

Floristic composition of a Subtropical bog, Eastern Plateau from southern Brazil

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ABSTRACT: This is a comprehensive list of plants and fungi from a bog in the Southern Brazilian Plateau, which may be used as a reference for subtropical marsh flora investigations. The very well preserved bog named Banhado Amarelo (29°19' S, 50°08' W) is located on the eastern Plateau of Rio Grande do Sul, the southernmost state of Brazil. A total of 262 specific and infra-specific taxa were listed, including six macroscopic fungi, 10 lichens, 21 mat forming algae, 57 bryophytes, 12 pteridophytes, two gymnosperms and 154 angiosperms. For every taxon the mode of occurrence in the bog was indicated. The frequency of distinct taxonomic groups among themselves was determined and a general description of the flora of the main bog environments is presented. The number of taxa found in the bog was compared to those obtained in other surveys of bogs of the eastern Plateau from Rio Grande do Sul.

INTRODUCTION

High altitude grasslands, with a mosaic of *Araucaria* forests and bogs, characterize the landscape physiognomy of the higher portions of the easternmost Southern Brazilian Plateau in Rio Grande do Sul state (Planalto das Araucárias, IBGE 1986). The great difference in altitude (about 1000 m) between the eastern highlands, which end abruptly, and the adjacent Coastal Plain leads to a rise of warm and humid air masses on the edge of the Plateau that results in fog formation (Nimer 1989). The total rainfall is between 1750 and 2500 mm per year (IBGE 1986), with an annual mean of 2252 mm (Backes *et al.* 2000), the highest rainfall in Southern Brazil (Nimer 1989). There is no defined dry season, and both the maximum and minimum monthly rainfalls may occur at any time of the year. However, periods with low levels of rainfall are possible (Rambo 1956). The oceanic humidity spreads inward with gradual reduction, but until about 10 km inland it is still high, with typical cool-climate vegetation. The climate of the region is *Cfb* in the Köppen classification (Moreno 1961). The average annual temperature in São Francisco de Paula municipality, eastern Plateau of Rio Grande do Sul, is 14.5°C. The average maximum temperature is 20.9°C, absolute maximum is 34°C, average low temperature is 9.9°C, and absolute minimum is -6.5°C. Negative temperatures can occur between April and November. Frosts are frequent, and during six months the average low temperatures are 10°C or lower. During more intense winters, snow may also occur (Backes 1999).

Bogs play an important role as water reservoirs as they slowly release water to feed creeks, thereby exerting a regulatory action. Organic debris, especially pollen, spores and other palynomorphs, are preserved in the peat, allowing the study of the vegetation and climate of the last millennia (Colditz 1994; Spalding and Lorscheitter 2009; Leonhardt and Lorscheitter 2010).

For a long time, Southern Brazilian bogs have attracted

the interest of researchers, including Ule (1899), who primarily studied bogs mainly in highlands of Santa Catarina state. According to Rambo (1949), perhaps there is no land more rewarding for botanical exploration in the whole of Rio Grande do Sul than the bogs of the eastern edge of the Plateau. Despite this, floristic surveys in these ecosystems have been rare in this State: Rambo (1949; 1956), Pfadenhauer and Boechat (1981) and Silva (2002). Rambo (1949) cited four species of angiosperms, one pteridophyte and one bryophyte for bogs. Rambo (1956) also reported 164 species of angiosperms in bogs of the Plateau of Rio Grande do Sul. A phytosociological study of the Banhado do Camisa bog in Cambará do Sul (Pfadenhauer and Boechat, 1981), revealed 91 species of angiosperms, four pteridophytes and nine bryophytes. For a bog at São José dos Ausentes, Silva (2002) listed 40 species of angiosperms, two pteridophytes and one bryophyte.

Our study focused on the Banhado Amarelo bog, on the eastern Plateau of Rio Grande do Sul (Fortes, 1959). For the first time in Southern Brazil highland bogs, our study listed macroscopic fungi, lichens, mat forming algae, bryophytes, pteridophytes, gymnosperms and angiosperms in order to provide an overview of this ecosystem and its biodiversity.

MATERIALS AND METHODS

Study site

The Banhado Amarelo bog (29°19' S, 50°08' W) is located in São Francisco de Paula municipality, eastern Plateau of the Rio Grande do Sul state. The bog is near the Serra das Pedras Brancas canyons at an altitude of 1003 m (Figure 1). Our study focused on the bog that is part of this wetland and that is 1130 m long and 400 m wide in its central portion. In this bog, the pH varies between 4 and 5. A long and sinuous *Araucaria* forest is found contiguous to the bog on the flat surfaces following along one of its sides. On the other side, the bog is interrupted by a slightly

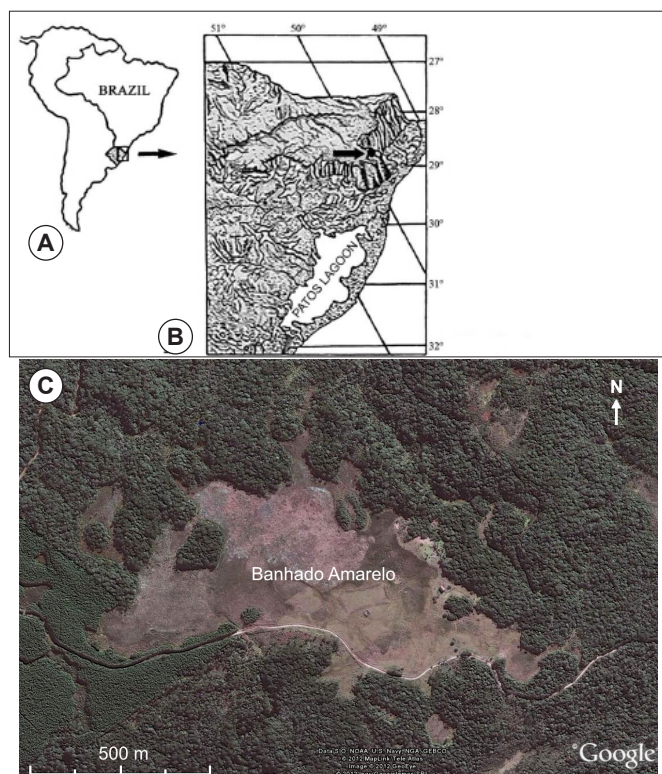


FIGURE 1. A. Map of South America showing Rio Grande do Sul in Southern Brazil; B. Banhado Amarelo location (arrow) on the eastern Plateau; C. Satellite image of the Banhado Amarelo bog (29°19' S, 50°08' W) and its access road. Proximal extremity (left), distal extremity (right).

elevated area, through which a narrow access road runs. Both the forest and the bog are very well preserved, in part due to their great geographic isolation from urban centers. The only influence of exotic species is from the extensive *Pinus* plantations that border part of the wetland and that dangerously threaten the entire ecosystem. Due to restrictive soil conditions – water accumulation, low oxygen level, poor nutrient supply and low pH – the adapted flora that has developed in the bog is characteristic of this ecosystem and independent, to a certain extent, of the regional climate. The slow and incomplete decomposition of plant residues due to the constant water logging in the soil and the subsequent absence of oxygen results in peat, a dark sediment that is rich in organic matter. *Sphagnum* species, the bog mosses, characterize this environment.

Data collection

The floristic survey was conducted for three years through monthly walks along transects running from the margin areas to the interior of the bog, including all types of phyto-physiognomies occurring within the bog. Voucher specimens were deposited in the ICN herbarium (herbarium of the Botany Department, Biosciences Institute, Universidade Federal do Rio Grande do Sul). Botanical identifications were carried out by consulting the ICN herbarium collection, specialized bibliography and various specialists. For families we followed CABI (2011) for fungi, ITIS (2011) for lichens, Bicudo and Menezes (2006) for algae, Gradstein and Costa (2003) for liverworts and hornworts, Tryon and Tryon (1982) for pteridophytes, Bold *et al.* (1987) for gymnosperms and APG III (2009) for angiosperms. We researched valid names in electronic databases of the World checklists: MOBOT (2011) for angiosperms and CABI (2011) and ITIS

(2011) for other groups. Although the specialists could not identify most species of fungi and algae because of their incomplete characteristics, these were included as a not negligible part of the ecosystem.

For every species we indicated its mode of occurrence in the bog: 1. Distributed indistinctly in different areas; 2. Exclusive to or more concentrated in: 2.1. Shrub-dominion; 2.2. Herbaceous-dominion; 2.3. Margin contiguous with the *Araucaria* forest; 2.4. Margin alongside the access road; 2.5. Margin in the proximal extremity (beginning of access road); 2.6. Margin in the distal extremity (end of access road). Rare taxa, generally only collected once, are indicated with the letter “r”.

The frequency of distinct taxonomic groups among themselves was determined and a general description of the flora of the main bog environments is presented. The number of taxa found in the bog was compared to those obtained in other floristic surveys of bogs of the eastern Plateau from Rio Grande do Sul.

RESULTS AND DISCUSSION

A total of 262 specific and infra-specific taxa were listed with their mode of occurrence in the bog (Table 1). The list includes two gymnosperms (1%), six macroscopic fungi (2%), 10 lichens (4%), 12 pteridophytes (5%), 21 mat forming algae (8%), 57 bryophytes (22%) and 154 angiosperms (58%), (Figure 2). Asteraceae, Cyperaceae and Poaceae accounted for 49% of the angiosperms and Asteraceae was the most represented family, corresponding to 23% of the angiosperms (Figure 3).

A general description of the flora of the main environments of the Banhado Amarelo bog is provided below.

Shrub-dominion (2.1)

From near the proximal extremity (beginning of access road) to the center of the bog, there is an extensive area covered by a dense community of *Androtrichum giganteum* (Kunth) H. Pfeiff., which promoted a discontinuous under layer of *Sphagnum recurvum* P. Beauvois due to space reduction and shade (Figure 4). Various shrubby Asteraceae were found in this area and are scattered over the ground, like *Eupatorium gaudichaudianum* DC., one of the most common species, *Symphyopappus compressus* (Gardner) B. L. Rob. and *Vernonia nitidula* Less.

Tall Poaceae species, including *Axonopus ramboi* G. A. Black, *Briza juergensii* Hack., *Festuca ampliflora* Döll, *Paspalum exaltatum* J. Presl and *Stipa sellowiana* Nees ex Trin. and Rupr. are also commonly found here. A small area of *Cortaderia selloana* (Schult. and Schult. f.) Asch. and Graebn. is evident near the *Araucaria* forest (Figure 5).

Aulonemia ulei (Hack.) McClure and L. B. Sm. is found scattered near the proximal extremity. A higher concentration of this species is found further on, in a location where a dense bamboo area is formed (Figure 6), first with well-defined lobed borders, which are interspersed with *Androtrichum giganteum* community, until *Aulonemia ulei* disappears in the middle of the bog. Lichens such as *Usnea elongata* Motika and *Hypotrachyna cf. laevigata* (Sm.) Hale are very common epiphytes on shrubs and bamboo in the area. The shade resulting from the *A. ulei* community and other tall plants, together

with the high humidity of the soil, led to the formation of microhabitats that favor the development of a large number of forest bryophytes, especially *Isopterygium tenerum* (Sw.) Mitt. and Lejeuneaceae and Jubulaceae species that live together at the humid bases of stems and sometimes extend to the soil.

Herbaceous-dominion (2.2)

From the middle of the bog to the distal extremity, *Sphagnum recurvum* greatly dominates (Figure 7), with a continuous and thick coverage on a soil that is wetter than that of the shrub-dominion. In the central zone, *S. recurvum* is frequently covered by a whitish layer of *Cladonia confusa* f. *confusa* R. Sant (Figure 8). Small dark patches of *Gloeotheca* sp. also cover *S. recurvum* and harbor other algae, such as *Tribonema* sp., and liverworts, such as *Cephalozia crassifolia* (Lindb. and Gott.) Fulford, *Cephaloziella subpapillosa* Herzog and *Kurzia capilaris* (Sw.) Grolle.

Polytrichum juniperinum Will. ex Hedw. grows among *S. recurvum* and is joined by *Campylopus filifolius* (Hornsch.) Mitt., *Campylopus reflexisetus* (C. M.) Broth., *Isopterygium tenerum*, lichens such as *Cladonia didyma* (Fée) Vain. and basidiomycetes such as *Hygrocybe miniata* (Fr.) P. Kumm. and *Conocybe* sp.

Drosera communis A. St.-Hil. and *Lycopodiella caroliniana* (Linnaeus) Pichi-Sermolli are also found in this environment. The latter can spread in large areas and

sometimes it is semi-covered by *S. recurvum* (Figure 10). Red portions of *Sphagnum capillifolium* (Ehrh.) Hedw. are also found. Puddles are commonly filled with filamentous algae, especially *Spirogyra* sp. 1 and *Tribonema* sp.

Agarista nummularia (Cham. and Schltdl.) G. Don, *Blechnum imperiale* H. Chr., *Eriocaulon gomphrenoides* Kunth, *Gaylussacia pseudogaultheria* Cham. and Schltdl., *Paepalanthus catharinae* Ruhland, *Utricularia praelonga* A. St.-Hil. and Girard, *Xyris regnelli* Nilsson and *X. teres* Alb. Nilsson are among the most common species in this area. *Achyrocline satureioides* (Lam.) DC. and *Saccharum asperum* (Nees) Steud. are dispersed throughout the habitat. In addition to these species with



FIGURE 4. Shrub-dominion. *Androtrichum giganteum*, *Eupatorium gaudichaudianum* and *Blechnum imperiale*.

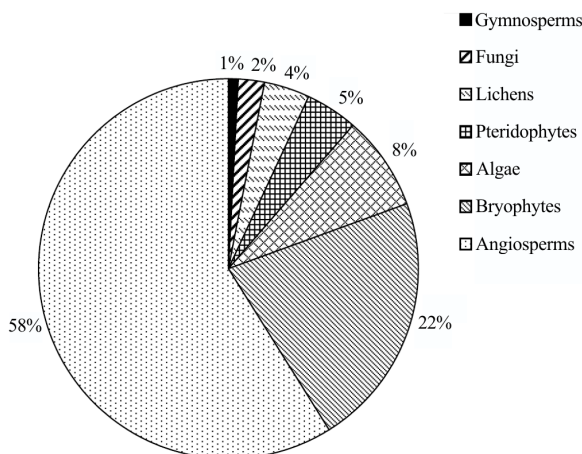


FIGURE 2. Percentage relationships among the taxonomic groups found at the Banhado Amarelo bog, São Francisco de Paula, Rio Grande do Sul, Southern Brazil.

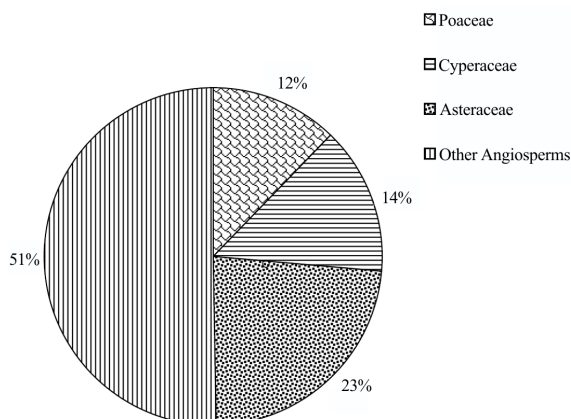


FIGURE 3. Percentage relationships among the principal families of the angiosperm species found in the Banhado Amarelo bog, São Francisco de Paula, Rio Grande do Sul, Southern Brazil.



FIGURE 5. Shrub-dominion. *Androtrichum giganteum*, *Baccharis milleflora*, and a small area of *Cortaderia selloana*.



FIGURE 6. Shrub-dominion. The area of higher concentration of *Aulonemia ulei* in the whole bog.

wide distributions, the area also has various patches of vegetation, such as a small bamboo grouping of *Aulonemia ulei*, a zone of *Rhynchospora brasiliensis* Boeck and other of *Danthonia montana* Döll (Figures 9 and 11). At the humid bases of stems of *Aulonemia ulei* bryophytes and lichens are found, although in lower quantities than those found in the larger bamboo thicket of the shrub-dominion zone. Near the distal extremity of the bog, there is a distinct zone that corresponded to a large concentration of *Senecio pulcher* Hook. and Arn. f. *pulcher* (Figure 12) and another zone densely populated with *Baccharis milleflora* DC. that clearly stands out in the landscape due to its dark green color (Figure 13).



FIGURE 7. Herbaceous-dominion. A continuous cover of *Sphagnum recurvum*, *Saccharum asperum* dispersed and a large area of *Blechnum imperiale*.



FIGURE 8. Herbaceous-dominion. *Cladonia confusa* f. *confusa* patch (whitish layer) and *Polytrichum juniperinum* covering part of *Sphagnum capillifolium* (red). *Agarista nummularia* forming the higher cover.



FIGURE 9. Herbaceous-dominion. Extensive zone of *Rhynchospora brasiliensis* covering *Sphagnum recurvum*. Some white small patches of *Cladonia confusa* f. *confusa* on the first plane.



FIGURE 10. Herbaceous-dominion. A continuous layer of *Sphagnum recurvum* partially covered by white patches of *Cladonia confusa* f. *confusa* and an area of *Lycopodiella caroliniana*, with erect strobili, semi-covered by *S. recurvum*.



FIGURE 11. Herbaceous-dominion. Extensive zone of *Danthonia montana* and *Blechnum imperiale* scattered in the area. Two *Eriocaulon gomphrenoides* plants on the first plane.



FIGURE 12. Herbaceous-dominion. The distinct zone of *Senecio pulcher* f. *pulcher*, with many plants of *Eriocaulon reitzii* and *Eriochrysis holcoides*.



FIGURE 13. Herbaceous-dominion. Densely populated zone of *Baccharis milleflora*.

Margin zones

Along the margin contiguous to the *Araucaria* forest (2.3), the bog was colonized by some forest species, such as *Araucaria angustifolia* (Bertol.) Kuntze, *Dicksonia sellowiana* Hook., *Drimys brasiliensis* Miers, *Fuchsia regia* (Vell.) Munz, *Myrceugenia glaucescens* (Cambess.) D. Legrand and Kausel, *Podocarpus lambertii* Klotzsch ex Endl., *Rapanea gardneriana* (A. DC.) Mez, and *Siphoneugena reitzii* D. Legrand. Among them, *D. brasiliensis* and *P. lambertii* can advance even more, and some specimens are found in more central areas of the shrub-domination zone.

The other margins of the bog – the margin alongside the access road (2.4), the proximal (2.5) and distal (2.6) extremity – had diverse flora, and some swamp species are exclusively found in these zones.

The margin alongside the access road (2.4) is very humid, and its herbaceous flora includes species common to other zones and exclusive species, such as *Achyrocline alata* DC., *Rhynchospora corymbosa* (L.) Britton and *Xyris tenella* Kunth. In a small shallow stream, which flows out of the bog, there are dark patches of *Batrachospermum* sp. and mucilaginous colonies of *Chlorococcum* cf. *infusioformis* (Schrank) Meneghini attached to submerged rocks (Figure 14).

The margin in the proximal extremity (2.5) is rich in species and has taxa such as *Axonopus compressus* (Sw.) P. Beauv., *Baccharis debilei* An. S. de Oliveira and Marchiori, *Brachystele ulaei* (Cogn.) Schltr., *Cyperus hermaphroditus* (Jacq.) Standl., *Emmeorhiza umbellata* (Spreng.) K. Schum., *Paspalum pumilum* Nees, *Ranunculus bonariensis* Poir. and *Scirpus sellowianus* (Kunth) Griseb., which are only found in this portion.

On the distal extremity margin (2.6) another narrow and shallow stream presents submersed algae, such as *Fragilaria javanica* Hustedt (in conspicuous macroscopic colonies) and species of *Batrachospermum*, *Bulbochaete*, *Microspora* and *Spirogyra* sp. 1. Another submerged plant is *Sphagnum cuspidatum* Ehrh. ex Hoffm. var. *serrulatum* (Schlieph.) Schlieph.. Along the stream margin the soggy ground enables the existence of some angiosperms of its own, such as *Paepalanthus caldensis* Malme, *Ranunculus* cf. *parviflorus* L. and *Utricularia gibba* L.

The total number of collected angiosperm species (154) corresponds to 94% of the angiosperm species listed by Rambo (1956) for bogs of Rio Grande do Sul highlands. The number of Angiosperms of Banhado Amarelo bog is also very high when compared to the other bogs of Rio Grande do Sul: 69% higher than the total number of

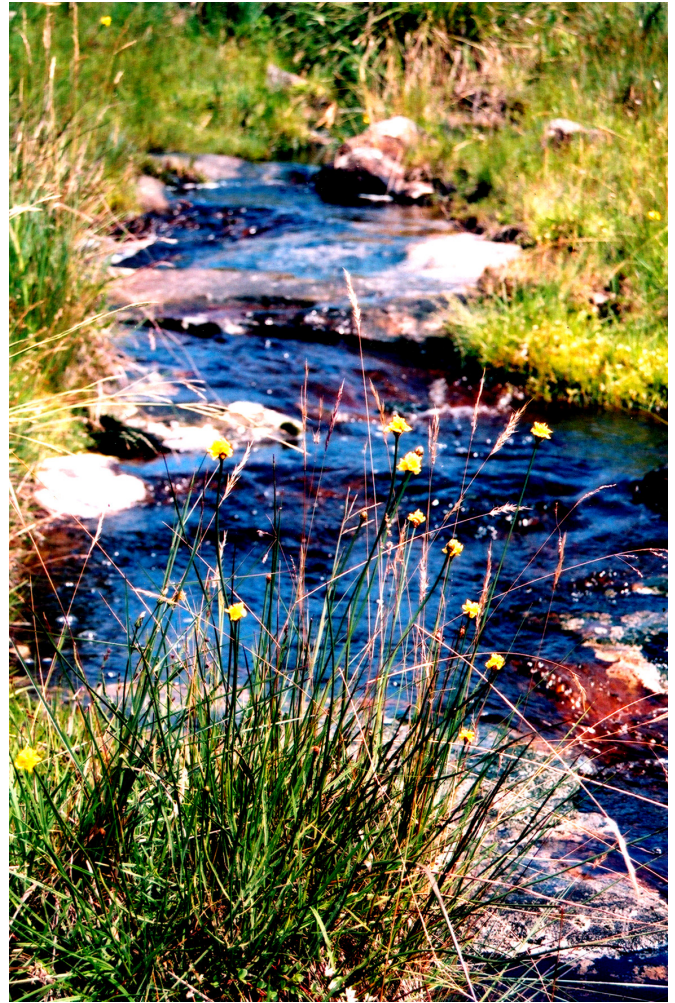


FIGURE 14. Small shallow stream, which flows out of the bog at margin alongside the access road, algae species of *Batrachospermum* and *Chlorococcum*, attached to submerged rocks. *Xyris teres* on the first plane.

angiosperms listed by Pfadenhauer and Boechat (1981) for the Banhado do Camisa bog (Cambará do Sul) and four times higher than the total number of angiosperms reported by Silva (2002) in a bog of São José dos Ausentes.

This taxonomic study of the bog showed a well-preserved native flora with a large number of species. Two new species from bogs, *Rumohra turficola* Senna and *Baccharis sphagnophila* Schneid and Heiden, were indicated to this bog (Senna 2005; Schneider et al. 2011).

The high floristic diversity encountered indicates the relevance of subtropical bog ecosystems in Southern Brazil highlands and the need to preserve them as important genetic resources.

TABLE 1. Fungi, lichens and plants in the Banhado Amarelo bog, São Francisco de Paula, Rio Grande do Sul, Southern Brazil and their occurrence. 1. Distributed indistinctly in different areas of the bog; 2. Exclusive to or more concentrated in: 2.1. Shrub-dominion; 2.2. Herbaceous-dominion; 2.3. Margin contiguous to the Araucaria forest; 2.4. Margin alongside the access road; 2.5. Margin in the proximal extremity (beginning of access road); 2.6. Margin in the distal extremity (end of access road). (r) rare.

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
FUNGI		
BOLBITIACEAE		
<i>Conocybe</i> sp.	2.2	172672
HYGROPHORACEAE		
<i>Hygrocybe miniata</i> (Fr.) P. Kumm.	2.2	172673
MARASMIACEAE		
<i>Marasmiellus</i> sp.	2.1 r	172674
STROPHARIACEAE		
<i>Agrocybe</i> sp.	2.2	172675
SUILLACEAE		
<i>Suillus</i> sp.	2.3 r	172676
TRICHOLOMATACEAE		
<i>Collybia</i> sp.	2.1 r	172677
LICHENS		
CLADONIACEAE		
<i>Cladonia</i> cf. <i>chlorophaea</i> (Flörke ex Sommerf.) Spreng.	2.2	172678
<i>Cladonia confusa</i> f. <i>confusa</i> R. Sant.	2.2	172679
<i>Cladonia didyma</i> (Fée) Vain.	2.2	172680
<i>Cladonia furfuracea</i> Vain.	2.2	172681
<i>Cladonia macilentoides</i> Ahti and Fleig	2.1 r	172682
COLLEMATACEAE		
<i>Leptogium cyanescens</i> (Pers.) Körb.	2.1 r	172683
CORTICIACEAE		
<i>Dictyonema glabratum</i> (Spreng.) D. Hawksw.	2.3	172684
PARMELIACEAE		
<i>Hypotrachyna</i> cf. <i>laevigata</i> (Sm.) Hale	2.1	172685
<i>Usnea elongata</i> Motika	1	172686
PHYSICIACEAE		
<i>Heterodermia leucomelaena</i> (L.) Poelt	2.1 r	172687
ALGAE		
BATRACHOSPERMACEAE		
<i>Batrachospermum</i> sp.	2.4; 2.6	172688
CHLOROCOCCACEAE		
<i>Chlorococcum</i> cf. <i>infusum</i> (Schrank) Meneghini	2.4; 2.6 r	172689
DESMIDIACEAE		
<i>Desmidium laticeps</i> Nordstedt var. <i>quadrangulare</i> Nordstedt	2.2 r	172690
<i>Hyalotheca dissiliens</i> (Smith) Brébisson var. <i>tatrica</i> Raciborski	2.2 r	172691
FRAGILARIACEAE		
<i>Fragilaria javanica</i> Hustedt	2.6 r	172692
MASTIGOCLADACEAE		
<i>Hapalosiphon</i> sp.	2.2 r	172693
MICROSPORACEAE		
<i>Microspora</i> sp.	2.6 r	172694
NOSTOCACEAE		
<i>Anabaena</i> sp.	1 r	172695
<i>Nostoc</i> sp.	2.1 r	172696
OEDOGONIACEAE		
<i>Bulbochaete</i> sp.	2.6 r	172697
<i>Oedogonium</i> sp.	2.2 r	172698
OSCILLATORIACEAE		
<i>Lyngbya</i> sp.	2.2 r	172699

TABLE 1. CONTINUED.

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
<i>Oscillatoria</i> sp.	2.1 r	172700
PHORMIDIACEAE		
<i>Microcoleus</i> sp.	2.2 r	172701
STIGONEMATACEAE		
<i>Stigonema</i> sp.	2.1 r	172702
SYNECHOCOCCACEAE		
<i>Gloeotheca</i> sp.	2.2	172703
TRENTEPOHLIACEAE		
<i>Trentepohlia</i> sp.	2.1	172704
TRIBONEMATACEAE		
<i>Tribonema</i> sp.	2.2	172705
ZYGNEACEAE		
<i>Mougeotia</i> sp.	2.2 r	172706
<i>Spirogyra</i> sp. 1	2.2; 2.6	172707
<i>Spirogyra</i> sp. 2	2.1 r	172708
BRYOPHYTES		
LIVERWORTS		
ANEURACEAE		
<i>Riccardia catractarum</i> (Spruce) Hell	2.1; 2.2	172709
CALYPOGEIACEAE		
<i>Calypogeia subintegra</i> (Gottsche, Lindenb. and Nees) Bischler	1	172710
CEPHALOZIACEAE		
<i>Cephalozia crassifolia</i> (Lindb. and Gott.) Fulford	2.2	172711
CEPHALOZIELLACEAE		
<i>Cephaloziella granatesis</i> (J. B. Jack) Fulford	2.1 r	172712
<i>Cephaloziella subpapillosa</i> Herzog	2.2	172713
GEOCALYCEAE		
<i>Lophocolea martiana</i> Nees	2.1 r	172714
<i>Lophocolea muricata</i> (Lehm.) Nees	2.1	172715
JUBULACEAE		
<i>Frullania arecae</i> (Spreng.) Gott.	2.1 r	172716
<i>Frullania beyrichiana</i> (Lehm. and Lindenb.) Lehm. and Lindenb.	2.1	172717
<i>Frullania brasiliensis</i> Raddi	2.1	172718
<i>Frullania caulisequa</i> (Nees) Nees	2.1 r	172719
<i>Frullania kunzei</i> (Lehm. and Lindenb.) Lehm. and Lindenb.	2.1 r	172720
<i>Frullania lindenbergii</i> Lehmann	2.1 r	172721
<i>Frullania setigera</i> Stph.	2.1 r	172722
LEJEUNEACEAE		
<i>Anoplolejeunea conferta</i> (Meiss.) Evans	1	172723
<i>Aphanolejeunea</i> sp.	2.1 r	172724
<i>Brachiolejeunea laxifolia</i> (Tayl.) Schiffn.	2.1	172725
<i>Cololejeunea minutissima</i> (Sm.) Schiffn. subsp. <i>minutissima</i>	2.1	172726
<i>Colura calyptrifolia</i> (Hook.) Dumort.	2.1	172727
<i>Colura tortifolia</i> (Nees and Mont.) Steph.	2.1 r	172728
<i>Drepanolejeunea araucariae</i> Steph.	1	172729
<i>Harpalejeunea stricta</i> (Lindenb. and Gottsche) Steph.	2.1 r	172730
<i>Lejeunea</i> sp. 1	1	172731
<i>Lejeunea</i> sp. 2	2.1	172732
<i>Lejeunea</i> sp. 3	2.1 r	172733
<i>Leucolejeunea xanthocarpa</i> (Lehm. and Lindenb.) Evs.	2.1	172734
<i>Microlejeunea bullata</i> (Tayl.) Steph.	2.1	172735
<i>Omphalanthus filiformis</i> (Sw.) Nees	2.1	172736
LEPIDOZIACEAE		
<i>Kurzia capilaris</i> (Sw.) Grolle	2.2	172737

TABLE 1. CONTINUED.

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
<i>Kurzia flagellifera</i> (Steph.) Grolle	2.1	172738
<i>Telaranea nematodes</i> (Gottsche ex Austin) M. A. Howe	1	172739
METZGERIACEAE		
<i>Metzgeria albinea</i> Spruce	2.1	172740
<i>Metzgeria dichotoma</i> (Sw.) Nees	2.1 r	172741
<i>Metzgeria furcata</i> (L.) Dumort.	2.1	172742
<i>Metzgeria myriopoda</i> Lindb.	2.1 r	172743
PALLAVICINIACEAE		
<i>Symphyogyna aspera</i> Steph.	2.1 r	172744
PLAGIOCHILACEAE		
<i>Plagiochila bifaria</i> (Sw.) Lindenb.	2.1	172745
<i>Plagiochila corrugata</i> (Nees) Nees and Mont.	2.1 r	172746
RADULACEAE		
<i>Radula kegelii</i> Gottsche ex Steph.	2.1 r	172747
<i>Radula sinuata</i> Gottsche ex Steph.	2.1	172748
<i>Radula tectiloba</i> Steph.	2.1 r	172749
HORNWORTS		
ANTHOCEROTACEAE		
<i>Phaeoceros laevis</i> (L.) Prosk.	2.2	172750
MOSESSES		
BRYACEAE		
<i>Bryum densifolium</i> Brid.	2.2 r	172751
<i>Rhodobryum beyrichianum</i> (Hornsch.) Müll. Hal.	2.1; 2.3	172752
CALYMPERACEAE		
<i>Syrrhopodon prolifer</i> Schwägr. var. <i>prolifer</i>	2r	172753
DALTONIACEAE		
<i>Daltonia longifolia</i> Taylor	2.1	172754
DICRANACEAE		
<i>Campylopus filifolius</i> (Hornsch.) Mitt.	2.2	172755
<i>Campylopus reflexisetus</i> (C. M.) Broth.	2.2	172756
FISSIDENTACEAE		
<i>Fissidens serratus</i> Müll. Hal.	2.1 r	172757
HOOKERIAACEAE		
<i>Cyclodictyon albicans</i> (Hedw.) Kunze	2.1 r	172758
HYPNACEAE		
<i>Isopterygium tenerum</i> (Sw.) Mitt.	1	172759
PHYLLOGONIACEAE		
<i>Phyllogonium viride</i> Brid.	2.1 r	172760
POLYTRICHACEAE		
<i>Polytrichum juniperinum</i> Will. and Hedw.	2.2	172761
RHIZOGONIACEAE		
<i>Pyrrhobryum spiniforme</i> (Hedw.) Mitt.	2.1 r	172762
SPHAGNACEAE		
<i>Sphagnum capillifolium</i> (Ehrh.) Hedw.	2.2	172763
<i>Sphagnum cuspidatum</i> Ehrh. ex Hoffm. var. <i>serrulatum</i> (Schlieph.) Schlieph.	2.6	172764
<i>Sphagnum recurvum</i> P. Beauvois	2.2	172765
PTERIDOPHYTES		
BLECHNACEAE		
<i>Blechnum imperiale</i> H. Chr.	2.2	172766
<i>Blechnum serrulatum</i> Richard	2.1	172767
DICKSONIACEAE		
<i>Dicksonia sellowiana</i> Hook.	2.3 r	172768

TABLE 1. CONTINUED.

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
DRYOPTERIDACEAE		
<i>Rumohra turficola</i> Senna	2.1	172769
HYMENOPHYLLACEAE		
<i>Hymenophyllum</i> sp.	2.1 r	172770
LYCOPODIACEAE		
<i>Lycopodiella allopecuroides</i> (L.) Cranfill	2.5 r	172771
<i>Lycopodiella caroliniana</i> (Linnaeus) Pichi-Sermolli	2.2	172772
<i>Lycopodium clavatum</i> Linnaeus	1 r	172773
OSMUNDACEAE		
<i>Osmunda cinnamomea</i> L.	2.3	172774
<i>Osmunda regalis</i> L.	2.3	172775
SELAGINELLACEAE		
<i>Selaginella marginata</i> (Willdenow) Spring	1	172776
THELYPTERIDACEAE		
<i>Thelypteris rivularioides</i> (Fée) Abbiatti	1	172777
GYMNOSPERMS		
ARAUCARIACEAE		
<i>Araucaria angustifolia</i> (Bertol.) Kuntze	2.3	172778
PODOCARPACEAE		
<i>Podocarpus lambertii</i> Klotzsch ex Endl.	2.3	172779
ANGIOSPERMS		
DICOTYLEDONS		
APIACEAE		
<i>Eryngium pandanifolium</i> Cham. and Schltld.	2.1	172780
<i>Eryngium urbanianum</i> H. Wolff	2.5	172781
APOCYNACEAE		
<i>Orthosia scoparia</i> (Nutt.) Liede and Meve	2.3 r	172782
ARALIACEAE		
<i>Hydrocotyle pusilla</i> A. Rich.	2.1 r	172783
<i>Hydrocotyle quinqueloba</i> Ruiz and Pav.	2.3 r	172784
ASTERACEAE		
<i>Achyrocline alata</i> DC.	2.4	172785
<i>Achyrocline satureioides</i> (Lam.) DC.	2.2	172786
<i>Baccharis brachylaenoides</i> DC.	2.1	172787
<i>Baccharis deblei</i> An. S. de Oliveira and Marchiori	2.5	172788
<i>Baccharis leucopappa</i> DC.	1	172789
<i>Baccharis megapotamica</i> Spreng.	1	172790
<i>Baccharis microcephala</i> Baker	2.2	172791
<i>Baccharis milleflora</i> DC.	2.2	172792
<i>Baccharis ramboi</i> G. Heiden and L. Macias	1	172793
<i>Baccharis sphagnophila</i> Schneid and Heiden	1	172794
<i>Baccharis uncinella</i> DC.	1 r	172795
<i>Chaptalia graminifolia</i> Dusén	2.2	172796
<i>Conyza floribunda</i> Kunth	1 r	172797
<i>Erechtites valerianifolius</i> (Link ex Spreng.) DC.	1	172798
<i>Eupatorium betonicifforme</i> (DC.) Baker var. <i>betonicifforme</i>	1	172799
<i>Eupatorium betonicifforme</i> (DC.) Baker var. <i>hastatum</i> Baker	1	172800
<i>Eupatorium bupleurifolium</i> DC. var. <i>bupleurifolium</i>	1	172801
<i>Eupatorium gaudichaudianum</i> DC.	2.1	172802
<i>Eupatorium purpurascens</i> Sch. Bip. ex Baker	2.3 r	172803
<i>Eupatorium serratum</i> Spreng.	1	172804
<i>Eupatorium tweedeanum</i> Hook. and Arn.	1 r	172805
<i>Holocheilus illustris</i> Cabrera	2.1	172806
<i>Hypochaeris lutea</i> Britton	1	172807

TABLE 1. CONTINUED.

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
<i>Jaegeria hirta</i> (Lag.) Less	2.5 r	172808
<i>Leptostelma catharinense</i> (Cabrera) A. Teles and Sobral	2.3	172809
<i>Mikania orleansensis</i> Hieron.	2.3 r	172810
<i>Pentacalia desiderabilis</i> (Velloso) Cuatrec.	2.3 r	172811
<i>Senecio conyzaefolius</i> Baker	2.2	172812
<i>Senecio juergensii</i> Mattf	1	172813
<i>Senecio promatensis</i> Matzenbacher	1	172814
<i>Senecio pulcher</i> Hook. and Arn. f. <i>pulcher</i>	2.2	172815
<i>Senecio pulcher</i> Hook. and Arn. f. <i>albiflorus</i> Matzenbacher	1	172816
<i>Symphyopappus compressus</i> (Gardner) B. L. Rob.	2.1	172817
<i>Trixis lessingii</i> DC.	1	172818
<i>Vernonia discolor</i> (Spreng.) Less.	2.3	172819
<i>Vernonia nitidula</i> Less.	2.1	172820
CAMPANULACEAE		
<i>Pratia hederacea</i> (Cham.) G. Don	2.4 r	172821
CAPRIFOLIACEAE		
<i>Valeriana salicariifolia</i> Vahl	2.3 r	172822
CARYOPHYLLACEAE		
<i>Cerastium commersonianum</i> DC.	2.2 r	172823
<i>Cerastium rivulare</i> Cambess.	2.3 r	172824
CUNONIACEAE		
<i>Weinmannia</i> cf. <i>paulliniifolia</i> Pohl	2.3	172825
DROSERACEAE		
<i>Drosera communis</i> A.St.-Hil.	2.2	172826
ERICACEAE		
<i>Agarista niederleinii</i> (Sleumer) Judd	2.1	172827
<i>Agarista nummularia</i> (Cham. and Schltdl.) G. Don	2.2	172828
<i>Gaylussacia pseudogaultheria</i> Cham. and Schltdl.	2.2	172829
EUPHORBIACEAE		
<i>Croton lanatus</i> Lam.	2.1	172830
<i>Croton myrianthus</i> Müll. Arg.	1 r	172831
HYPERICACEAE		
<i>Sarothra brasiliensis</i> (Choisy) Y. Kimura	2.5	172832
LENTIBULARIACEAE		
<i>Utricularia gibba</i> L.	2.6 r	172833
<i>Utricularia praelonga</i> A. St.-Hil. and Girard	2.2	172834
<i>Utricularia tridentata</i> Sylvén	2.2	172835
LYTHRACEAE		
<i>Cuphea</i> cf. <i>urbaniana</i> f. <i>uleana</i> Koehne	2.1	172836
MELASTOMATACEAE		
<i>Leandra humilis</i> (Cogn.) Wurdack	1	172837
<i>Miconia hyemalis</i> Naudin	2.3	172838
<i>Rhynchanthera brachyrhyncha</i> Cham.	1	172839
<i>Tibouchina cerastifolia</i> (Naudin) Cogn.	1	172840
<i>Tibouchina clinopodifolia</i> (DC) Cogn.	2.3 r	172841
<i>Tibouchina gracilis</i> (Bonpl.) Cogn.	1	172842
MYRTACEAE		
<i>Myrceugenia glaucescens</i> (Cambess.) D. Legrand and Kausel	2.3 r	172843
<i>Siphoneugena reitzii</i> D. Legrand	2.3	172844
ONAGRACEAE		
<i>Fuchsia regia</i> (Vell.) Munz	2.3	172845
<i>Ludwigia longifolia</i> (DC.) H. Hara	2.3	172846
OXALIDACEAE		
<i>Oxalis</i> sp.	2.5	172847
<i>Oxalis</i> cf. <i>bipartita</i> A. St.-Hil.	2.3 r	172848

TABLE 1. CONTINUED.

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
PASSIFLORACEAE		
<i>Passiflora caerulea</i> L.	2.1 r	172849
PLANTAGINACEAE		
<i>Plantago australis</i> Lam.	2.3 r	172850
POLYGALACEAE		
<i>Polygala brasiliensis</i> L.	1	172851
<i>Polygala linoides</i> Poir.	2.2	172852
PRIMULACEAE		
<i>Anagallis filiformis</i> Cham. and Schltdl.	2.4	172853
<i>Rapanea gardneriana</i> (A. DC.) Mez	2.3	172854
RANUNCULACEAE		
<i>Ranunculus bonariensis</i> Poir.	2.5 r	172855
<i>Ranunculus</i> cf. <i>parviflorus</i> L.	2.6 r	172856
ROSACEAE		
<i>Rubus</i> sp.	2.1 r	172857
RUBIACEAE		
<i>Coccocypselum reitzii</i> L. B. Sm. and Downs	1	172858
<i>Emmeorhiza umbellata</i> (Spreng.) K. Schum.	2.5 r	172859
<i>Galium equisetoides</i> (Cham. and Schltdl.) Standl.	2.1	172860
<i>Galium hypocarpium</i> (L.) Endl. ex Griseb.	2.1 r	172861
<i>Galium nigroramosum</i> (Ehrend.) Dempster	2.3	172862
<i>Oldenlandia salzmännii</i> (DC.) Benth. and Hook. f. ex B.D. Jacks.	2.4; 2.5	172863
<i>Relbunium humile</i> (Cham. and Schltdl.) K. Schum.	2.2 r	172864
SCROPHULARIACEAE		
<i>Buddleja elegans</i> Cham. and Schltdl.	2.1	172865
SOLANACEAE		
<i>Solanum laxum</i> Spreng.	2.1	172866
<i>Solanum pseudocapsicum</i> L.	2.3	172867
VERBENACEAE		
<i>Verbena alata</i> Otto ex Sweet	2.3	172868
WINTERACEAE		
<i>Drimys brasiliensis</i> Miers	2.3	172869
MONOCOTYLEDONS		
ALSTROEMERIACEAE		
<i>Alstroemeria isabellana</i> Herb.	1 r	172870
BURMANNIACEAE		
<i>Apteria aphylla</i> (Nutt.) Barnhart ex Small	2.1 r	172871
CYPERACEAE		
<i>Androtrichum giganteum</i> (Kunth) H. Pfeiff.	2.1	172872
<i>Carex longii</i> Mack. subsp. <i>meridionalis</i> (Kük.) Luceño and M. V. Alves	1 r	172873
<i>Cyperus haspan</i> L.	1	172874
<i>Cyperus hermaphroditus</i> (Jacq.) Standl.	2.5 r	172875
<i>Cyperus intricatus</i> Schrad. ex Schult.	2.2 r	172876
<i>Cyperus pohlii</i> (Nees) Steud.	2.3 r	172877
<i>Eleocharis bonariensis</i> Nees	2.3 r	172878
<i>Eleocharis kleinii</i> Barros	2.2	172879
<i>Eleocharis maculosa</i> (Vahl) Roem. and Schult.	2.3; 2.4 r	172880
<i>Eleocharis squamigera</i> Svenson	2.3 r	172881
<i>Eleocharis viridans</i> Kük. ex Osten	2.3	172882
<i>Pycnus niger</i> (Ruiz & Pav.) Cufod.	1r	172883
<i>Rhynchospora</i> cf. <i>barrosiana</i> Guagl.	1	172884
<i>Rhynchospora brasiliensis</i> Boeck.	2.2	172885
<i>Rhynchospora corymbosa</i> (L.) Britton	2.4 r	172886
<i>Rhynchospora glaziovii</i> Boeck.	2.3 r	172887

TABLE 1. CONTINUED.

FAMILY/SPECIES	OCURRENCE	ICN NUMBER
<i>Rhynchospora gollmeri</i> Boeck.	1 r	172888
<i>Rhynchospora hieronymii</i> Boeck.	1	172889
<i>Rhynchospora marisculus</i> Lindl. ex Nees	2.2 r	172890
<i>Rhynchospora</i> cf. <i>polyantha</i> Steud.	2.3 r	172891
<i>Scirpus sellowianus</i> (Kunth) Griseb.	2.5 r	172892
<i>Scleria balansae</i> Maury	2.2 r	172893
ERIOCAULACEAE		
<i>Eriocaulon gomphrenoides</i> Kunth	2.2	172894
<i>Eriocaulon reitzii</i> Moldenke and L. B. Smith	2.2	172895
<i>Paepalanthus caldensis</i> Malme	2.6 r	172896
<i>Paepalanthus catharinae</i> Ruhland	2.2	172897
<i>Syngonanthus caulescens</i> (Poir.) Ruhland.	2.4; 2.6	172898
HYPOXIDACEAE		
<i>Hypoxis decumbens</i> L.	2.3 r	172899
IRIDACEAE		
<i>Sisyrinchium</i> cf. <i>luzula</i> Klotzsch ex Klatt	1	172900
<i>Sisyrinchium</i> cf. <i>vaginatum</i> Spreng	2.2	172901
JUNCACEAE		
<i>Juncus brasiliensis</i> Breistr.	2.2 r	172902
<i>Juncus effusus</i> L.	2.3	172903
<i>Juncus microcephalus</i> Kunth	1	172904
<i>Juncus scirpoides</i> Lam.	2.3	172905
<i>Luzula ulei</i> Buchenau	2.2 r	172906
ORCHIDACEAE		
<i>Brachystele ulaei</i> (Cogn.) Schltr.	2.5 r	172907
<i>Cyclopogon apricus</i> (Lindl.) Schltr.	2.2 r	172908
<i>Habenaria montevidensis</i> Spreng. var. <i>parviflora</i> (Lindl.) Pabst	2.4	172909
<i>Habenaria rupicola</i> Barb. Rodr.	2.4	172910
POACEAE		
<i>Andropogon lateralis</i> Nees	2.2 r	172911
<i>Andropogon macrothrix</i> Trin.	2.1	172912
<i>Aulonemia ulei</i> (Hack.) McClure and L.B. Sm.	1	172913
<i>Axonopus compressus</i> (Sw.) P. Beauv.	2.5	172914
<i>Axonopus ramboi</i> G. A. Black	2.1	172915
<i>Briza juergensii</i> Hack.	1	172916
<i>Calamagrostis longearistata</i> (Wedd.) Hack. ex Sodiro	1	172917
<i>Cortaderia selloana</i> (Schult. and Schult. f.) Asch. and Graebn.	2.1	172918
<i>Danthonia montana</i> Döll	2.2	172919
<i>Dichanthelium sabulorum</i> (Lam.) Gould and C. A. Clark var. <i>polycladum</i> (Ekman) Zuloaga	1	172920
<i>Eriochrysis holcoides</i> (Nees) Kuhlman.	1	172921
<i>Festuca ampliflora</i> Döll	1	172922
<i>Leersia hexandra</i> Sw.	1	172923
<i>Paspalum exaltatum</i> J. Presl	2.1	172924
<i>Paspalum juergensii</i> Hack.	2.3 r	172925
<i>Paspalum polyphyllum</i> Nees ex Trin.	2.2	172926
<i>Paspalum pumilum</i> Nees	2.5 r	172927
<i>Saccharum asperum</i> (Nees) Steud.	2.2	172928
<i>Stipa sellowiana</i> Nees ex Trin. and Rupr.	1	172929
XYRIDACEAE		
<i>Xyris jupicai</i> Rich.	2.2	172930
<i>Xyris regnelli</i> Nilsson	2.2	172931
<i>Xyris tenella</i> Kunth	2.4 r	172932
<i>Xyris teres</i> Nilsson	2.2	172933

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