil
<b>TOTAL</b>			
36 families, 99 genera, 234 species			

*Prionolejeunea recurvula* (Spruce 1884: 155) Stephani (1913: 224) was only known from the type specimen from the Upper Rio Negro (São Gabriel da Cachoeira, *Spruce s.n.*), being here cited for the second time to Brazil for the Middle Rio Negro. This species is considered rare and restricted to lowland forests of the Rio Negro in Amazonia.

*Sphagnum amazonicum* Crum & Buck (1992: 449) is only known from the type specimen from Amazonas State: Serra do Curicuriari (Igarapé Arabú of the Rio Curicuriari along the Rio Negro, 00°20'S, 66°50'W, 450 m, growing

in hummock, 9–12 Jul 1979, *W.R. Buck 2501*). It is characterized by branches in fascicles of 3; stem leaves plane or slightly concave; apex rounded-fringed; branch leaves roughened at the back of the apex and bordered; leucocysts with 3 robust ringed pores at adjacent angles and few pores or none at commissures on the outer surface. In Brazil it is considered restricted to the mountains of the Amazon Forest but is expected to be found in the mountains of the Guyana Shield.

*Sphagnum curicuriariense* Crum & Buck (1992: 458) is known from the type specimen from Amazonas State (Rio Negro entre Manaus and São Gabriel, slopes and summit of Serra Curicuriari, from Igarapé Arabú of the Rio Curicuriari to the summit, ca. 450 m at summit, 00°20'S, 66°50'W, pendent from dripping cliff at summit, 9–12 Jul 1979, *W.R. Buck 2500*) and from Roraima State (Serra Parima, south of Auaris, 1200 m, cloud forest, growing on rock amongst roots of Bromeliaceae, 30 Jul 1974, *G.T. Prance, O. Fidalgo, B.W. Nelson & J.F. Ramos 21579, 21596, 21582*). According to Crum & Buck (1992), the pendent habitat is particularly remarkable. The chlorocysts are very narrowly triangular and exposed on the inner surface, and the leucocysts are convex on both surfaces, a characteristic found in a few species of the subgenus *Subsecunda*. In Brazil this species is considered restricted to the Amazon mountains but expected to be found in the mountains of the Guyana Shield.

Together, the 234 bryophyte species of the Serra do Curicuriari comprise an important portion of the total Brazilian bryoflora, accounting for 15% of the total diversity of bryophytes in Brazil (1,524 species), and 41% of the total diversity of bryophytes in the Amazon domain (570 species), according to Costa & Peralta (2015). Furthermore, 30 species were recorded for the first time for the Amazon domain. These results show the importance of studies to increase knowledge of Brazilian bryophytes, and also demonstrates sampling gaps in the Amazonian mountains in Brazil. Similar results were found by Mota de Oliveira *et al.* (2009) and Mota de Oliveira (2010) for the Amazon Forest, a systematic approach to identify community structures of epiphytic bryophytes in a transect from east to west across the Amazon Basin that resulted in the identification of 225 species.

## Conclusions

The bryological inventory of the Serra do Curicuriari, São Gabriel da Cachoeira County, Amazonas State, in 1979, yielded 234 species (158 liverworts, 76 mosses), including a considerable number of novelties, with 31 species new records to northern Brazil (22 liverworts and 9 mosses) and 10 new records to Brazil (seven liverworts and three mosses). As usual in tropical lowland forests, liverworts outnumber mosses in numbers of species and genera, but for families mosses are more numerous (Richards 1983). As observed by Ducke (1938) for the vascular flora, the region also proved to be a very rich area for bryophytes with 41% of the total species of the Amazon Rainforest domain in Brazil, and 15% of the total bryophyte species in Brazil (Costa & Peralta, 2015). The area needs to be well conserved because four species are only known in Brazil from this area. A considerable number of floristic novelties are reported: seven species are new records to Brazil; 31 species are new records to northern Brazil; and 14 species new records to Amazonas State. These results represent a significant increase in knowledge of the Brazilian bryoflora and are relevant for the conservation of bryophyte diversity in the indigenous areas of the Middle Rio Negro, such as Serra do Curicuriari. Seven species are endemic to Brazil, and many other have restricted global ranges (Guiana Highlands and north of South America, seven and twelve species, respectively), and as such the data here represent an important contribution toward the targets of the Global Strategy for Plant Conservation (CDB 2010).

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