Vascular flora of the Upper Paraná River floodplain

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(With 3 figures)

Abstract

The purpose of this study was to update the floristic inventory found in the Upper Paraná River floodplain. Floristic surveys were performed from February 2000 through March 2008, as part of the Brazilian Long-Term Ecological Research Program (PELD/CNPq - Site 6). The material collected was identified from 774 species, 442 genera, and 116 families. The ten families with high species richness were Leguminosae, Poaceae, Rubiaceae, Asteraceae, Euphorbiaceae, Myrtaceae, Cyperaceae, Solanaceae, Sapindaceae, and Orchidaceae, which contributed to 46.1% of the total number of species. Genera with high richness were *Solanum*, *Cyperus*, *Panicum*, *Eugenia*, *Tillandsia*, *Serjania*, *Casearia*, and *Polygonum*, which together contributed to 10.2% of the total number of species. These data, combined with information published in 1997, recorded 955 species, 575 genera, and 128 families. These organisms were from several riparian environments and were distributed as herbs, shrubs, trees, climbers and epiphytes. *Panicum maximum*, *Pennisetum purpureum*, *Ricinus communis*, and *Urochloa decumbens* are considered weeds due to the wide distributions determined for these species. The results presented herein suggest the need to further investigate the control of these potential weed species.

Keywords: riparian vegetation, floristic inventory, Mato Grosso do Sul, Paraná.

Flora vascular da planície de inundação do Alto Rio Paraná

Resumo

Com o objetivo de ampliar os conhecimentos sobre a flora da planície de inundação do Alto Rio Paraná, foram conduzidos inventários florísticos no período de fevereiro de 2000 a março de 2008, incluídos no Programa Brasileiro de Pesquisas Ecológicas de Longa Duração (PELD/CNPq - Sítio 6). O material coletado foi identificado em 774 espécies, 442 gêneros e 116 famílias. As dez famílias de maior riqueza de espécies foram Leguminosae, Poaceae, Rubiaceae, Asteraceae, Euphorbiaceae, Myrtaceae, Cyperaceae, Solanaceae, Sapindaceae e Orchidaceae, que juntas reuniram 46,1% do total do número de espécies. Os gêneros com maior riqueza de espécies foram *Solanum*, *Cyperus, Panicum*, *Eugenia*, *Tillandsia, Serjania*, *Casearia* e *Polygonum*, que juntos reuniram 10,2% do número de espécies. Estes dados, somados aos publicados em 1997, permitiram elevar para 955 espécies, 555 gêneros e 128 famílias, distribuídos entre herbáceas, arbustivas, arbóreas, lianas e epífitas, e em diversas formações ripárias. *Panicum maximum*, *Pennisetum purpureum*, *Ricinus communis* e *Urochloa decumbens* são consideradas invasoras e sugerimos estudos propondo seu controle.

Palavras-chave: vegetação ripária, inventário florístico, Mato Grosso do Sul, Paraná

1. Introduction

Floristic inventories provide fundamental information regarding the composition of flora in a given area. The construction of a database and supporting materials, which are primarily in the form of exsiccatae housed in herbaria, and the availability of these data form a basis for the advancement of other studies, such as taxonomy, ecology, geographical distribution, or reforestation of degraded areas. The biodiversity of Brazilian organisms is among the most diverse in the world, but only 15-20% of the species are presently identified (Brasil, 2002). A total of approximately 60,000 plant species are estimated to inhabit Brazil (Harley and Giulietti, 2004). However,

little is known regarding this flora and, consequently, the functioning of the associated ecosystems and the potential in both ecological and economic terms, particularly ecosystem sustainability.

A similar scenario has also been determined for vegetation along the Paraná River basin. This river forms at the junction of the Grande and Paranaíba rivers and is as the principal river of the La Plata basin. From source to mouth in the La Plata River estuary, the Paraná flows for approximately 4,695 km (Petri and Fúlfaro, 1985), which drains most of south-central South America from the Andes to the Serra do Mar near the Atlantic Coast. There are several dams in the main channel and tributaries of the Paraná, but there still exists a floodplain with a complex of tributaries, side channels, lakes, and marginal dikes (Stevaux, 1994; Souza Filho, 2009). This floodplain extends to the states of Paraná and Mato Grosso do Sul, encompassing areas of the Ilha Grande National Park, the Ivinhema State Park, the Environmental Protection Area (APA) of the Islands, and Várzeas of the Paraná River. Despite a rich array of habitats, the states of Paraná and Mato Grosso do Sul are undergoing rapid, uncontrollable agricultural development and deforestation, which results in serious disturbances of the ecosystems and floodplain. In addition, inventories of the flora and collections in herbaria are limited.

Among the disturbances acting on this floodplain, one of the most serious is the Porto Primavera Dam (UHE Engenheiro Sérgio Motta) that was constructed in 1998 along the border between the states of São Paulo and Mato Grosso do Sul. This dam reduced the length of the floodplain from 480 to 230 km (Agostinho et al., 2004; 2008), and altered the seasonal flood regime.

Recently, the Upper Paraná River floodplain was incorporated into the Biosphere Reserve of the Atlantic Forest- MAB/UNESCO (Agostinho et al., 2004), and this study site has been included in the Brazilian Long-Term Ecological Research Program since 1999 (PELD/CNPq - Site 6). The floodplain vegetation has been cataloged by researchers at the Universidade Estadual de Maringá (UEM) for over 20 years. Previous studies of this floodplain have investigated floristic (Souza et al., 1997; 2004a; 2004b; Souza and Monteiro, 2005) and phytosociologic inventories (Souza, 1998; Campos et al., 2000; Campos and Souza, 2002a; 2002b; Romagnolo and Souza, 2000); dynamics in the floodplain lakes (Kita and Souza, 2003); ichthiochory (Souza-Stevaux et al., 1994); epiphytes (Tomazini, 2003; 2007); aquatic macrophytes (Thomaz et al., 2009) and the families Sapindaceae (Romagnolo et al., 1994; Ferrucci and Souza, 2008); Myrtaceae (Romagnolo, 2003; Romagnolo and Souza, 2004; 2006) and Rubiaceae (Souza and Souza, 1998; Pereira, 2007; Cabral et al., 2007).

Considering the ecological importance of the Upper Paraná River floodplain and that assiduity and frequency are fundamentals to minimize underestimates floristic surveys, the purpose of this study was to update the floral inventory. Specifically, the number of families, genera, and species are described herein. We described the number of species per family, genera and life habits and identified potential species that could affect vascular plant diversity in the area. Thus, this investigation will contribute to future ecological studies, extend the knowledge of flora in the states of Paraná and Mato Grosso do Sul, and augment the Special Collection Vegetação Ripária of the Núcleo de Pesquisas em Limnologia, Ictiologia e Aqüicultura - Nupélia, which is housed into the Herbário da Universidade Estadual de Maringá (HUEM).

2. Material and Methods

2.1. Study area

The study area comprised a stretch of the Upper Paraná River floodplain (approximately 22° 40' to 22° 58' S and 53° 10' to 53° 39' W) (Figure 1). The riparian vegetation of the Paraná River and the associated floodplain was sampled, including the Baía, Curupaí, Guiraí, Ivinhema, and Victório Rivers, the Samambaia stream in the state of Mato Grosso do Sul (Municipalities of Bataiporã, Ivinhema, Jateí, Novo Horizonte do Sul and Taquarussu), the Caracu stream, São Pedro stream, and Areia river in the state of Paraná (Municipalities of Marilena, Porto Rico, and São Pedro do Paraná).

The climate of the region is type Cfa or subtropical humid, according to the Köppen classification. The mean temperature in colder months is below 18 °C with rare frosts and is above 22 °C during warmer months. Most of the rainfall occurs from September to December, and the least amount occurs from June to August, with a mean annual rainfall of 1,500 mm (IAPAR, 1994).

Vegetation in this area is dominated by Seasonal Semideciduous Forest (SSF) (Veloso and Góes-Filho, 1982), which is represented by Submontane and Alluvial formations. The forests are subjected to various degrees of disruption and water influences, which are dependent on the flood pulse of the Paraná River, relief differences along the banks, and soil texture. Therefore, vegetation types range from those typical of dry areas to marshes with permanently inundated soils. These areas are also influenced by the surrounding formations, such as the Cerrado and the Pantanal, and buriti forests are present in the state of Mato Grosso do Sul. Extensive areas are occupied by non-forest vegetation, including plains and fields, which are either of natural or anthropogenic origin, such as pastures. The many permanent or temporary floodplain lakes support a variety of species in the plain, and the composition changes according to the flood regime (Souza et al., 2004a; 2004b).

2.2. Floristic inventory

We sampled vascular plants in approximately 235 ha of riparian areas that included distinct environments, such as forests (dry, flooded, and seasonal marshes) and seasonally flooded plains (várzeas) with lakes, dry fields,

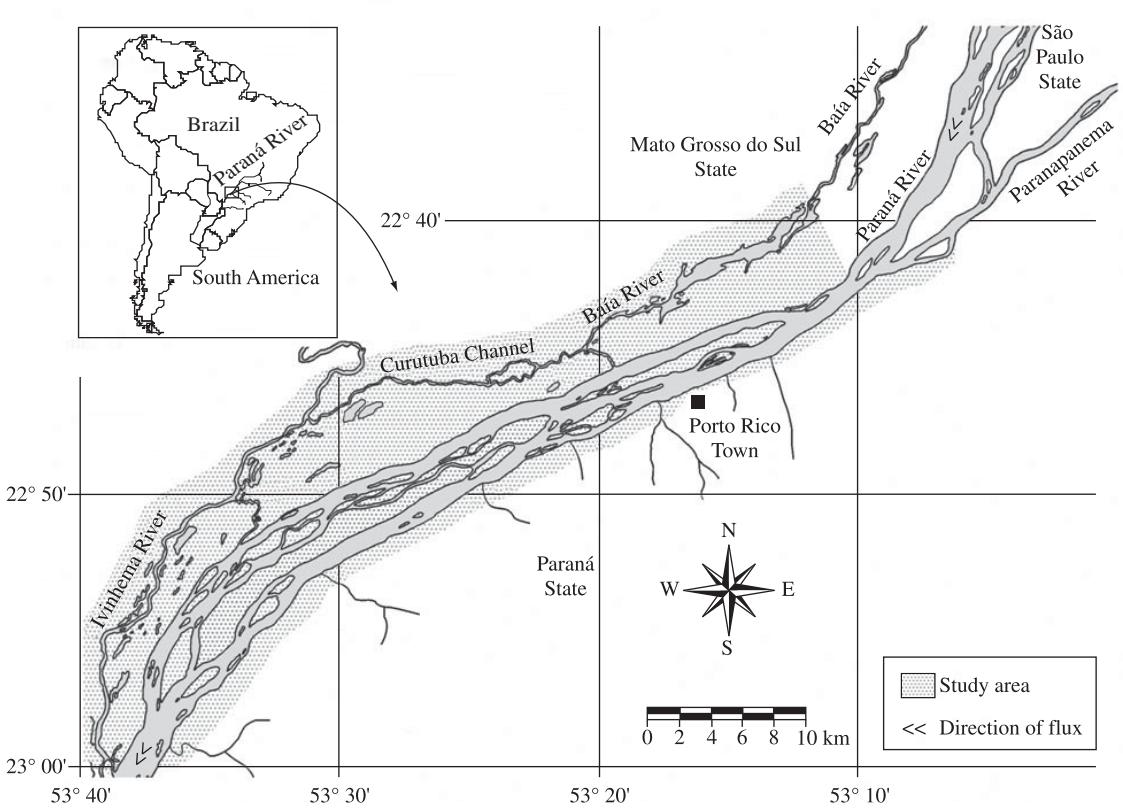

Figure 1. Map of the Upper Paraná River floodplain located in the states of Paraná and Mato Grosso do Sul, Brazil.

and areas modified by humans. These areas were visited using vehicles, boats, or by foot. Field facilities included camps or the field stations of Nupélia/UEM at the Porto Rico municipality (Paraná State) and Parque Estadual do Rio Ivinheima (Ivinhema River State Park), which is located in the Jateí municipality (Mato Grosso do Sul State). The inventory of vascular plants was performed from February 2000 through March 2008 over 38 field trips, which averaged five days per trip and focused primarily on the PELD/CNPq - Site 6 area. Botanical material (including reproductive structures) was collected and prepared for herbarium storage, according to the methods of Fidalgo and Bononi (1989). Exsiccatae were housed into the Special Collection Vegetação Ripária of the HUEM/Nupélia. Taxonomic identifications were performed consulting literature, collections of several herbaria (CTES, FUEL, HUEM, IAC, ICN, MBM and UPCB), and several specialists.

Organization of the Pteridophyta families was based on Tryon and Tryon (1982), and organization of Magnoliophyta (Angiosperms) families was based on Cronquist's System (Cronquist, 1988), except for Leguminosae (Barroso et al., 1984). Species were also classified according to life habits, based on the definitions of Font Quer (1985). To emphasize the contribution of PELD to these floral records, results were compared with those of an earlier broad survey conducted from 1986 to 1996 in the Upper Paraná River floodplain (UPRF) by Souza et al. (1997). A list of invasive species was also presented, according to an official list published in the Government Order No. 095/2007 of the State of Paraná (IAP, 2007).

3. Results

A total of 774 species (available from: ftp://ftp.nupelia.uem.br/publications/appendices/) were identified, which belonged to 442 genera and 116 families. Magnoliopsida predominated with 610 species (Table 1). Leguminosae presented the highest richness at 13.4% of the species (Faboideae was dominated with 59 species among subfamilies). The nine other families of relatively high richness were Poaceae, Asteraceae, Rubiaceae, Euphorbiaceae, Myrtaceae, Cyperaceae, Solanaceae, Sapindaceae, and Orchidaceae. These 10 families accounted for 46.1% of the total species richness, and 34 families contained only one species (Figure 2). Leguminosae exhibited a strong dominance, particularly in forests. However, species of this family were replaced by those of Poaceae in open fields, which conferred a physiognomic dominance to these organisms.

The genus *Solanum* contained the largest number of species and comprised 11.8% of the species along

Table 1. Families of Pteridophyta and Magnoliophyta (Liliopsida and Magnoliopsida) organized in descending order, with respective number and percentage of genera (NG/%NG) and species (NS/%NS). Floristic inventory of the Upper Paraná River floodplain located in the states of Paraná and Mato Grosso do Sul, Brazil: period 2000 to 2008 - PELD/CNPq – Site 6.

Family	NG	NG (%)	NS	NS (%)
PTERIDOPHYTA				
Polypodiaceae	4	0.88	6	0.78
Pteridaceae	4	0.88	6	0.78
Salviniaceae	2	0.44	4	0.52
Thelypteridaceae	1	0.22	3	0.39
Schizaeaceae	1	0.22	1	0.13
Selaginellaceae	1	0.22	1	0.13
MAGNOLIOPHYTA				
Liliopsida				
Poaceae	23	5.09	49	6.33
Cyperaceae	8	1.77	21	2.71
Orchidaceae	12	2.65	16	2.07
Bromeliaceae	6	1.33	14	1.81
Commelinaceae	5	1.10	9	1.16
Arecaceae	6	1.33	7	0.90
Araceae	4	0.88	4	0.52
Marantaceae	3	0.66	4	0.52
Pontederiaceae	2	0.44	4	0.52
Smilacaceae	1	0.22	4	0.52
Alismataceae	2	0.44	3	0.39
Hydrocharitaceae	2	0.44	3	0.39
Costaceae	1	0.22	2	0.26
Dioscoriaceae	1	0.22	1	0.13
Heliconiaceae	1	0.22	1	0.13
Iridaceae	1	0.22	1	0.13
Liliaceae	1	0.22	1	0.13
Potamogetonaceae	1	0.22	1	0.13
Magnoliopsida				
Leguminosae	54	11.95	104	13.44
Asteraceae	25	5.53	34	4.39
Rubiaceae	26	5.75	34	4.39
Euphorbiaceae	15	3.32	31	4.01
Myrtaceae	11	2.43	31	4.01
Solanaceae	5	1.10	20	2.58
Sapindaceae	8	1.77	17	2.20
Cactaceae	9	1.99	15	1.94
Bignoniaceae	9	1.99	13	1.68
Convolvulaceae	7	1.55	13	1.68
Melastomataceae	5	1.10	11	1.42
Rutaceae	7	1.55	11	1.42
Verbenaceae	7	1.55	11	1.42
Flacourtiaceae	3	0.66	10	1.29
Lauraceae	3	0.66	10	1.29
Malvaceae	4	0.88	10	1.29
Boraginaceae	4	0.88	9	1.16
Meliaceae	4	0.88	9	1.16

Table 1. Continued...

Family	NG	NG (%)	NS	NS (%)
Polygonaceae	3	0.66	9	1.16
Amaranthaceae	6	1.33	8	1.03
Apocynaceae	5	1.10	8	1.03
Piperaceae	3	0.66	8	1.03
Asclepiadaceae	6	1.33	7	0.90
Malpighiaceae	6	1.33	7	0.90
Sterculiaceae	5	1.10	7	0.90
Vitaceae	2	0.44	7	0.70
Moraceae	3	0.66	6	0.78
Onagraceae	1	0.22	6	0.78
Acanthaceae	4	0.88	5	0.65
Annonaceae	4	0.88	5	0.65
Lamiaceae	4	0.88	5	0.65
Sapotaceae	3	0.66	5	0.65
Anacardiaceae	3	0.66	4	0.52
Apiaceae	4	0.88	4	0.52
Aristolochiaceae	1	0.22	4	0.52
Chrysobalanaceae	2	0.44	4	0.52
Combretaceae	2	0.44	4	0.52
Lythraceae	1	0.22	4	0.52
Phytolaccaceae	4	0.88	4	0.52
Rhamnaceae	3	0.66	4	0.52
Tiliaceae	2	0.44	4	0.52
Clusiaceae	2	0.44	3	0.39
Cucurbitaceae	3	0.66	3	0.39
Dilleniaceae	2	0.44	3	0.39
Erythroxylaceae	1	0.22	3	0.39
Hippocrateaceae	2	0.44	3	0.39
Myrsinaceae	1	0.22	3	0.39
Nyctaginaceae	3	0.66	3	0.39
Oxalidaceae	1	0.22	3	0.39
Passifloraceae	1	0.22	3	0.39
Polygalaceae	3	0.66	3	0.39
Portulacaceae	2	0.44	3	0.39
Begoniaceae	1	0.22	2	0.26
Cabombaceae	1	0.22	2	0.26
Capparaceae	2	0.44	2	0.26
Elaeocarpaceae	1	0.22	2	0.26
Gentianaceae	2	0.44	2	0.26
Loganiaceae	1	0.22	2	0.26
Menispermaceae	1	0.22	2	0.26
Ochnaceae	2	0.44	2	0.26
Schrophulariaceae	2	0.44	2	0.26
Turneraceae	1	0.22	2	0.26
Ulmaceae	2	0.44	2	0.26
Urticaceae	1	0.22	2	0.26
Violaceae	1	0.22	2	0.26
Bombacaceae	1	0.22	1	0.13

Table 1. Continued...

Family	NG	NG (%)	NS	NS (%)
Brassicaceae	1	0.22	1	0.13
Budlejaceae	1	0.22	1	0.13
Burseraceae	1	0.22	1	0.13
Campanulaceae	1	0.22	1	0.13
Caricaceae	1	0.22	1	0.13
Caryophyllaceae	1	0.22	1	0.13
Cecropiaceae	1	0.22	1	0.13
Celastraceae	1	0.22	1	0.13
Ebenaceae	1	0.22	1	0.13
Haloragaceae	1	0.22	1	0.13
Hypericaceae	1	0.22	1	0.13
Hydrophyllaceae	1	0.22	1	0.13
Lacistemataceae	1	0.22	1	0.13
Lecythidaceae	1	0.22	1	0.13
Lentibulariaceae	1	0.22	1	0.13
Menyanthaceae	1	0.22	1	0.13
Molluginaceae	1	0.22	1	0.13
Nymphaeaceae	1	0.22	1	0.13
Plantaginaceae	1	0.22	1	0.13
Proteaceae	1	0.22	1	0.13
Simaroubaceae	1	0.22	1	0.13
Symplocaceae	1	0.22	1	0.13
Theophrastaceae	1	0.22	1	0.13
Trigoniaceae	1	0.22	1	0.13
Viscaceae	1	0.22	1	0.13
Vochysiaceae	1	0.22	1	0.13

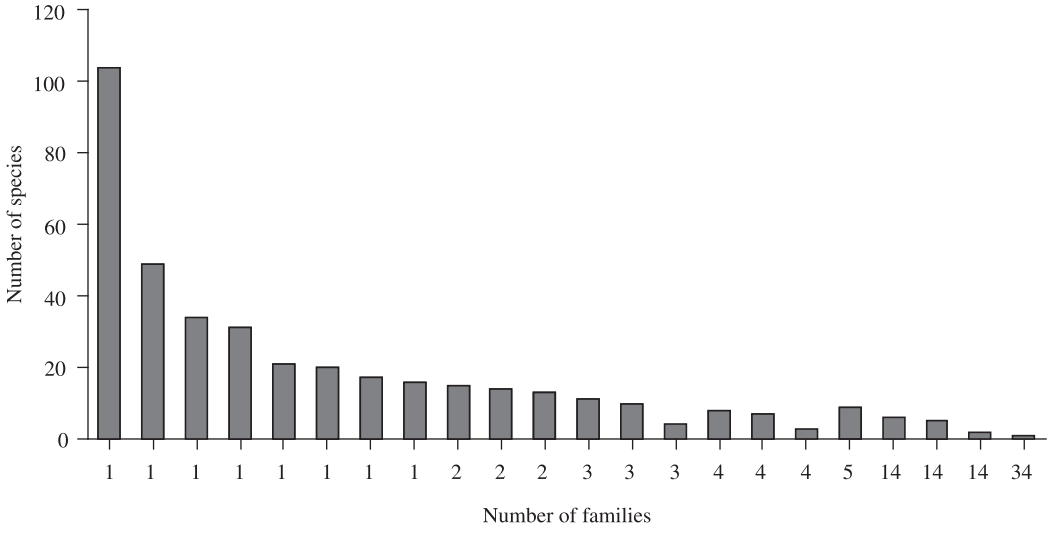

Figure 2. Number of species by number of families for the floristic inventories conducted in the Upper Paraná River floodplain located in the states of Paraná and Mato Grosso do Sul, Brazil: period from 2000 to 2008 - PELD/CNPq–Site 6.

with *Cyperus*, *Panicum*, *Eugenia*, *Tillandsia*, *Serjania*, *Casearia*, *Polygonum*, *Chamaechrista*, and *Cissus* (Table 2, Figure 3). Therefore, the distribution of species by genus was more homogeneous than by family, due to the higher number of species in Leguminosae (Figure 3).

Herbs (32%) and trees (28%) dominated in regards to life habits, followed by shrubs (19%), climbers (15%), epiphytes (6%), and parasites (0.1%). The dominant families for herbs were Poaceae (39 species), Asteraceae (20), Cyperaceae (19), Leguminosae (17), Euphorbiaceae (13), and Rubiaceae (12); for trees, the dominant families were Leguminosae (46), Myrtaceae (22), Euphorbiaceae (11), Rutaceae (11), Flacourtiaceae (10), and Lauraceae (10); for shrubs, the dominant families were Leguminosae (22), Rubiaceae (13), Solanaceae (12), Asteraceae (11), Malvaceae (10), and Myrtaceae (9); for climbers, the dominant families were Leguminosae (19), Convolvulaceae (12), Sapindaceae (11), Bignoniaceae (9), Malpighiaceae (7), and Vitaceae (7); and for epiphytes, the dominant families were Orchidaceae (15), Bromeliaceae (14), Cactaceae (12), and Polypodiaceae (5).

The species *Citrus aurantium* L., *C. limon* (L.) Burm. f., *Eucaliptus* sp., *Hovenia dulcis* Thunb., *Melia azedarach* L., *Panicum maximum* Jacq., *Pennisetum purpureum* Schum., *Psidium guajava* L., *Ricinus communis* L., *Syzygium cumini* (L.) Skeels, and *Urochloa decumbens* (Stapf) RD Welster are listed under an official list of 47 high risk invasive species, published in the Government Order No. 095/2007 of the State of Paraná (IAP, 2007).

Table 2. Most specious genera of the floristic inventory conducted in the Upper Paraná River Floodplain located in the states of Paraná and Mato do Grosso do Sul, Brazil: period from 2000 to 2008 - PELD/CNPq – Site 6 (NSP = number of species; SP (%) = percentage in relation to the total number of species.

Genera	NSP	SP (%)
Solanum	14	1.8
Cyperus	12	1.6
Panicum	12	1.6
Eugenia	11	1.4
Tillandsia	8	1.0
Serjania	8	1.0
Casearia	7	0.9
Polygonum	7	0.9
Chamaecrista	6	0.8
Cissus	6	0.8
Eragrostis	6	0.8
Ipomoea	6	0.8
Myrcia	6	0.8
Nectandra	6	0.8
Paspalum	6	0.8
Aeschynomene	5	0.7
Desmodium	5	0.7
Inga	5	0.7
Ludwigia	5	0.7
Machaerium	5	0.7
Miconia	5	0.7
Phyllanthus	5	0.7
Senna	5	0.7

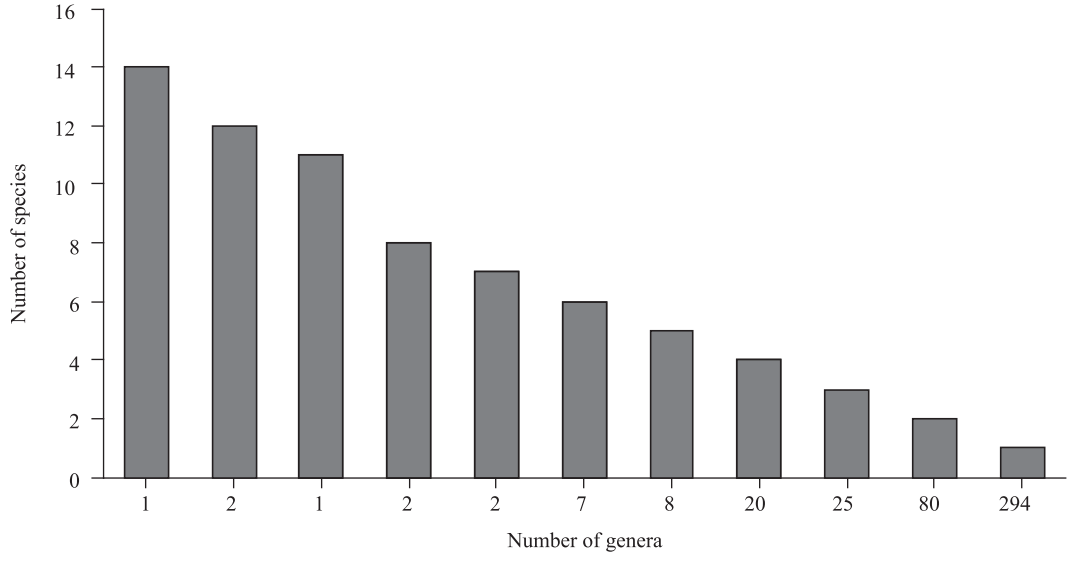

Figure 3. Number of species by number of genera for the floristic inventories conducted in the Upper Paraná River floodplain located in the states of Paraná and Mato Grosso do Sul, Brazil: period from 2000 to 2008 - PELD/CNPq – site 6.

4. Discussion

These data, when added to those from the inventory conducted by Souza et al. (1997) from 1986 to 1996, resulted in a total of 955 species, 575 genera, and 128 families (Table 3) identified in the study area. A total of 331 species were common for both inventories, and 473 were new occurrences to the UPRF, which demonstrated the importance of long-term research studies. These results are in agreement with Pifano et al. (2007), considering the assiduity and frequency fundamentals to minimize floristic underestimates.

Psilotaceae is worth noting among the families that were only found in the previous study (Table 4), since *Psilotum nudum* (L.) P. Beau. was not found again in the only locality that this organism was previously recorded. In Brazil, this species occurs in the states of Mato Grosso, Minas Gerais, Rio de Janeiro, Rio Grande do Sul, Santa Catarina, and São Paulo (Sehnem, 1979; Athayde-Filho and Felizardo, 2007; Santos and Araujo, 2007; Salino and Almeida, 2008), and it occurred in rock crevices in the left bank of the Paraná River (Municipality of São Pedro do Paraná, Paraná State) in the study area. In contrast, Orchidaceae included 16 species and was among the dominant families, which were only found periodically in the PELD (Tomazini, 2003).

The dominance of Leguminosae and Poaceae in species richness was previously described by Kita and Souza (2003) and Souza et al. (2004b) in the UPRF. The first family was dominant in forests, while the second was dominant in fields. Emphasis on Leguminosae, Euphorbiaceae, Myrtaceae, and Rubiaceae is common in studies of riparian forests located in Paraná and Mato Grosso do Sul, as well as of other areas in Brazil outside of the Amazon (Leitão Filho, 1982; 1987; Silva et al.,

Table 3. Compilation of the number of taxa for the inventories conducted in the Upper Paraná River floodplain in 1986-1997 (A) and 2000-2008 (B) (CO = common species; T = total number for each group).

Division/Class	Family				Genus				Species			
	A	B	CO	T	A	B	CO	T	A	B	CO	T
Pteridophyta	11	6	5	12	21	13	12	22	31	20	10	41
Liliopsida	16	18	13	21	40	67	35	72	51	144	31	164
Magnoliopsida	78	92	78	95	255	362	216	481	400	610	260	750
Total	105	116	96	128	316	442	263	575	482	774	301	955

Table 4. Families of Pteridophyta and Magnoliophyta exclusive to the inventory conducted in 1986-1996 or 2000-2008 in the Upper Paraná River floodplain.

PTERIDOPHYTA		MAGNOLIOPHYTA			
		Liliopsida		Magnoliopsida	
1986-1996	2000-2008	1986-1996	2000-2008	1986-1996	2000-2008
Aspleniaceae	Sellaginalaceae	Cabombaceae	Araceae	Caprifoliaceae	Bombacaceae
Blechnaceae		Limnocharitaceae	Dioscoreaceae	Gesneriaceae	Brassicaceae
Cyatheaceae		Najadaceae	Hydrocharitaceae	Monimiaceae	Budlejadaceae
Denstaediaceae		Xyridaceae	Orchidaceae		Caricaceae
Lycopodiaceae			Potamogetonaceae		Caryophyllaceae
Psilotaceae					Celastraceae
					Ebenaceae
					Gentianaceae
					Haloragaceae
					Hypericaceae
					Lacistemataceae
					Menyanthaceae
					Ochnaceae
					Plantaginaceae
					Proteaceae
					Symplocaceae

1992; Soares-Silva et al., 1992; Dias et al., 1998; Silva et al., 1995; Nakajima et al., 1996; Bianchini et al., 2003; Damasceno Junio and Bezerra, 2004; Rodrigues and Nave, 2004; Battilani et al., 2005; Daniel and Arruda, 2005; Arruda and Daniel, 2007). Poaceae and Asteraceae have been cited as the most species-rich in studies that included herbaceous plants and shrubs (Azevedo and Vieira, 2008).

The phytosociologic importance of Poaceae in areas under anthropogenic interference (Vieira and Pessoa, 2001) refers to the characteristics of this group, such as growth rate, morphology, and arrangement of leaves, as well as the production of litter that reduces light availability and increases the competition for nutrients and water at ground level, which impedes the establishment and development of seeds and seedlings. All these characteristics have direct implications for community succession. In a study of old fields located in riparian areas in the UPRF, Vianna (2008) determined that *Panicum maximum* Jacq. and *Urochloa decumbens* (Stapf) R.D.Webster are a serious problem for the natural regeneration of forests.

With regard to invasive plants, *Panicum maximum* Jacq., *Pennisetum purpureum* Schumach., *Ricinus communis* L., and *Urochloa decumbens* (Stapf) R.D.Webster are considered weeds and widely distributed in the environment. For these species, our results suggest the need for further studies that purpose control of these plants. *Psidium guajava* L. was also observed in association with native species in naturally regenerating areas. The fruits serve as food for wildlife and humans, which are eaten as juices and jams. Therefore, this plant exhibits potential to be used by the local population (Ubessi-Macarini, 2008).

The species that caused most concern in regards to competition with natives was *Merremia dissecta* Hallier f., which is a vigorous fast-growing liana that covers trees and shrubs in the forest edges. Two other species of *Merremia* (*M. macrocalyx* (Ruiz & Pav.) O'Donell and *M. tuberosa* Rendle), which have similar growth forms, were already reported as high-risk in the Parque Municipal do Ingá located in the Maringá municipality, Paraná state (Kita et al., 2007).

This type of survey, which included all types of life habits found, demonstrates the importance of herbaceous, shrubs, climbers, and epiphytes for characterization of the flora of a particular area. In this study, plants of these habits comprised 72% of the total number of species.

The results presented herein are based on the list of plants identified thus far. Continued floristic surveys and further taxonomic identifications will certainly add new taxa for the area. Improved taxonomic studies of certain groups, be they families, genera, or species, are vital for the expansion of knowledge on the flora of Upper Paraná River floodplain.

Our results may be applied to projects for revegetation of the riparian areas in this region, and to other studies on the taxonomy and distribution of species, ecology, endangered species, invasive species, and sustainable development. The importance of this area for biodiversity conservation is indisputable. The existent conservation units are important, but new units must be created, such as in the area of buritis (*Mauritia* sp.) in Mato Grosso do Sul State, since this palm is very rare in this region of Brazil.

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