



Floristic composition of the Seasonal Semideciduous Forest in Southern Brazil: *Reserva Biológica das Perobas*, State of Paraná

Greta Aline Dettke*, Laianne Mayara Pezenti Crespão, Luciana Veríssimo Siquerolo, Edemilson Luiz Siqueira and Marcelo Galeazzi Caxambú

Herbário HCF, Universidade Tecnológica Federal do Paraná, Marginal Rosalina Maria dos Santos, 1233, 87301-899, Campo Mourão, Paraná, Brazil. *Author for correspondence. E-mail: gretadet@yahoo.com.br

ABSTRACT. This study catalogued the vascular species found in the second largest continuous remnant of Seasonal Semideciduous Forest in the State of Paraná. A total of 425 species distributed among 295 genera and 101 families were identified. The most representative families are Fabaceae (27 species), Asteraceae (21), Bignoniaceae (19), Poaceae (19) and Orchidaceae (15). Two species are unique records in the State of Paraná, in the study area: *Bulbophyllum rupicolum* Barb.Rodr. (Orchidaceae) and *Heladena multiflora* (Hook. & Arn.) Nied. (Malpighiaceae). The predominant life forms are herbs and trees, and terrestrial plants represented the majority of species. We recorded 11 exotic species. It is a large remnant and contains high specific diversity for the region, with a quarter of the species listed for the Seasonal Semideciduous Forest of the State of Paraná.

Keywords: Atlantic Forest; inventory floristic; conservation; diversity; herbarium.

Composição florística da Floresta Estacional Semidecidual do Sul do Brasil: Reserva Biológica das Perobas, Paraná

RESUMO. Este estudo apresenta o catálogo da flora vascular do segundo maior remanescente de Floresta Estacional Semidecidual do Paraná. Foram identificadas 425 espécies, distribuídas em 295 gêneros e 101 famílias. As famílias mais representativas foram Fabaceae (27 espécies), Asteraceae (21), Bignoniaceae (19), Poaceae (19) e Orchidaceae (15). Duas espécies possuem registro único no estado do Paraná: *Bulbophyllum rupicolum* Barb.Rodr. (Orchidaceae) e *Heladena multiflora* (Hook. & Arn.) Nied. (Malpighiaceae). As formas de vida predominante foram plantas herbáceas e arbóreas, e as terrícolas foram maioria no uso de substrato. Foram registradas 11 espécies exóticas. Este é um remanescente de grande extensão e apresenta alta diversidade específica para a região, apresentando um quarto das espécies listadas para a Floresta Estacional Semidecidual do Paraná.

Keywords: Floresta Atlântica; inventário florístico; conservação; diversidade; herbário.

Introduction

The Seasonal Semideciduous Forest is one of the most extensive forest vegetation types in Brazil, included in Domain of the Atlantic Rainforest, stretches along the Brazilian coast and inland to Paraguay and Argentina (*Instituto Brasileiro de Geografia e Estatística* [IBGE], 2012). The high levels of species richness and endemism associated with the destruction in the past included the Atlantic Rainforest as one of the 34 biodiversity hotspots on Earth (Mittermeier et al., 2004). Currently, there are only 8% of the original territory and what is left is becoming increasingly fragmented (Mittermeier et al., 2004). In the Atlantic Rainforest, approximately 49.5% of the Brazilian flowering plants species are endemic (Brazil Flora Group [BFG], 2015).

Brazil holds 95% of Seasonal Semideciduous Forest, corresponding to 13% of its territory (Stehmann et al., 2009). This vegetation type is characterized by the dual climate seasonality and the partial leaf shedding between 20 and 50% individuals, which takes place annually in the unfavorable dry period in the tropics or intense cold in the subtropical region (Veloso, Rangel Filho, & Lima, 1991; IBGE, 2012).

In the State of Paraná, Seasonal Semideciduous Forest occurs in the North, Northwest and West, down from 800 m high (Roderjan, Galvão, Kuniyoshi, & Hatschbach, 2002). In such areas, the forest is characterized by presenting canopy between 15 and 20 m high, with emerging individual trees about 30 m high. Currently not much is left of this phytophysionomy because it is in the region that

was most deforested in the State of Paraná over the past 75 years, for the establishment of monocultures of coffee, soybeans, wheat, sugarcane and corn. The vegetation was poorly studied before the profound disturbances, so there is little existing data on the original floristic composition.

Thus, the objective of this study was to characterize the floristic diversity of vascular species of one of the largest remnants of Seasonal Semideciduous Forest in southern Brazil, the 'Reserva Biológica das Perobas'.

Material and methods

Study area

The 'Reserva Biológica das Perobas' (Figure 1) was located in the northwestern State of Paraná (23° 47' S, 52° 55' W). It was established in 2006 as a Federal Integral Protection Conservation Unit and covers the municipalities of Tuneiras do Oeste and Cianorte. The total surface area is approximately 8.716 ha (*Instituto Chico Mendes de Conservação da Biodiversidade* [ICMBio], 2013), being the second largest continuous remnant of the Seasonal Semideciduous Forest in the State of Paraná, smaller only than the 'Parque Nacional do Iguaçu', which is located approximately 160 km to the southwest of the study area. The symbol species of this protected area are the 'peroba' (*Aspidosperma polyneuron*

Müll.Arg., Apocynaceae), an emergent tree that was very common in the region and an important logging product.

The climate of the study area is, according to the Köppen–Geiger climate classification system, Cfa, characterized by a humid subtropical climate with hot, humid summers and mild to cool winters, with rainfall concentrated in summer (*Instituto Agrônomo do Paraná* [Iapar], 2000). Soils are derived from sandstone (Arenito Caiuá) and have a high vulnerability to erosion (Iapar, 1999).

The predominant phytogeographic formation in this area are the Seasonal Semideciduous Forest. However, near the Reserve there are two remnants of differentiated vegetation: one, about 5 Km east, covered by Subtropical Mixed Forest, with great abundance of *Araucaria angustifolia* (Bertol.) Kuntze (Araucariaceae); and another less than 100 m from the unit, in the east, with characteristic elements of Tropical Savanna (Cerrado) (unpubl. data, M.G. Caxambú).

According to Castella and Britez (2004), this forest can be classified as forest in intermediate stage of succession. Although this area has not been clear-cut, intense logging for more than four decades promoted the development of features of this succession stage.

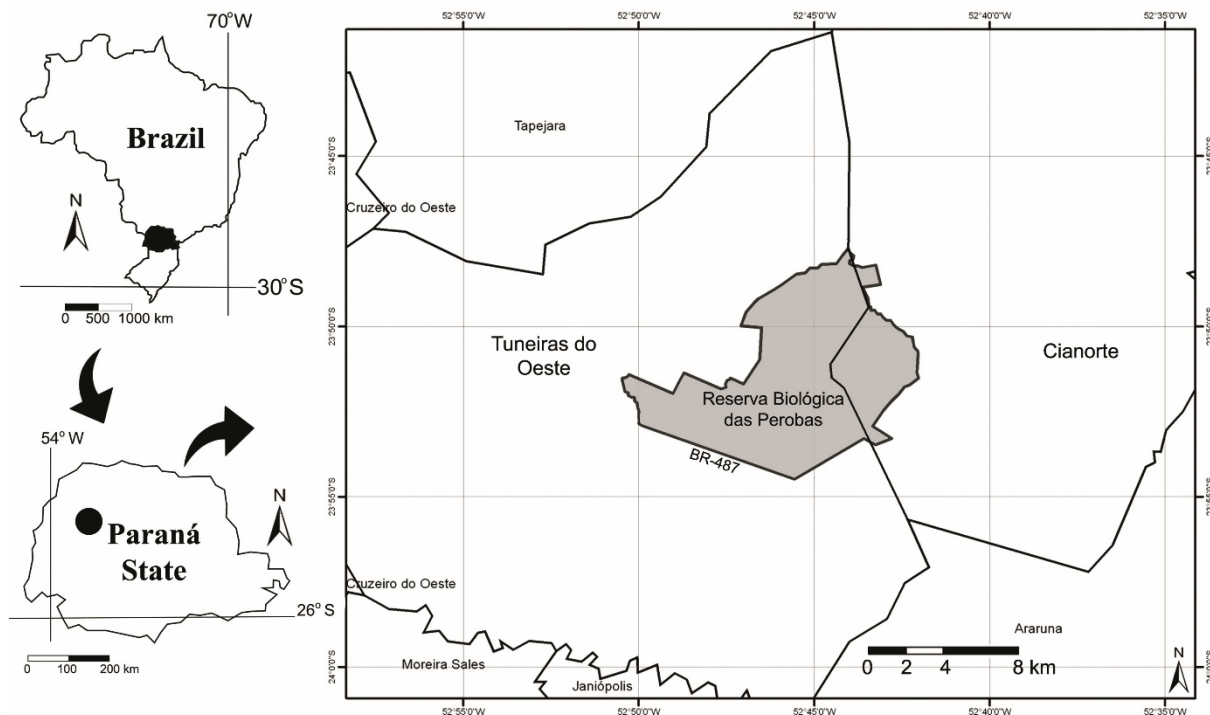


Figure 1. Location of the 'Reserva Biológica das Perobas', State of Paraná, Brazil.

Data collection and data analysis

Fieldwork on ‘Reserva Biológica das Perobas’ was carried out during field trips from August 2011 to November 2015. During our surveys, we compiled a complete species list of vascular plants. Hiking have been covered along the entire area and covering all phytophysionomy, according to Filgueiras, Brochado, Nogueira, and Gualla II (1994). All species were collected and deposited with a voucher number in the herbarium of ‘Universidade Tecnológica Federal do Paraná, campus Campo Mourão’ (HCF). Species that were not found fertile but are vegetatively easily recognized were also included in the list with ‘no voucher’. Taxonomic identification was conducted using specialized references, comparisons to material deposited in herbaria, and consultation with experts.

The classification system used for angiosperms was based on Angiosperm Phylogeny Group IV (APG, 2016) and for families and genera of

lycophytes and ferns, we followed the classification of Pteridophyte Phylogeny Group I (PPG, 2016).

Species status (native, exotic), life form (climber, herb, shrub, subshrub, tree) and use of substrate (aquatic, epiphytic, hemiepiphytic, hemiparasitic, mycoheterotroph, rupicolous, terrestrial) was assigned according to the observed on the field and database of *Flora do Brasil* (2017).

Results

A total of 425 species was recorded for ‘Reserva Biológica das Perobas’ (414 native and eleven exotic) belonging to 295 genera and 101 families (Table 1). Ferns were represented by 44 species, 29 genera and 17 families; Lycophytes, with only one species, *Palhinhaea cernua* (L.) Franco & Vasc. (Lycopodiaceae); Gymnosperms, with one species, *Araucaria angustifolia* (Bertol.) Kuntze (Araucariaceae); and Angiosperms with 379 species, 264 genera and 82 families.

Table 1. Complete checklist, life forms, use of substrate and voucher of the vascular plants of the ‘Reserva Biológica das Perobas’, State of Paraná, Brazil. (End, Endangered; Vul, Vulnerable; *exotic).

Family/ Species (n genera/n species)	Life form	Use of substrate	Obs	Voucher number (HCF)
Lycophytes & ferns				
Anemiaceae 1/1				
<i>Anemia phyllitidis</i> (L.) Sw.	Herb	Terrestrial		738
Aspleniaceae 1/4				
<i>Asplenium gastonis</i> Fée	Herb	Epiphytic		1056
<i>Asplenium clausenii</i> Hieron	Herb	Terrestrial		14941
<i>Asplenium harpeodes</i> Kunze	Herb	Epiphytic		13354
<i>Asplenium stuebelianum</i> Hieron.	Herb	Epiphytic		11073
Athuriaceae 1/3				
<i>Diplazium cristatum</i> (Desr.) Alston	Herb	Terrestrial		14937
<i>Diplazium mattogrossense</i> A. Samp.	Herb	Terrestrial		13362
<i>Diplazium plantaginifolium</i> (L.) Urb.	Herb	Terrestrial		13360
Blechnaceae 3/3				
<i>Blechnum polypodioides</i> Raddi	Herb	Terrestrial		13946
<i>Lomariidium plumieri</i> (Desv.) C. Presl.	Herb	Hemiepiphytic		13160
<i>Neoblechnum brasiliense</i> (Desv.) Gasper & V.A.O. Dittrich	Herb	Terrestrial		9184
Cyatheaceae 1/2				
<i>Cyathea atrovirens</i> (Langsd. & Fisch.) Domin	Tree	Terrestrial		925
<i>Cyathea delgadii</i> Sternb.	Tree	Terrestrial		13353
Dennstaedtiaceae 1/1				
<i>Pteridium arachnoideum</i> (Kaulf.) Maxon	Herb	Terrestrial		13937
Didymochlaenaceae 1/1				
<i>Didymochlaena truncatula</i> (Sw.) J. Sm.	Herb	Terrestrial		13351
Dryopteridaceae 4/4				
<i>Ctenitis submarginalis</i> (Langsd. & Fisch.) Ching	Herb	Terrestrial		9183
<i>Lastreopsis effusa</i> (Sw.) Tindale	Herb	Terrestrial		3324
<i>Olfersia cervina</i> (L.) Kunze	Herb	Terrestrial		13358
<i>Polystichum platylepis</i> Fée	Herb	Terrestrial		12128
Equisetaceae 1/1				
<i>Equisetum giganteum</i> L.	Herb	Terrestrial		10541
Gleicheniaceae 1/1				
<i>Dicranopteris nervosa</i> (Kaulf.) Maxon	Herb	Terrestrial		2743
Hymenophyllaceae 2/2				
<i>Vandenboschia radicans</i> (Sw.) Copel	Herb	Epiphytic		14940
<i>Polyphlebium pyxidiferum</i> (L.) Ebihara & Dubuisson	Herb	Epiphytic		13161
Lycopodiaceae 1/1				
<i>Palhinhaea cernua</i> (L.) Franco & Vasc.	Herb	Terrestrial		307
Marattiaceae 1/1				
<i>Danaea moritziana</i> C. Presl	Herb	Terrestrial		13357
Osmundaceae 1/1				
<i>Osmunda regalis</i> L.	Herb	Terrestrial		3221

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Polypodiaceae 4/8					
<i>Campyloneurum nitidum</i> (Kaulf.) C. Presl.	Herb	Epiphytic			1055
<i>Microgramma lindbergii</i> (Mett.) de la Sota	Herb	Epiphytic			17036
<i>Microgramma squamulosa</i> (Kaulf.) de la Sota	Herb	Epiphytic			11052
<i>Pecluma filicula</i> (Kaulf.) M.G. Price	Herb	Epiphytic			11907
<i>Pecluma sicca</i> (Lindm.) M.G. Price	Herb	Epiphytic			19909
<i>Pleopeltis hirsutissima</i> (Raddi) de la Sota	Herb	Epiphytic			2737
<i>Pleopeltis minima</i> (Bory) J. Prado & R.Y. Hirai	Herb	Epiphytic			2741
<i>Pleopeltis pleopeltifolia</i> (Raddi) Alston	Herb	Epiphytic			9218
Pteridaceae 4/7					
<i>Adiantopsis radiata</i> (L.) Feé	Herb	Terrestrial			694
<i>Adiantum raddianum</i> C. Presl.	Herb	Terrestrial			10813
<i>Doryopteris concolor</i> (Langsd. & Fisch.) Kuhn	Herb	Terrestrial			9672
<i>Doryopteris patula</i> Fée	Herb	Terrestrial			13349
<i>Doryopteris pentagona</i> Pic. Serm.	Herb	Terrestrial			17037
<i>Pityrogramma calomelanos</i> (L.) Link	Herb	Terrestrial			3298
<i>Pityrogramma trifoliata</i> (L.) R.M. Tryon	Herb	Terrestrial			10540
Tectariaceae 1/1					
<i>Tectaria incisa</i> Cav.	Herb	Terrestrial			14938
Thelypteridaceae 1/3					
<i>Thelypteris rivularioides</i> (Fée) Abbiatti	Herb	Terrestrial			3297
<i>Thelypteris serrata</i> (Cav.) Alston	Herb	Terrestrial			10545
<i>Thelypteris opposita</i> (Vahl) Ching	Herb	Terrestrial			13944
Gymnosperms					
Araucariaceae 1/1					
<i>Araucaria angustifolia</i> (Bertol.) Kuntze	Tree	Terrestrial	End	No voucher	
Angiosperms					
Acanthaceae 3/3					
<i>Hygrophila costata</i> Nees	Herb	Terrestrial			3325
<i>Justicia brasiliana</i> Roth	Subshrub	Terrestrial			736
<i>Ruellia angustiflora</i> (Nees) Lindau ex Rambo	Shrub	Terrestrial			2758
Alismataceae 1/1					
<i>Echinodorus grandiflorus</i> (Cham & Schltdl.) Micheli	Herb	Aquatic			9219
Amaranthaceae 2/2					
<i>Alternanthera tenella</i> Colla	Herb	Terrestrial			2224
<i>Hebanthe eriantha</i> (Poir.) Pedersen	Climber, Subshrub	Terrestrial			9663
Amaryllidaceae 1/1					
<i>Hippeastrum reticulatum</i> Herb.	Herb	Terrestrial			13350
Anacardiaceae 2/2					
<i>Astronium graveolens</i> Jacq.	Tree	Terrestrial			2761
<i>Mangifera indica</i> L.	Tree	Terrestrial	*		9162
Annonaceae 1/2					
<i>Annona cacans</i> Warm.	Tree	Terrestrial			9230
<i>Annona emarginata</i> (Schltdl.) H. Rainer	Tree	Terrestrial			9211
Apocynaceae 10/12					
<i>Asclepias curassavica</i> L.	Herb	Terrestrial			9197
<i>Aspidosperma polyneuron</i> Müll.Arg.	Tree	Terrestrial			10453
<i>Condylocarpon isthmicum</i> (Vell.) A. DC.	Climber	Terrestrial			919
<i>Forsteronia thyrsoides</i> (Vell.) Müll.Arg.	Climber	Terrestrial			1299
<i>Oxypetalum balansae</i> Malme	Climber	Terrestrial			1109
<i>Oxypetalum wightianum</i> Hook. & Arn.	Climber	Terrestrial			910
<i>Peltastes peltatus</i> (Vell.) Woodson	Climber	Terrestrial			9882
<i>Peplonia axillaris</i> (Vell.) Fontella & Rapini	Climber	Terrestrial			10820
<i>Prestonia coalita</i> (Vell.) Woodson	Climber	Terrestrial			703
<i>Prestonia riedelli</i> (Müll.Arg.) Markgr.	Climber	Terrestrial			18265
<i>Tabernaemontana catharinensis</i> A.DC.	Tree	Terrestrial			9131
<i>Temnadenia violacea</i> (Vell.) Miers	Climber	Terrestrial			721
Aquifoliaceae 1/2					
<i>Ilex dumosa</i> Reissek	Tree	Terrestrial			3327
<i>Ilex paraguariensis</i> A.St.-Hil.	Tree	Terrestrial			9881
Araceae 1/1					
<i>Philodendron bipinnatifidum</i> Schott	Herb	Hemiepiphytic			9194
Araliaceae 1/2					
<i>Hydrocotyle callicephala</i> (Cham.) Urb.	Herb	Terrestrial			1162
<i>Hydrocotyle leucocephala</i> Cham. & Schltdl.	Herb	Terrestrial			9201
Arecaceae 3/3					
<i>Geonoma schottiana</i> Mart.	Subshrub	Terrestrial			1317
<i>Syagrus romanzoffiana</i> (Cham.) Glassman	Tree	Terrestrial			911
<i>Euterpe edulis</i> Mart.	Tree	Terrestrial	Vul		9122
Asparagaceae 1/1					
<i>Cordylone spectabilis</i> Kunth & Bouché	Tree	Terrestrial			9206
Asteraceae 17/21					
<i>Acanthospermum australe</i> (Loefl.) O Kuntze	Herb	Terrestrial			3203
<i>Ambrosia elatior</i> L.	Herb	Terrestrial			3336
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<i>Baccharis dracunculifolia</i> DC.	Shrub	Terrestrial	924
<i>Baccharis pingraea</i> DC.	Subshrub	Terrestrial	3314
<i>Baccharis trinervis</i> (Lam.) Pers.	Climber, Subshrub	Terrestrial	2748
<i>Clibadium armani</i> (Balb.) Sch.Bip. ex O.E. Schulz	Shrub	Terrestrial	3296
<i>Conyza bonariensis</i> (L.) Cronquist	Subshrub	Terrestrial	1922
<i>Cyrtocymura scorpioides</i> (Lam.) H. Robinson	Subshrub	Terrestrial	1483
<i>Dasyphyllum brasiliense</i> (Spreng.) Cabrera	Climber, Shrub	Terrestrial	13943
<i>Elephantopus mollis</i> Kunth	Herb	Terrestrial	9220
<i>Lessingianthus niederleinii</i> (Hieron.) H. Rob.	Subshrub	Terrestrial	1060
<i>Mikania hirsutissima</i> DC.	Climber	Terrestrial	319
<i>Moquiniastrum polymorphum</i> (Less.) G. Sancho	Shrub, Tree	Terrestrial	3304
<i>Mutisia speciosa</i> Aiton ex Hook.	Climber	Terrestrial	918
<i>Porophyllum ruderale</i> (Jacq.) Cass.	Herb	Terrestrial	1484
<i>Praxelis dematidea</i> (Griseb.) R.M. King & H. Rob.	Subshrub	Terrestrial	706
<i>Pterocaulon lanatum</i> O. Kuntze	Herb, Subshrub	Terrestrial	1100
<i>Senecio bonariensis</i> Hook. & Arn.	Herb	Terrestrial	3335
<i>Senecio brasiliensis</i> (Spreng.) Less.	Herb, Shrub	Terrestrial	1485
<i>Vernonanthura discolor</i> (Spreng.) H. Rob.	Tree	Terrestrial	305
<i>Vernonanthura petiolaris</i> (DC.) H. Rob.	Tree	Terrestrial	1311
Begoniaceae 1/1			
<i>Begonia fruticosa</i> (Klotzsch) A.DC.	Climber	Hemiepiphytic, Terrestrial	13363
Bignoniaceae 13/19			
<i>Adenocalymma bracteatum</i> (Cham.) DC.	Climber	Terrestrial	1067
<i>Adenocalymma marginatum</i> (Cham.) DC.	Climber	Terrestrial	10452
<i>Amphilophium crucigerum</i> (L.) L.G. Lohmann	Climber	Terrestrial	712
<i>Amphilophium dusenianum</i> (Kraenzl.) L.G. Lohmann	Climber	Terrestrial	10817
<i>Amphilophium paniculatum</i> (L.) Kunth.	Climber	Terrestrial	3320
<i>Anemopaegma chamberlaynii</i> (Sims) Bureau & K. Schum.	Climber	Terrestrial	1921
<i>Cuspidaria pulchella</i> (Cham.) K.Schum.	Climber	Terrestrial	1507
<i>Dolichandra unguis-cati</i> (L.) L.G. Lohmann	Climber	Terrestrial	9165
<i>Fridericia caudigera</i> (S. Moore) L.G. Lohmann	Climber	Terrestrial	9940
<i>Fridericia chica</i> (Bonpl.) L.G.Lohmann	Climber	Terrestrial	1492
<i>Fridericia samydoides</i> (Cham.) L.G.Lohmann	Climber	Terrestrial	1927
<i>Jacaranda mutabilis</i> Hassl.	Tree	Terrestrial	No voucher
<i>Jacaranda puberula</i> Cham.	Tree	Terrestrial	9232
<i>Mansoa diffilis</i> (Cham.) Bureau. & K. Schum.	Climber	Terrestrial	9143
<i>Pyrostegia venusta</i> (Ker Gawl.) Miers	Climber	Terrestrial	1305
<i>Tanaecium mutabile</i> L.G. Lohmann	Climber	Terrestrial	9155
<i>Tecoma stans</i> (L.) Juss. ex Kunth	Tree	Terrestrial	* No voucher
<i>Tynanthus micranthus</i> Corr.Mello ex K. Schum.	Climber	Terrestrial	1500
<i>Zeyheria tuberculosa</i> (Vell.) Bureau ex Verl.	Tree	Terrestrial	Vul 13162
Boraginaceae 4/4			
<i>Cordia ecalyculata</i> Vell.	Tree	Terrestrial	3329
<i>Heliotropium transalpinum</i> Vell.	Shrub, Subshrub	Terrestrial	9153
<i>Myriopus paniculatus</i> (Cham.) Feuillet	Climber, Shrub	Terrestrial	739
<i>Varronia polycephala</i> Lam.	Shrub, Subshrub	Terrestrial	13348
Bromeliaceae 5/7			
<i>Acanthostachys strobilacea</i> (Schult. & Schult. f.) Klotzsch	Herb	Epiphytic	1482
<i>Aechmea distichantha</i> Lem.	Herb	Epiphytic, Terrestrial	11057
<i>Ananas bracteatus</i> (Lindley) Schult. & Schult. f.	Herb	Terrestrial	1510
<i>Billbergia nutans</i> H.H. Wendl. ex Regel	Herb	Epiphytic	1110
<i>Tillandsia loliacea</i> Mart. ex Schult. & Schult. f.	Herb	Epiphytic	11904
<i>Tillandsia recurvata</i> (L.) L.	Herb	Epiphytic	11050
<i>Tillandsia tenuifolia</i> L.	Herb	Epiphytic	9699
Cactaceae 5/7			
<i>Cereus hildmannianus</i> K. Schum.	Shrub	Terrestrial	No voucher
<i>Epiphyllum phyllanthus</i> (L.) Haw.	Herb	Epiphytic	No voucher
<i>Lepismium cruciforme</i> (Vell.) Miq.	Herb	Epiphytic	1487
<i>Lepismium warmingianum</i> (K. Schum.) Barthlott	Herb	Epiphytic	9199
<i>Pereskia aculeata</i> Mill.	Climber	Terrestrial	9673
<i>Rhipsalis cereuscula</i> (How) Volguin	Herb	Epiphytic	9195
<i>Rhipsalis floccosa</i> Salm-Dyck ex Pfeiff.	Herb	Epiphytic	No voucher
Campanulaceae 1/1			
<i>Siphocampylus verticillatus</i> (Cham.) G. Don.	Herb, Subshrub	Terrestrial	1928
Cannabaceae 2/2			
<i>Celtis iguanaea</i> (Jacq.) Sarg.	Climber, Shrub, Tree	Terrestrial	937
<i>Trema micrantha</i> (L.) Blume	Shrub, Tree	Terrestrial	9175
Capparaceae 1/1			
<i>Monilicarpa brasiliiana</i> (Banks ex DC.) Cornejo & Iltis	Shrub, Tree	Terrestrial	2733
Caricaceae 1/1			
<i>Jacaratia spinosa</i> (Aubl.) A.DC.	Tree	Terrestrial	1486
Celastraceae 3/3			
<i>Hippocratea volubilis</i> L.	Climber	Terrestrial	9189
<i>Pristimera celastroides</i> (Kunth.) A.C. Sm.	Climber	Terrestrial	2740
<i>Tontelea miersii</i> (Peyr.) A.C. Sm.	Climber	Terrestrial	9937
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Clethraceae 1/1			
<i>Clethra scabra</i> Pers.	Shrub, Tree	Terrestrial	730
Combretaceae 2/2			
<i>Combretum fruticosum</i> (Loef.) Stunz	Climber, Shrub	Terrestrial	677
<i>Terminalia glabrescens</i> Mart.	Shrub, Tree	Terrestrial	9228
Commelinaceae 2/3			
<i>Commelina erecta</i> L.	Herb	Terrestrial	10812
<i>Commelina obliqua</i> Vahl	Herb	Terrestrial	9186
<i>Dichorisandra hexandra</i> (Aubl.) C.B. Clarke	Climber, Herb	Terrestrial	3302
Convolvulaceae 3/3			
<i>Distimake macrocalyx</i> (Ruiz & Pav.) Simões & Staples	Climber	Terrestrial	13938
<i>Ipomoea nil</i> (L.) Roth	Climber	Terrestrial	13936
<i>Jacquemontia ferruginea</i> Choisy	Climber	Terrestrial	10536
Cucurbitaceae 2/2			
<i>Melothria cucumis</i> Vell.	Climber	Terrestrial	18266
<i>Wilbrandia longisepala</i> Cogn.	Climber	Terrestrial	1479
Cyperaceae 6/10			
<i>Carex brasiliensis</i> A.St.-Hil.	Herb	Terrestrial	3334
<i>Cyperus esculentus</i> L.	Herb	Terrestrial	1926
<i>Cyperus friburgensis</i> Bockeler	Herb	Terrestrial	3204
<i>Cyperus hermaphroditus</i> (Jacq.) Standl.	Herb	Aquatic, Terrestrial	1923
<i>Cyperus virens</i> Michaux	Herb	Terrestrial	9198
<i>Eleocharis mutata</i> (L.) Roem. & Schult.	Herb	Aquatic	1924
<i>Lipocarpus humboldtiana</i> Nees	Herb	Terrestrial	317
<i>Rhynchospora corymbosa</i> (L.) Britton	Herb	Aquatic, Terrestrial	9202
<i>Scleria panicoides</i> Kunth.	Herb	Terrestrial	1313
<i>Scleria secans</i> (L.) Urb.	Climber, Herb	Terrestrial	18264
Dilleniaceae 2/2			
<i>Davilla rugosa</i> Poir.	Climber, Subshrub	Terrestrial	1112
<i>Tetracera oblongata</i> DC.	Climber, Shrub	Terrestrial	1309
Dioscoreaceae 1/2			
<i>Dioscorea amaranthoides</i> C. Presl.	Climber	Terrestrial	10459
<i>Dioscorea monadelpha</i> (Kunth) Griseb.	Climber	Terrestrial	10458
Erythroxylaceae 1/1			
<i>Erythroxylum deciduum</i> A.St.-Hil.	Shrub, Tree	Terrestrial	1481
Euphorbiaceae 11/15			
<i>Acalypha gracilis</i> Spreng.	Herb	Terrestrial	2221
<i>Acalypha herzogiana</i> Pax & K. Hoffm.	Herb, Shrub	Terrestrial	9671
<i>Actinostemon klotzschii</i> (Didr.) Pax	Shrub, Tree	Terrestrial	9677
<i>Alchornea glandulosa</i> Poepp. & Endl.	Shrub, Tree	Terrestrial	9158
<i>Alchornea triplinervia</i> (Spreng.) Müll.Arg.	Shrub, Tree	Terrestrial	1491
<i>Bernardia pulchella</i> (Baill.) Müll.Arg.	Shrub	Terrestrial	912
<i>Bia alienata</i> Didr.	Climber	Terrestrial	939
<i>Croton floribundus</i> Spreng.	Tree	Terrestrial	9164
<i>Croton glandulosus</i> L.	Herb, Shrub	Terrestrial	701
<i>Croton hirtus</i> L'Hér.	Herb	Terrestrial	3315
<i>Dalechampia stipulacea</i> Müll.Arg.	Climber	Terrestrial	9149
<i>Gymnanthes klotzschiana</i> Müll.Arg.	Shrub, Tree	Terrestrial	9188
<i>Ricinus communis</i> L.	Shrub	Terrestrial	9147
<i>Sapium glandulosum</i> (L.) Morong	Shrub, Tree	Terrestrial	3311
<i>Tragia volubilis</i> L.	Climber	Terrestrial	9669
Fabaceae 19/27			
<i>Anadenanthera colubrina</i> (Vell.) Brenan	Tree	Terrestrial	3312
<i>Anadenanthera peregrina</i> var. <i>falcata</i> (Benth.) Altschul	Tree	Terrestrial	No voucher
<i>Calliandra foliolosa</i> Benth.	Shrub, Tree	Terrestrial	1315
<i>Camptosema scarlatinum</i> (Mart. ex Benth.) Burkart	Climber	Terrestrial	3310
<i>Condylostylis candida</i> (Vell.) A. Delgado	Climber	Terrestrial	13947
<i>Copaifera langsdorffii</i> Desf.	Tree	Terrestrial	389
<i>Crotalaria vespertilio</i> Benth.	Shrub, Subshrub	Terrestrial	306
<i>Dalbergia frutescens</i> (Vell.) Britton	Climber, Shrub	Terrestrial	9874
<i>Inga marginata</i> Willd.	Tree	Terrestrial	9145
<i>Inga striata</i> Benth.	Tree	Terrestrial	1495
<i>Machaerium brasiliense</i> Vogel	Climber, Shrub, Tree	Terrestrial	9879
<i>Machaerium hirtum</i> (Vell.) Stellfeld	Tree	Terrestrial	3307
<i>Macroptilium atropurpureum</i> (Sessé & Moc. ex DC.) Urb.	Climber, Herb	Terrestrial	3295
<i>Mimosa debilis</i> Humb. & Bonpl. ex Willd.	Herb, Subshrub	Terrestrial	930
<i>Mimosa polycarpa</i> Kunth	Shrub, Subshrub	Terrestrial	10538
<i>Neonotonia wightii</i> (Graham ex Wight & Arn.) J.A. Lackey	Climber	Terrestrial	1057
<i>Parapiptadenia rigida</i> (Benth.) Brenan	Tree	Terrestrial	No voucher
<i>Peltophorum dubium</i> (Spreng.) Taub.	Tree	Terrestrial	3306
<i>Rhynchosia melanocarpa</i> Grear	Climber	Terrestrial	2744
<i>Schnella microstachya</i> Raddi	Climber	Terrestrial	No voucher
<i>Senegalia recurva</i> (Benth.) Seigler & Ebinger	Climber, Shrub	Terrestrial	10454
<i>Senegalia parviceps</i> (Speg.) Seigler & Ebinger	Climber, Shrub	Terrestrial	9918
<i>Senegalia velutina</i> (DC.) Seigler & Ebinger	Climber	Terrestrial	9151
continuation...			

continuation...				
<i>Senna macranthera</i> (DC. ex Collad.) H.S. Irwin & Barneby	Shrub, Tree	Terrestrial		695
<i>Senna occidentalis</i> (L.) Link	Shrub, Subshrub	Terrestrial		13941
<i>Senna rugosa</i> (G. Don) H.S. Irwin & Barneby	Shrub, Subshrub	Terrestrial		13940
<i>Zornia latifolia</i> Sm.	Subshrub	Terrestrial		10537
Gentianaceae 1/1				
<i>Voyria aphylla</i> (Jacq.) Pers.	Herb	Mycoheterotroph		13364
Iridaceae 1/1				
<i>Sisyrinchium micranthum</i> Cav.	Herb	Terrestrial		3205
Lacistemataceae 1/1				
<i>Lacistema hasslerianum</i> Chodat	Shrub, Tree	Terrestrial		2747
Lamiaceae 4/5				
<i>Aegiphila mediterranea</i> Vell.	Tree	Terrestrial		9193
<i>Aegiphila verticillata</i> Vell.	Shrub, Subshrub, Tree	Terrestrial		744
<i>Condea fastigiata</i> (Benth.) Harley & J.F.B. Pastore	Subshrub	Terrestrial		10542
<i>Hyptis radicans</i> (Pohl) Harley & J.F.B. Pastore	Herb	Terrestrial		1107
<i>Vitex megapota mica</i> (Spreng.) Moldenke	Shrub, Tree	Terrestrial		9213
Lauraceae 3/8				
<i>Endlicheria paniculata</i> (Spreng.) J.F. Macbr.	Shrub, Tree	Terrestrial		728
<i>Nectandra lanceolata</i> Nees	Tree	Terrestrial		9166
<i>Nectandra megapota mica</i> (Spreng.) Mez	Tree	Terrestrial		9664
<i>Ocotea corymbosa</i> (Meisn.) Mez	Tree	Terrestrial		9235
<i>Ocotea diospyrifolia</i> (Meisn.) Mez	Tree	Terrestrial		9878
<i>Ocotea indecora</i> (Schott) Mez	Tree	Terrestrial		1508
<i>Ocotea puberula</i> (Rich.) Nees	Tree	Terrestrial		9142
<i>Ocotea silvestris</i> Vattimo-Gil	Tree	Terrestrial		720
Lecythidaceae 1/1				
<i>Cariniana estrellensis</i> (Raddi) Kuntze	Tree	Terrestrial		No voucher
Loganiaceae 1/2				
<i>Strychnos brasiliensis</i> Mart.	Climber, Shrub	Terrestrial		15118
<i>Strychnos rubiginosa</i> A.DC.	Shrub	Terrestrial		742
Malpighiaceae 8/8				
<i>Alicia anisopetala</i> (A. Juss.) W.R. Anderson	Climber	Terrestrial		9136
<i>Banisteriopsis muricata</i> (Cav.) Cuatrec.	Climber	Terrestrial		915
<i>Carolus chlorocarpus</i> (A. Juss.) W.R. Anderson	Climber	Terrestrial		9662
<i>Dicella nucifera</i> Chodat	Climber	Terrestrial		733
<i>Diplopterys pubipetala</i> (A. Juss.) W.R. Anderson & C.C. Davis	Climber	Terrestrial		2729
<i>Heladenia multiflora</i> (Hook. & Arn.) Nied.	Climber, Shrub	Terrestrial	End	9670
<i>Mascagnia divaricata</i> (Kunth) Nied.	Climber	Terrestrial		716
<i>Niedenzuella multiglandulosa</i> (A. Juss.) W.R. Anderson	Climber	Terrestrial		2732
Malvaceae 5/7				
<i>Helicteres brevispira</i> A.St.-Hil.	Shrub	Terrestrial		1501
<i>Heliocarpus popayanensis</i> Kunth	Tree	Terrestrial		2731
<i>Luehea candicans</i> Mart. & Zucc.	Tree	Terrestrial		745
<i>Luehea divaricata</i> Mart. & Zucc.	Tree	Terrestrial		929
<i>Pavonia communis</i> A.St.-Hil.	Shrub, Subshrub	Terrestrial		927
<i>Pavonia sepium</i> A.St.-Hil.	Subshrub	Terrestrial		2220
<i>Triumfetta semitriloba</i> Jacq.	Subshrub	Terrestrial		13355
Marantaceae 2/2				
<i>Ctenanthe setosa</i> (Roscoe) Eichler	Herb	Terrestrial	*	No voucher
<i>Sarantia eichleri</i> Petersen	Herb	Terrestrial		3318
Melastomataceae 5/11				
<i>Acisanthera variabilis</i> (Naud.) Triana	Herb, Subshrub	Terrestrial		913
<i>Leandra australis</i> (Cham.) Cogn.	Shrub, Subshrub	Terrestrial		2736
<i>Leandra purpurascens</i> (DC.) Cogn.	Shrub	Terrestrial		9233
<i>Leandra xanthocoma</i> (Naudin) Cogn.	Tree	Terrestrial		698
<i>Miconia discolor</i> DC.	Tree	Terrestrial		1316
<i>Miconia pauciflora</i> DC.	Shrub, Tree	Terrestrial		933
<i>Miconia sellowiana</i> Naudin	Tree	Terrestrial		2726
<i>Miconia tristis</i> Spring	Shrub, Tree	Terrestrial		3294
<i>Ossaea amygdaloides</i> (DC.) Triana	Climber, Shrub, Subshrub	Terrestrial		3323
<i>Ossaea marginata</i> (Desr.) Triana	Shrub	Terrestrial		690
<i>Tibouchina cerastifolia</i> Cogn.	Shrub	Terrestrial		13945
Melhiaceae 4/6				
<i>Cabralea canjerana</i> (Vell.) Mart.	Tree	Terrestrial		691
<i>Cedrela fissilis</i> Vell.	Tree	Terrestrial	Vul	1494
<i>Guarea macrophylla</i> Vahl.	Tree	Terrestrial		9146
<i>Trichilia catigua</i> A. Juss.	Tree	Terrestrial		724
<i>Trichilia elegans</i> A. Juss.	Shrub, Tree	Terrestrial		1051
<i>Trichilia pallida</i> Sw.	Tree	Terrestrial		1105
Monimiaceae 1/2				
<i>Mollinedia clavifera</i> Tul.	Tree	Terrestrial		700
<i>Mollinedia uleana</i> Perkins	Tree	Terrestrial		9178
Moraceae 2/4				
<i>Ficus adhatodifolia</i> Schott ex Spreng.	Tree	Hemipiphytic, Terrestrial		1480
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<i>Ficus guaranitica</i> Chodat	Tree	Hemiepiphytic, Terrestrial	9880
<i>Ficus insipida</i> Willd.	Tree	Terrestrial	13934
<i>Madura tinctoria</i> (L.) D. Don ex Steud.	Tree	Terrestrial	9150
Myrtaceae 6/13			
<i>Calyptanthus concinna</i> DC.	Tree	Terrestrial	9172
<i>Campomanesia xanthocarpa</i> (Mart.) O. Berg.	Tree	Terrestrial	9214
<i>Eugenia florida</i> DC.	Tree	Terrestrial	9666
<i>Eugenia speciosa</i> Cambess.	Tree	Terrestrial	1477
<i>Eugenia subterminalis</i> DC.	Tree	Terrestrial	9209
<i>Myrcia guianensis</i> (Aubl.) DC.	Tree	Terrestrial	9180
<i>Myrcia oblongata</i> DC.	Shrub, Tree	Terrestrial	3308
<i>Myrcia pulchra</i> (O. Berg) Kiaersk	Tree	Terrestrial	715
<i>Myrcia selloi</i> (Spreng.) N. Silveira	Shrub, Tree	Terrestrial	3299
<i>Myrcia splendens</i> (Sw.) DC.	Tree	Terrestrial	3322
<i>Plinia peruviana</i> (Poir.) Govaerts	Tree	Terrestrial	9660
<i>Plinia rivularis</i> (Cambess.) Rotman	Tree	Terrestrial	1498
<i>Siphoneugena reitzii</i> D. Legrand	Tree	Terrestrial	692
Nyctaginaceae 2/2			
<i>Guapira opposita</i> (Vell.) Reitz	Shrub, Tree	Terrestrial	3326
<i>Pisonia aculeata</i> L.	Climber	Terrestrial	2745
Onagraceae 1/1			
<i>Ludwigia sericea</i> (Cambess.) H. Hara	Shrub, Subshrub	Terrestrial	10547
Orchidaceae 13/16			
<i>Aspidogyne serripetala</i> (Garay) Garay	Herb	Terrestrial	15060
<i>Bulbophyllum epiphytum</i> Barb.Rodr.	Herb	Epiphytic	11203
<i>Bulbophyllum rupicolum</i> Barb.Rodr.	Herb	Epiphytic	13262
<i>Bulbophyllum tripetalum</i> Lindl.	Herb	Epiphytic	11829
<i>Capanemia micromera</i> Barb.Rodr.	Herb	Epiphytic	11023
<i>Gomesa lietzei</i> (Regel) M.W.Chase & N.H.Williams	Herb	Epiphytic	1493
<i>Gomesa uniflora</i> (Booth ex Lindl.) M.W.Chase & N.H.Williams	Herb	Epiphytic	11075
<i>Habenaria repens</i> Nutt.	Herb	Terrestrial	916
<i>Miltonia flavesces</i> (Lindl.) Lindl.	Herb	Epiphytic	1488
<i>Octomeria warmingii</i> Rchb.f.	Herb	Epiphytic	11828
<i>Oeceoclades maculata</i> (Lindl.) Lindl.	Herb	Terrestrial	931
<i>Rodriguezia decora</i> (Lem.) Rchb.f.	Herb	Epiphytic	1061
<i>Specklinia grobyi</i> (Batem. ex Lindl.) F. Barros	Herb	Epiphytic	11202
<i>Trichocentrum pumilum</i> (Lindl.) M.W.Chase & N.H.Williams	Herb	Epiphytic	10546
<i>Wulfschlaegelia aphylla</i> (Sw.) Rchb.f.	Herb	Mycoheterotroph	13359
<i>Zygopetalum maxillare</i> Lodd.	Herb	Epiphytic	13361
Passifloraceae 1/3			
<i>Passiflora alata</i> Curtis	Climber	Terrestrial	1102
<i>Passiflora amethystina</i> J.C. Mikan	Climber	Terrestrial	1059
<i>Passiflora miersii</i> Mast.	Climber	Terrestrial	1499
Peraceae 1/1			
<i>Pera glabrata</i> (Schott) Poepp. ex Baill.	Shrub, Tree	Terrestrial	9229
Phyllanthaceae 1/1			
<i>Margaritaria nobilis</i> L. f.	Shrub	Terrestrial	15119
Phytolaccaceae 2/2			
<i>Petiveria alliacea</i> L.	Herb, Subshrub	Terrestrial	13352
<i>Seguieria aculeata</i> Jacq.	Climber, Shrub	Terrestrial	11027
Piperaceae 2/15			
<i>Peperomia catharinae</i> Miq.	Herb	Epiphytic	14946
<i>Peperomia circinnata</i> Link	Herb	Epiphytic	3201
<i>Peperomia hispidula</i> (Sw.) A.Dietr.	Herb	Epiphytic	14945
<i>Peperomia schwackei</i> C.DC.	Herb	Epiphytic	14943
<i>Peperomia tetraphylla</i> (G. Forst.) Hook. & Arn.	Herb	Epiphytic	11047
<i>Peperomia trineura</i> Miq.	Herb	Epiphytic	11053
<i>Peperomia urocarpa</i> Fisch. & C.A. Mey	Herb	Epiphytic, Terrestrial	9192
<i>Piper amalago</i> L.	Shrub	Terrestrial	9875
<i>Piper arboreum</i> Aubl.	Shrub	Terrestrial	9135
<i>Piper cernuum</i> Vell.	Shrub	Terrestrial	10816
<i>Piper corcovadensis</i> (Miq.) C. DC.	Shrub, Subshrub	Terrestrial	9181
<i>Piper gaudichaudianum</i> Kunth	Shrub	Terrestrial	304
<i>Piper glabratum</i> Kunth	Shrub	Terrestrial	2222
<i>Piper lhotzkyanum</i> Kunth	Shrub	Terrestrial	9118
<i>Piper miquelianum</i> C.DC.	Shrub	Terrestrial	13159
Poaceae 15/19			
<i>Andropogon bicornis</i> L.	Herb	Terrestrial	1930
<i>Bambusa tuldoidea</i> Munro	Shrub, Tree	Terrestrial	11830
<i>Cynodon plectostachyus</i> (K. Schum.) Pilg.	Herb	Terrestrial	9221
<i>Eustachys uliginosa</i> (Hack.) Herter	Herb	Terrestrial	3333
<i>Lasiacis ligulata</i> Hitchc. & Chase	Herb	Terrestrial	934
<i>Merostachys clausenii</i> Munro	Shrub, Tree	Terrestrial	318
<i>Olyra humilis</i> Nees	Herb	Terrestrial	678
<i>Olyra latifolia</i> L.	Herb	Terrestrial	9128
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<i>Parodiolyra micrantha</i> (Kunth) Davidse & Zuloaga	Herb	Terrestrial		1314
<i>Pennisetum glaucum</i> (L.) R.Br.	Herb	Terrestrial	*	917
<i>Rugoloo polygonata</i> (Schr.) Zuloaga	Herb	Terrestrial		3319
<i>Saccharum asperum</i> (Nees) Steud.	Herb	Terrestrial		3331
<i>Schizachyrium condensatum</i> (Kunth) Nees	Herb	Terrestrial		2232
<i>Setaria parviflora</i> (Poir.) Kerguelen	Herb	Terrestrial		1933
<i>Setaria sulcata</i> Raddi	Herb	Terrestrial		935
<i>Stephostachys mertensii</i> (Roth) Zuloaga & Morrone	Subshrub	Terrestrial		9224
<i>Urochloa brizantha</i> (Hochst. ex A. Rich.) R.D. Webster	Herb	Terrestrial	*	1929
<i>Urochloa decumbens</i> (Stapf) R.D. Webster	Herb	Terrestrial	*	9223
<i>Urochloa plantaginea</i> (Link.) R.D. Webster	Herb	Terrestrial	*	9222
Polygalaceae 2/2				
<i>Acanthodadus brasiliensis</i> (Klotzsch ex A.St.-Hil. & Moq.) Hassk.	Shrub, Subshrub	Terrestrial		1312
<i>Securidaca lanceolata</i> A.St.-Hil. & Moq.	Climber	Terrestrial		1506
Polygonaceae 1/1				
<i>Polygonum rubricaula</i> Cham.	Herb	Aquatic		1925
Primulaceae 1/1				
<i>Myrsine balansae</i> (Mez.) Otegui	Tree	Terrestrial		2738
Proteaceae 1/1				
<i>Roupala montana</i> Aubl.	Shrub, Tree	Terrestrial		2730
Rhamnaceae 1/1				
<i>Gouania ulmifolia</i> Hook. & Arn.	Climber	Terrestrial		1058
Rosaceae 2/3				
<i>Prunus myrtifolia</i> (L.) Urb.	Tree	Terrestrial		722
<i>Rubus brasiliensis</i> Mart.	Climber, Subshrub	Terrestrial		708
<i>Rubus sellowii</i> Cham. & Schltdl.	Climber, Subshrub	Terrestrial		9683
Rubiaceae 9/14				
<i>Chiococca alba</i> (L.) Hitch.	Climber, Shrub	Terrestrial		735
<i>Cordia concolor</i> (Cham.) Kuntze	Subshrub, Shrub	Terrestrial		928
<i>Coussarea contracta</i> (Walp.) Müll.Arg.	Shrub, Tree	Terrestrial		1505
<i>Esenbeckia febrifuga</i> (A.St.-Hil.) A. Juss ex. Mart.	Tree	Terrestrial		699
<i>Geophila repens</i> (L.) I.M. Johnst.	Herb	Terrestrial		9123
<i>Manettia paraguariensis</i> Chodat.	Climber	Terrestrial		3309
<i>Pilocarpus pennatifolius</i> Lem.	Tree	Terrestrial		1496
<i>Psychotria carthagenensis</i> Jacq.	Shrub, Tree	Terrestrial		9676
<i>Psychotria deflexa</i> DC.	Shrub	Terrestrial		1119
<i>Psychotria hoffmannseggiana</i> (Roem. & Schult.) Müll.Arg.	Shrub, Subshrub	Terrestrial		3303
<i>Psychotria leiocarpa</i> Cham. & Schltdl.	Shrub	Terrestrial		9169
<i>Psychotria myriantha</i> Müll.Arg.	Shrub	Terrestrial		9936
<i>Psychotria vellosiana</i> Benth.	Shrub, Tree	Terrestrial		3301
<i>Randia armata</i> (Sw.) DC.	Climber, Shrub, Tree	Terrestrial		9675
Rutaceae 4/5				
<i>Balfourodendron riedelianum</i> (Engl.) Engl.	Tree	Terrestrial		9173
<i>Esenbeckia febrifuga</i> (A.St.-Hil.) A. Juss ex. Mart.	Tree	Terrestrial		9177
<i>Esenbeckia grandiflora</i> Mart.	Shrub, Subshrub, Tree	Terrestrial		14942
<i>Metrodorea nigra</i> A.St.-Hil.	Tree	Terrestrial		9121
<i>Zanthoxylum rhoifolium</i> Lam.	Tree	Terrestrial		9156
Salicaceae 3/4				
<i>Banara parviflora</i> (A. Gray) Benth.	Tree	Terrestrial		3300
<i>Casearia gossypiosperma</i> Briq.	Shrub	Terrestrial		15117
<i>Casearia sylvestris</i> Sw.	Shrub, Subshrub, Tree	Terrestrial		9171
<i>Prockia crucis</i> P. Browne ex L.	Shrub, Tree	Terrestrial		9203
Santalaceae 1/1				
<i>Phoradendron piperoides</i> (Kunth) Trel.	Herb	Hemiparasitic		1497
Sapindaceae 7/11				
<i>Allophylus edulis</i> (A.St.-Hil. et al.) Hieron. ex Niederl.	Shrub, Tree	Terrestrial		9205
<i>Cupania tenuivalvis</i> Radlk.	Tree	Terrestrial		1310
<i>Cupania vernalis</i> Cambess.	Tree	Terrestrial		1099
<i>Diatenopteris sorbifolia</i> Radlk.	Tree	Terrestrial		9667
<i>Paullinia rhomboidea</i> Radlk.	Climber, Shrub	Terrestrial		696
<i>Serjania caracasana</i> (Jacq.) Willd.	Climber	Terrestrial		2735
<i>Serjania laruotteana</i> Cambess.	Climber	Terrestrial		10818
<i>Serjania meridionalis</i> Cambess.	Climber	Terrestrial		922
<i>Thinoia mucronata</i> Radlk.	Climber	Terrestrial		737
<i>Urvillea laevis</i> Radlk.	Climber	Terrestrial		11025
<i>Urvillea ulmacea</i> Kunth	Climber	Terrestrial		320
Sapotaceae 1/2				
<i>Chrysophyllum gonocarpum</i> (Mart. & Eichler ex Miq.) Engl.	Tree	Terrestrial		1504
<i>Chrysophyllum marginatum</i> (Hook. & Arn.) Radlk.	Shrub, Tree	Terrestrial		920
Smilacaceae 1/3				
<i>Smilax campestris</i> Griseb.	Climber	Terrestrial		2749
<i>Smilax elastica</i> Griseb.	Climber	Terrestrial		1104
<i>Smilax fluminensis</i> Steud.	Climber	Terrestrial		10450
Solanaceae 4/13				

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<i>Brunfelsia pilosa</i> Plowman	Shrub	Terrestrial	9687
<i>Cestrum bracteatum</i> Link & Otto	Shrub	Terrestrial	2219
<i>Cestrum corymbosum</i> Schlttdl.	Shrub	Terrestrial	9938
<i>Cestrum intermedium</i> Sendtn.	Shrub, Tree	Terrestrial	1300
<i>Lycianthes pauciflora</i> (Vahl) Bitter	Climber, Tree	Terrestrial	711
<i>Solanum americanum</i> Mill.	Herb	Terrestrial	9196
<i>Solanum atropurpureum</i> Schrank	Shrub	Terrestrial	13935
<i>Solanum caavurana</i> Vell.	Shrub	Terrestrial	10819
<i>Solanum diploconos</i> (Mart.) Bohs	Shrub, Tree	Terrestrial	9190
<i>Solanum hintellum</i> (Spreng.) Hassl.	Climber, Shrub	Terrestrial	10455
<i>Solanum mauritianum</i> Scop.	Shrub, Tree	Terrestrial	13933
<i>Solanum pseudoquina</i> A.St.-Hil.	Tree	Terrestrial	1071
<i>Solanum sanctae-catharinae</i> Dunal.	Tree	Terrestrial	9217
Styracaceae 1/2			
<i>Styrax latifolius</i> Pohl	Shrub, Tree	Terrestrial	1490
<i>Styrax leprosus</i> Hook. & Arn.	Tree	Terrestrial	9668
Symplocaceae 1/1			
<i>Symplocos tetrandra</i> Mart.	Shrub, Tree	Terrestrial	923
Trigonaceae 1/1			
<i>Trigonia nivea</i> Cambess.	Climber, Shrub	Terrestrial	679
Urticaceae 2/3			
<i>Cecropia glaziovii</i> Snethl.	Tree	Terrestrial	9159
<i>Cecropia pachystachya</i> Trécul.	Tree	Terrestrial	1101
<i>Urera nitida</i> (Vell.) P. Brack	Shrub, Subshrub	Terrestrial	1065
Verbenaceae 2/2			
<i>Lippia brasiliensis</i> (Link) T.R.S. Silva	Shrub	Terrestrial	3202
<i>Verbena litoralis</i> Kunth	Herb	Terrestrial	9200
Violaceae 2/3			
<i>Anchietea pyrifolia</i> (Mart.) G. Don.	Climber	Terrestrial	312
<i>Pombalia bigibbosa</i> (A.St.-Hil.) Paula-Souza	Shrub, Subshrub	Terrestrial	9179
<i>Pombalia communis</i> (A.St.-Hil.) Paula-Souza	Shrub, Subshrub	Terrestrial	1053
Vitaceae 1/2			
<i>Cissus simsiana</i> Schult. & Schult. f.	Climber	Terrestrial	9216
<i>Cissus sulcata</i> (Baker) Planch.	Climber	Terrestrial	10457
Vochysiaceae 1/1			
<i>Vochysia tucanorum</i> Mart.	Tree	Terrestrial	675
Xyridaceae 1/2			
<i>Xyris jupicai</i> Rich.	Herb	Terrestrial	3305
<i>Xyris savanensis</i> Miq.	Herb	Terrestrial	3328
Zingiberaceae 1/1			
<i>Hedychium coronarium</i> J. König	Herb	Terrestrial	9215

Fourteen families of angiosperms had more than 10 species, represented in Figure 2. The families with the highest number of species were Fabaceae (27 spp.), Asteraceae (21 spp.), Bignoniaceae (19 spp.), Poaceae (19 spp.) and Orchidaceae (16 spp.). Twenty-six families were represented by only one species.

Among the ferns, Polypodiaceae (8 spp.), Pteridaceae (7 spp.), Dryopteridaceae and Aspleniaceae (4 spp. each) were the families with the highest number of species.

The genera with the highest number of species were *Piper* L., *Solanum* L. (8 spp. each), *Peperomia* Ruiz & Pav. (7 spp.), *Psychotria* L. (6 spp.), *Myrcia* DC., *Ocotea* Aubl. (5 spp. each), *Cyperus* L., *Miconia* Ruiz & Pav. and *Asplenium* L. (4 spp. each). Fifty-one genera were represented by three species, 46, by two species and 221 by one species.

Life form and use of substrate are summarized in Table 2. Most species were herbs and trees, followed by shrubs and climbers. Subshrubs had a lower number of species in the study area. Nearly 22% of

species showed variable life forms. Concerning the use of substrate, terrestrial was the most representative, followed by epiphytic species that accounted for 10% of all recorded species. Aquatic, hemiepiphytic, mycoheterotroph and hemiparasitic species were poorly represented in this area. The number of species with variable use of substrate was low (1.7%).

Table 2. Summary of life form and use of substrate of species found in 'Reserva Biológica das Perobas', State of Paraná, Brazil.

Life Form	Number of species	%
Herb	144	33.9
Tree	131	30.1
Shrub	106	24.9
Climber	100	23.5
Subshrub	42	9.9
Variable	91	21.4
Use of substrate		
Terrestrial	376	88.5
Epiphytic	43	10.1
Aquatic	5	1.2
Hemiepiphytic	5	1.2
Mycoheterotroph	2	0.5
Hemiparasitic	1	0.2
Variable	7	1.6

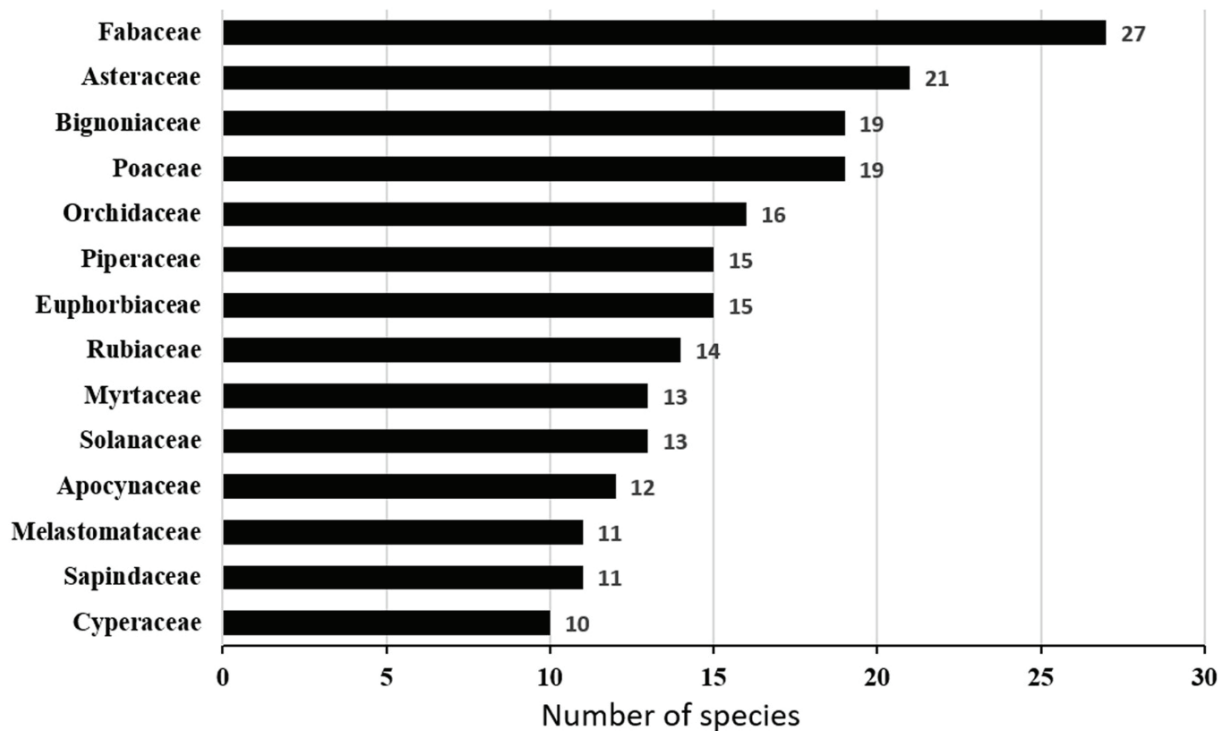


Figure 2. Families with the highest number of species in 'Reserva Biológica das Perobas', State of Paraná, Brazil.

Two species recorded in the study area have unique records in the State of Paraná: *Bulbophyllum rupicolum* Barb.Rodr. (Orchidaceae) and *Heladena multiflora* (Hook. & Arn.) Nied. (Malpighiaceae).

Eleven species are exotic to the State of Paraná; six are Poaceae species and other five are in Anacardiaceae, Bignoniaceae, Euphorbiaceae, Marantaceae and Orchidaceae (Table 1).

Discussion

The study area contains about 6.5 to 7.0% of the vascular plant species registered for the State of Paraná (Kaehler et al., 2014; BFG, 2015) and about 25.5% of the species listed for the Seasonal Semideciduous Forest on this State (*Flora do Brasil*, 2017). Therefore, it is a large remnant with high specific diversity for the region.

Geologist Reinhard Maack was the pioneer in describing and mapping the Paraná vegetation in the 1950s and 1960s, before the deep changes in the post-colonization landscape. According to Maack (1968), one of the elements that characterized the vegetation on the sandstone soil 'Arenito Caiuá' was the abundance of palm specimens, especially *Euterpe edulis* (Arecaceae), constituting dense clusters in original forest. In the study area, adults are rare and occur sparsely in border areas. Dense clusters of this species are still found in interior of forest and in more conserved areas. After the creation of

Conservation Units, in 2006, and prohibition of selective logging, great regeneration and nuclei formation with many young individuals are visible.

A characteristic tree species is 'peroba' (*Aspidosperma polyneuron*, Apocynaceae), reaching up to 40 m high (Maack, 1968). Currently, the largest individuals of 'peroba' found on this area (30-33 m in height and about 1.3 m in diameter) do not form a continuous canopy and in rare cases are found groups of 4-5 individuals side by side. The selective cut in the past has removed most of the larger trees, used for the construction of houses, very common in the region. The remaining individuals are those with deformities in the trunks, with no interest in commercial exploration. Species of Meliaceae (*Cedrela* L. species) and Lauraceae (*Nectandra* Rol. ex Rottb. and *Ocotea* species) are other typical flora elements (Maack, 1968) and still can be found with abundance in the study area.

Other typical species of submontane Seasonal Semideciduous Forest (Roderjan et al., 2002) present in the study area are: *Astronium graveolens* Jacq. (Anacardiaceae), *Balfourodendron riedelianum* (Engl.) Engl. (Rutaceae), *Diatenopteryx sorbifolia* Radlk. (Sapindaceae), *Peltophorum dubium* (Spreng.) Taub. and *Parapiptadenia rigida* (Benth.) Brenan (Fabaceae), among the trees; *Syagrus romanzoffiana* (Cham.) Glassman (Arecaceae), *Inga marginata* Willd. (Fabaceae) and *Jacaratia spinosa* (Aubl.) A.DC. (Caricaceae), in the understory layer.

In relation to the families with higher species diversity, this and several studies in Seasonal Semideciduous Forest in the State of Paraná point to Fabaceae in remnants of diverse sizes (Souza, Kawakita, Slusarski, & Pereira, 2009; Costa, Estevan, Bianchini, & Fonseca, 2011; Slusarski & Souza, 2012; Rossetto & Vieira, 2013; Garcia, Romagnolo, & Souza, 2017). Asteraceae appears in second place in the study area and in Souza et al. (2009), Rossetto and Vieira (2013) and Garcia et al. (2017). The other following families, more diverse and which can be considered characteristics of the Seasonal Semideciduous Forest in Paraná remnants are Rubiaceae, Euphorbiaceae, Myrtaceae, Bignoniaceae, Poaceae, Orchidaceae, Solanaceae and Sapindaceae.

Herbaceous species were more numerous in this area (34%) and in the Upper Paraná River floodplain (32%), a vegetation with several riparian environments and a large area sampled (235 ha) (Souza et al., 2009). In other remnants of Seasonal Semideciduous Forest in the State of Paraná, tree species are dominant, between 38 and 53% of the total flora (Costa et al., 2011; Slusarski & Souza, 2012; Rossetto & Vieira, 2013; Garcia et al., 2017).

According to Roderjan et al. (2002), the presence of climbers is expressive in the Seasonal Semideciduous Forest, with Bignoniaceae, Sapindaceae, Cucurbitaceae and Asteraceae as the most common families. In the study area, 23.5% of the native species are climbers and the dominant families are Bignoniaceae, Fabaceae, Apocynaceae, Malpighiaceae and Sapindaceae, as in several studies in nearby areas (Carneiro & Vieira, 2012; Santos, Caxambú, Silva, Hoppen, & Villagra, 2014). This study demonstrates the highest proportion of climbers (23.5%) in relation to other surveyed remnants of Seasonal Semideciduous Forest in Paraná, which recorded less than 18% of the total flora (Souza et al., 2009; Costa et al., 2011; Slusarski & Souza, 2012; Rossetto & Vieira, 2013; Garcia et al., 2017).

The occurrence of epiphytes is extremely low in Seasonal Semideciduous Forest (Roderjan et al., 2002), being *Philodendron bipinnatifidum* Schott (Araceae) the most characteristic species. In the study area, 43 epiphytes were recorded (30 angiosperms, 13 ferns), about 18% of epiphytes occurring in Seasonal Semideciduous Forest in the State of Paraná (*Flora do Brasil*, 2017) and approximately 10% of local flora, showing that epiphytes are an important component of this forest. Orchidaceae, Polypodiaceae and Piperaceae are the most common families, which are the families often found as more diverse in studies in the region (Borgo, Silva, & Petean, 2002; Cervi & Borgo, 2007;

Dettke, Orfrini, & Milaneze-Gutierrez, 2008; Bonnet, Curcio, Lavoranti, & Galvão, 2011).

Gomesa lietzei (Regel) M.W.Chase & N.H.Williams and *Miltonia flavescent* (Lindl.) Lindl. (Orchidaceae) are the most common epiphytes in the area and *Pechuma sicca* (Lindm.) M.G. Price and *Microgramma squamulosa* (Kaulf.) de la Sota (Polypodiaceae) are the common among ferns. The occurrence of epiphytes is significant in the canopy of large tree species, especially in the emergent branches of 'perobas', where several species of *Tillandsia* L. can be found. Inside the forest, in more shady areas and with larger trunks, *Philodendron bipinnatifidum* is often found, as Cactaceae species.

Five species found in 'Reserva Biológica das Perobas' are in official list of threatened species of Brazil (Ordinance 443/dez 2014) (Brasil, 2014): *Araucaria angustifolia* (Bertol.) Kuntze (Araucariaceae) and *Heladenia multiflora* (Hook. & Arn.) Nied. (Malpighiaceae) in Endangered status and *Euterpe edulis* Mart. (Arecaceae), *Zeyheria tuberculosa* (Vell.) Bureau ex Verl. (Bignoniaceae) and *Cedrela fissilis* Vell. (Meliaceae) in Vulnerable status.

Two species are unique records in the State of Paraná in the study area: *Bulbophyllum rupicolum* (Orchidaceae), recently cited for Paraná (Barros et al., 2015) and *Heladenia multiflora* (Malpighiaceae), a new occurrence by this study. *Bulbophyllum rupicolum* occurs preferentially as rupicolous in areas of Tropical Savanna (Cerrado), Central Brazil (Barros et al., 2015); in the study area, it was collected as epiphytic and probably represents an influence of the nearby Cerrado, although it has not yet been found in this area (unpubl. data, M.G. Caxambú). *Heladenia multiflora* was a liana or shrub, distributed in Brazil, Paraguay and northeastern Argentina (Anderson, Anderson, & Davis, 2016). In Brazil, it occurs in Central-West and Southeast regions, and according Amorim, Kutschenko, Judice, and Barros (2013), the occupation area has suffered a continuous decline and the species is included as Endangered in Brazil.

On the other hand, the presence of exotic species points out this area as vulnerable, especially in areas of forest edges under human influence. Seven out of the eleven species recorded for the area are indicated as invasive species by State laws (Ordinance IAP 59/April 2015) (Paraná, 2015). *Mangifera indica* L. (Anacardiaceae), *Tecoma stans* (L.) Juss. ex Kunth (Bignoniaceae), *Ricinus communis* L. (Euphorbiaceae) and *Oeceoclades maculata* (Lindl.) Lindl. (Orchidaceae), are invasive, but few individuals were found in the area. However, three herbaceous species of *Urochloa* P. Beauv. (Poaceae) are common in forest edges, in contact with monocultures areas.

For other species, *Ctenanthe setosa* (Roscoe) Eichler (Marantaceae), which is not treated as invasive to the State of Paraná, was found locally and is very common on the trails and spreads quickly, being potential invasive in the study area.

Conclusion

The 'Reserva Biológica das Perobas' presents a quarter of the species listed for the Seasonal Semideciduous Forest in the State of Paraná, including two exclusive species. Therefore, it is a large remnant with high specific diversity for the region. The most representative families are Fabaceae, Asteraceae, Bignoniaceae, Poaceae and Orchidaceae. The predominant life forms are herbs and trees, and terrestrial plants represented the majority of species. Eleven species in this area are exotic to the flora of the State of Paraná, points out this as vulnerable area.

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