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What survived from the PLANAFLORO Project: Angiosperms of Rondônia State, Brazil

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Abstract: The Rondônia Natural Resources Management Project (PLANAFLORO) was a strategic program developed in partnership between the Brazilian Government and The World Bank in 1992, with the purpose of stimulating the sustainable development and protection of the Amazon in the state of Rondônia. More than a decade after the PLANAFORO program concluded, the aim of the present work is to recover and share the information from the long-abandoned plant collections made during the project's ecological-economic zoning phase. Most of the material analyzed was sterile, but the fertile voucher specimens recovered are listed here. The material examined represents 378 species in 234 genera and 76 families of angiosperms. Some 8 genera, 68 species, 3 subspecies and 1 variety are new records for Rondônia State. It is our intention that this information will stimulate future studies and contribute to a better understanding and more effective conservation of the plant diversity in the southwestern Amazon of Brazil.

Introduction

In early 1990, Brazilian Amazon was facing remarkably high rates of forest conversion (Laurance *et al.* 2001; INPE 2012). This was particularly true in the state of Rondônia where cattle ranching, poorly planned settlement, logging, and mining were threatening the local environments and dramatically changing the landscape (Pedlowski *et al.* 1997).

Following heavy criticism of the unsuccessful POLONOROESTE Project in the 1980s, the Brazilian Federal Government undertook a second effort to control biodiversity loss in Rondônia State. Therefore it conceived a plan in partnership with the World Bank to "implement an improved approach to natural resource management, conservation and development in the state": the Rondônia Natural Resources Management Project, also known as PLANAFLORO (World Bank 1992).

The project had an initial budget of US$ 167 million and was implemented from 1993 to 2001. It consisted of a series of strategic activities, focusing on land use, biodiversity conservation, farming systems, and agroecological and socioeconomic zoning (World Bank 2003). PLANAFLORO is appropriately credited with several important achievements, such as the creation of conservation units and the improvement of the local transportation infrastructure. Numerous criticisms, however, were still made by national and international experts, especially social NGOs, which had extremely limited participation in the project (World Bank 1995; Rodrigues 2002). For instance, critics highlighted the increase in deforestation during the implementation of PLANAFLORO (Browder *et al.* 2008) and thereafter. From 1990 to 2000, Rondônia State lost 26,247 km^2 of forests, corresponding to 12.94% of its natural coverage. By 2011, it was estimated that nearly 46% or almost half of the state's forests had been lost (Euler *et al.* 2008; INPE 2012).

The PLANAFLORO Project funded botanical expeditions in different areas of the state to inventory arboreal plants with potential use in the wood industry. The aim of the present study was to recover plant specimens and data collected during PLANAFLORO's ecological-economic zoning study between 1996 and 1997 and to disseminate these data and a preliminary checklist of the angiosperm trees in Rondônia State.

Materials and Methods

Unfortunately, the plant collections made during PLANAFLORO are dispersed. After almost 15 years neglected, less than half (870) of the originally 4000 vouchers were fertile and relatively undamaged. That material was decontaminated with a combination of 70% ethanol and 0.2% sodium hypochlorite. Then, it was frozen two times for three days, with a three-day interval, before transference to the main herbarium collection. Finally, specimens were registered, mounted, and deposited under an official voucher number at the Herbário Rondoniense - João Geraldo Kuhlmann (RON) of the Federal University of Rondônia (UNIR). The vouchers are available digitally at the RON website (http://www.ron.unir.br).

To gather the information from the specimens, all available labels and identification lists were used. Collection sites, when specified, included protected areas, riparian zones, highways and farms, although we only mention here the entire municipality (Figure 1). Some specimens collected by Hamilton S. Pereira, however, lacked crucial information about site or date of collection and were only included to indicate new records for Rondônia State [see Table 1, tagged as (?)]. In addition, further information on date of collection, common name, and collector name and number were also recovered, when possible. The collector names were Araújo J., Eloísio Vinha, Dirlei (DRL), Marco Antonio, Martins, F. Almeida, L. Prestes and Hamilton S. Pereira.

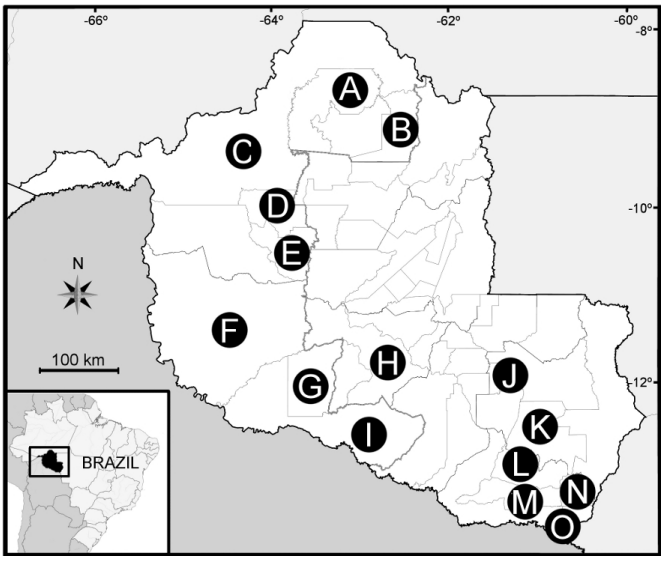

Figure 1. State of Rondônia, Brazil, showing the municipalities where field collections were carried out by PLANAFLORO during the 1990s. Sites were as follows: (a) Candeias do Jamari, (b) Cujubim, (c) Porto Velho, (d) Buritis, (e) Campo Novo de Rondônia, (f) Guajará Mirim, (g) São Francisco do Guaporé, (h) São Miguel do Guaporé, (i) Costa Marques, (j) Primavera de Rondônia, (k) Chupinguaia, (l) Corumbiara, (m) Cerejeiras, (n) Colorado do Oeste, and (o) Cabixi.

For the checklist, we have included only fertile vouchers, i.e. bearing flower or fruits (Figure 2A). Sterile material was deposited in a secondary collection (Figure 2B) under different voucher numbers [ex: RON e1721, *Abarema jupunba* (Willd.) Britton & Killip], also available online.

Plant determination was carried out in 1997 by Nelson de Araújo Rosa, of the Museu Paraense Emílio Goeldi (MPEG). Burseraceae was revised by Douglas Daly (NYBG), while Peraceae was revised by Narcísio C. Bigio (UNIR). In addition, species names were double-checked against Tropicos (http://www.tropicos.org) and The Plant List 2010 (http://www.theplantlist.org) websites to avoid nomenclatural confusion. New records for the region were based on the online Lista de Espécies da Flora do Brasil 2012 (http://floradobrasil.jbrj.gov.br/) and the Herbário Virtual da Flora e dos Fungos (INCT- HVFF) (http://inct.splink.org.br) websites. Finally, voucher duplicates were sent to the CEN, IAN, INPA, MG, and RB herbaria (acronyms according to Holmgren *et al.* 1990).

Results and Discussion

We recorded 378 species distributed in 234 genera and 76 families of angiosperms (see Table 1). The most species-rich families found were Annonaceae (21 spp.), Leguminosae - Caesalpinioideae (21 spp.), and Moraceae (19 spp.), followed by Euphorbiaceae and Rubiaceae, each with 18 spp. (Figure 3). The remaining families, which made up 75% of the species, each presented 17 species or fewer, and ca. 42% of these were each represented by a single species. *Casearia* (Salicaceae) (9 spp.), *Protium* (Burseraceae), and *Inga* (Leguminosae - Mimosoideae) (8 spp.) were the richest genera, followed by *Guarea* (Meliaceae) and *Miconia* (Melastomataceae) each with 7 species (Figure 4).

Our results showed 72 new records for Rondônia State, including 8 genera, 68 species, 3 subspecies, and 1 variety. Approximately 20% of the specimens recovered from PLANAFLORO collections constituted new records, underscoring the lack of knowledge of the local Flora. For example, common species occurring in the state, like caranaí (*Lepidocaryum tenue* Mart.) or the fig tree *Ficus maxima* Mill. (pers. obs.) were not found in the database of the Brazilian Flora 2012 for Rondônia.

The PLANAFLORO Project aimed specifically to inventory arboreal species (World Bank 1992). Curiously, though, we found some characteristically herbaceous families, such as Commelinaceae and Costaceae. We can argue that these species were collected, because they were abundant inside the collection sites. Likewise, these species could have been perceived as economically important, regardless of their wood potential. The reason behind this, however, is still unclear.

To mention some of the herbs and shrubs collected, we found a Heliconia (*Heliconia rostrata* Ruiz & Pav., Heliconiaceae), a cactus (*Selenicereus* sp., Cactaceae), and grasses (*Lasiacis ligulata* Hitchc. & Chase and *Olyra latifolia* L., Poaceae). But, due to the bad conservation status and the lack of reproductive parts on these specimens which would allow an identification confirmation, we decided to exclude these records from our checklist.

Although records occurred in diverse municipalities, few species were found in more than one collection site. The most frequently collected species was *Fusaea longifolia* (Aubl.) Saff. (Annonaceae), found in six different sites. Comparisons with the Flora of the neighbor state of Acre, Brazil (Daly & Silveira 2008), showed that 239 species occur on both states, representing over 60% of the species listed here [see Table 1, tagged as (♦)].

In addition, some economically important trees have been observed in Rondônia but are not yet represented on the new checklist, including big-leaf mahogany (*Swietenia macrophylla* King) and cedar (*Cedrela odorata* L.). On the contrary, other common species were found, like jatobá (*Hymenaea courbaril* L., Leguminosae - Caesalpinioideae), Pará rubber [*Hevea brasiliensis* (Willd. ex A. Juss.) Müll. Arg., Euphorbiaceae], and *Copaifera* spp. (Leguminosae - Caesalpinioideae), already reported as native species from Rondônia State by some surveys (Curi 2000; Bentes-Gama *et al.* 2008). This suggests that the material recovered from PLANAFLORO, although informative, could still be incomplete for the studied area.

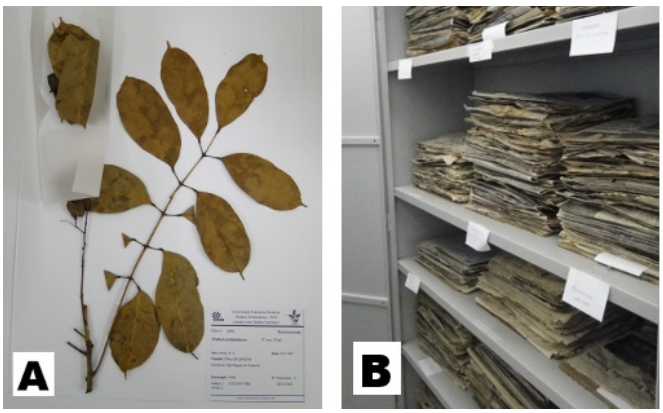

Figure 2. PLANAFLORO botanical collections deposited at the Herbário Rondoniense (RON). (A) Protium polybotryum (Turcz.) Engl., a new record for Rondônia and one of the few fertile vouchers found in reasonable conservation status. (B) The sterile collection is formed by more than 3000 vouchers. Specimens present only leaves and wood samples.

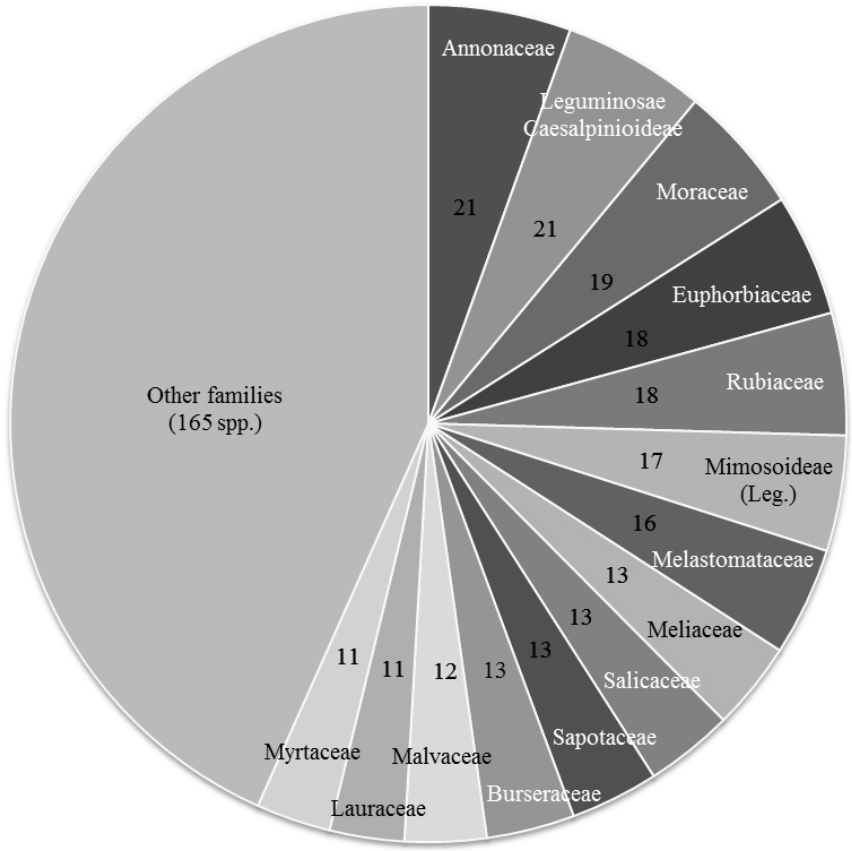

Figure 3. Most speciose families of angiosperms found in the PLANAFLORO collections. These presented from 21 (Annonaceae and Leguminosae - Caesalpinioideae) to 11 (Myrtaceae and Lauraceae) species. The remaining 62 families corresponded to 82% of total families and 166 species.

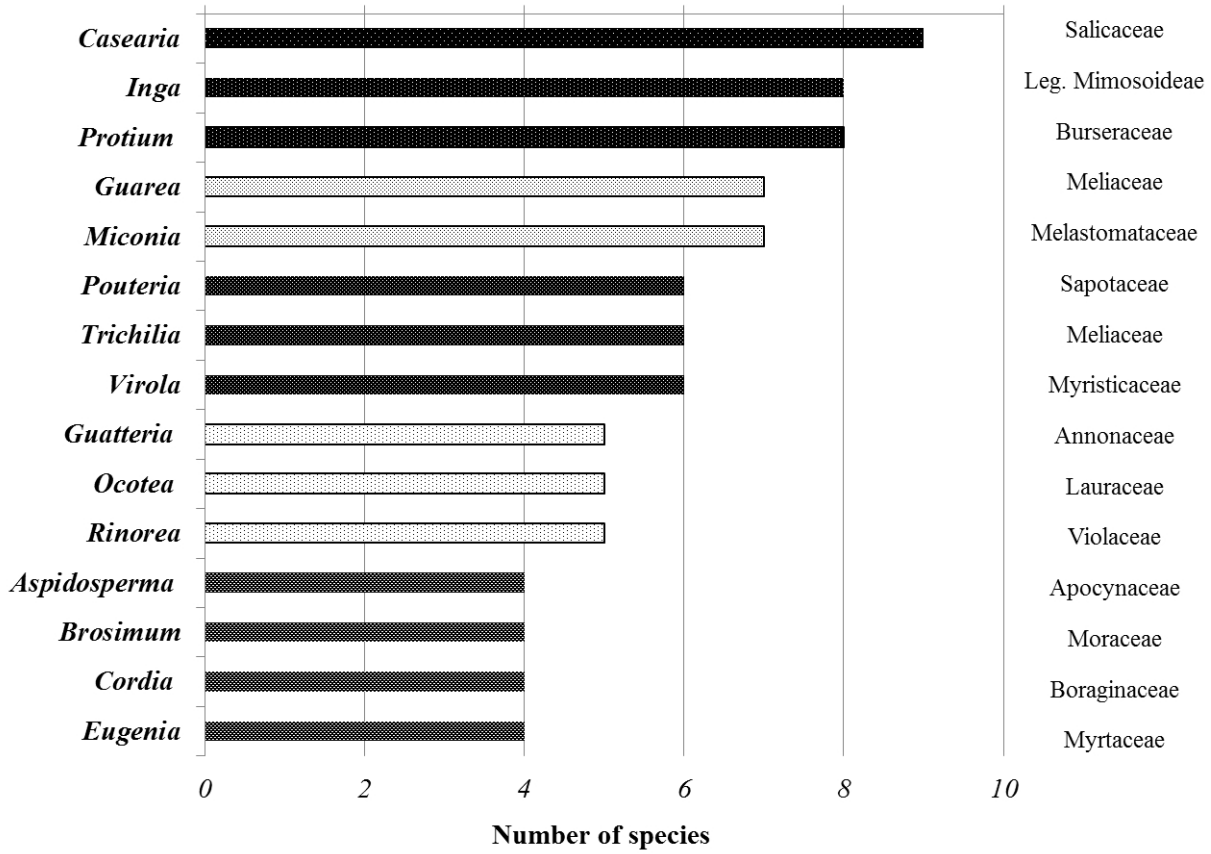

Figure 4. Richest genera found in the PLANAFLORO collections. Note that the most representative genera did not belong to the richest families. All genera presented less than 10 species and more than half of the 234 genera presented only one species.

After the PLANAFLORO Project ended, local authorities produced a technical report on vegetation cover, as part of the ecological-economic zoning study (SEDAM 2007). The majority of the specimens were sent to the MG herbarium, while Poaceae and Asteraceae specimens were sent to the IBGE-DF and to the SPF herbarium, respectively. We have found specimens stored at the MG herbarium that were collected at the same sites in Rondônia State between 1996 and 1997. However, the field data for these have different collector names and dates different from those registered in our study. It is possible that these specimens belong to PLANAFLORO collections as well, but future surveys will be necessary to answer this question. Therefore, our list of plant species of Rondônia seems to be the first attempt to associate PLANAFLORO collections to a herbarium, making the plant information available publicly.

It is important to consider that forests of Rondônia have been under continuous human pressure over the past decades. While Pacaás Novos in Guajará Mirim (Figure 1F) is now officially conserved as a National Park, other forests in the state that were collection sites have been degraded or converted (Ribeiro *et al.* 2005). For instance, the zones of impact along the BR-319 and BR-421 highways, where Dirlei (DRL) and H. S. Pereira collected, have been seriously degraded by human activities (Euler *et al.* 2008). Nevertheless, since information about the local diversity in Rondônia is scarce (Brandon *et al.* 2005) and no effective survey has attended to the urgent need for a full inventory of local species, the data provided in this work is still of great value.

Remote and isolated areas, such as indigenous territories or agricultural frontiers, are usually overlooked by scientific research, and sadly, Rondônia State is not an exception. As daunting as the task might appear, however, the data from an intensive inventory of the botanical diversity of southwestern Brazilian Amazon can be used as an important tool to conserve its forests and plant diversity in the face of severe development pressures and unsustainable management of plant resources. We hope that this work will stimulate other flora-related studies in Rondônia in the near future, and perhaps it will constitute the first step toward a complete Flora of Rondônia.

Table 1. List of angiosperms from Rondônia State, Brazil. Some records are missing due to incomplete information on labels or determination lists. New records are discriminated in taxonomic level. (*): voucher number of the specimen deposited at the Herbário Rondoniense (RON). (?): voucher collected by Hamilton S. Pereira lacking information on site of collection. (♦): species which also occurs in the neighbor state of Acre, Brazil.

SPECIES/FAMILY	AREA	*VOUCHER	NEW RECORD
Achariaceae			
Carpotroche longifolia (Poepp.) Benth. (♦)	e	3753	
Lindackeria latifolia Benth.	e	3759	
Lindackeria paludosa (Benth.) Gilg (♦)	e	4159	
Anacardiaceae			
Spondias mombin L.	c	3963	
Tapirira guianensis Aubl. (♦)	c	3954	
Annonaceae			
Anaxagorea phaeocarpa Mart. (♦)	d, n/o	3723, 3679	
Anaxagorea sp.	l	3996	
Annona ambotay Aubl. (♦)	e	4137	
Annona montana Macfad. (♦)	d	4104	
Bocageopsis multiflora (Mart.) R.E. Fr.	j	3776	
Duguetia calycina Benoist	c	2534	species
Duguetia flagellaris Huber	d	3722/4090	
Duguetia lepidota (Miq.) Pulle	(?)	3836	species
Ephedranthus sp.	m	4037	
Fusaea longifolia (Aubl.) Saff. (♦)	c, d, f, h, j, m	3890, 4067, 3952, 2547, 3787, 4016	
Guatteria discolor R.E. Fr. (♦)	c	2632	
Guatteria poeppigiana Mart.	e	3766	species
Guatteria recurvisepala R.E. Fr. (♦)	d	4077	
Guatteria schomburgkiana Mart.	n/o	3695	
Guatteria cf. *olivacea* R.E. Fr. (♦)	d	3719	species
Guatteria sp.	l	3981	
Onychopetalum amazonicum R.E. Fr.	c	2543/2599	
Oxandra riedeliana R.E. Fr. (♦)	c, n/o	3965, 3701	
Oxandra xylopioides Diels (♦)	c, d, e	2541, 3712, 4119	
Oxandra sp.	d	4068	
Unonopsis guatterioides (A.DC.) R.E.Fr. (♦)	d	4106/4107	
Xylopia amazonica R.E. Fr.	d	4105	
Xylopia benthamii R.E. Fr. (♦)	e	4133	
Xylopia cuspidata Diels (♦)	d	3720/3721	
Xylopia multiflora R.E.Fr. (♦)	(?)	3842	
Apocynaceae			
Aspidosperma carapanauba Pichon	d	4062	
Aspidosperma multiflorum A. DC.	m	4026	

Table 1. ***Continued.***

SPECIES/FAMILY	AREA	*VOUCHER	NEW RECORD
Aspidosperma nitidum Benth. ex Müll. Arg.	c	2556	species
Aspidosperma rigidum Rusby (♦)	a/b	2510	
Lacmellea floribunda (Poeppig.) Benth.	c	2520	species
Macoubea guianensis Aubl. (♦)	(?)	3830	
Rauvolfia pentaphylla (Huber) Ducke	n	3906	
Tabernaemontana angulata Mart. ex Müll. Arg.	e	3760	
Tabernaemontana linkii A.DC. (♦)	f	2584	
Tabernaemontana undulata Vahl	c	2528	
Tabernaemontana sp.	h	2623	
Araceae			
Heteropsis flexuosa var. *flexuosa* (Kunth) G.S.Bunting (♦)	e	4122	
Araliaceae			
Schefflera morototoni (Aubl.) Maguire, Steyerm. & Frodin(♦)	k	3803	
sp. 1	h	2621	
sp. 2	d	4047	
Arecaceae			
Bactris sp.	l	4010	
Geonoma sp.	l	3997/4003	
Lepidocaryum tenue var. *gracile* (Mart.) A.J.Hend. (♦)	c	3962	variety
Asteraceae			
Hebeclinium macrophyllum (L.) DC. (♦)	l	3984/3990	
Bignoniaceae			
Handroanthus barbatus (E.Mey.) Mattos	c, e	3877, 4138	
Handroanthus heptaphyllus Mattos	i	3931	species
Jacaranda copaia (Aubl.) D. Don (♦)	a/b	2515	
Jacaranda glabra (DC.) Bureau & K.Schum. (♦)	m	4019	
Bixaceae			
Bixa arborea Huber	(?)	4187	
Cochlospermum orinocense (Kunth) Steud. (♦)	e	4163	
Boraginaceae			
Cordia alliodora (Ruiz & Pav.) Oken (♦)	a/b	2517	
Cordia exaltata Lam. (♦)	e	3752	
Cordia nodosa Lam. (♦)	d, e	3733, 4145	
Cordia tetrandra Aubl. (♦)	c	3956	
Burseraceae			
Crepidospermum goudotianum (Tul.) Triana & Planch. (♦)	d, n/o	4070, 3696	
Protium decandrum (Aubl.) Marchand	c	3881	
Protium krukovii Swart (♦)	c, n	3818, 3895	
Protium polybotryum (Turcz.) Engl.	h	2609	
Protium rhynchophyllum Rusby (♦)	l	3977	species
Protium robustum (Swart) D.M. Porter (♦)	c	2502	
Protium sagotianum Marchand (♦)	f, k	3943, 3798	
Protium tenuifolium (Engl.) Engl.	d, n/o	3732, 3700	
Protium trifoliolatum Engl.	(?)	4179	
Tetragastris altissima (Aubl.) Swart (♦)	a/b, d	2516, 4061	
Tetragastris panamensis (Engl.) Kuntze (♦)	f	3944	
Trattinnickia burserifolia Mart. (♦)	(?)	3834	
Trattinnickia glaziovii Swart (♦)	a/b	2511	
Calophyllaceae			
Calophyllum brasiliense Cambess. (♦)	j	3774	genus
Caraipa densifolia Mart. (♦)	k	3805	
Cannabaceae			
Trema micrantha (L.) Blume (♦)	m	4041	
Trema sp.	i, k	3935, 1596	
Capparaceae			
Capparis frondosa Jacq..	d	4085	species
Caricaceae			
Jacaratia spinosa (Aubl.) A. DC. (♦)	f, m	2577, 4030	

Table 1. *Continued.*

SPECIES/FAMILY	AREA	*VOUCHER	NEW RECORD
Caryocaraceae			
Caryocar glabrum Pers. (♦)	c	3819	
Caryocar microcarpum Ducke	m	4021	
Caryocar villosum (Aubl.) Pers.	(?)	3866	
Caryocar sp.	(?)	3829	
Celastraceae			
Cheiloclinium cognatum (Miers) A.C. Sm. (♦)	c, d, n/o	2633, 4053, 3688	
Goupia glabra Aubl.	k	3793	
Maytenus guyanensis Klotzsch ex Reissek	c	3822	
Chrysobalanaceae			
Hirtella hispidula Miq. (♦)	e	4123	
Hirtella racemosa Lam. (♦)	e, h, l	3740, 2608, 3994	
Licania licaniiflora (Sagot) S.F. Blake (♦)	(?)	3831	species
Licania octandra (Hoffmanns. ex Roem. & Schult.) Kuntze(♦)	g	2624	
Licania sclerophylla (Hook.f.) Fritsch (♦)	m	4017	
Clusiaceae			
Chrysochlamys weberbaueri Engl. (♦)	d	3714/4065	
Garcinia brasiliensis Mart.	e, l	4149, 4008	species
Garcinia macrophylla Mart. (♦)	l	4013	
Garcinia madruno (Kunth) Hammel (♦)	f	2568	species
Moronobea coccinea Aubl.	(?)	3843	
Symphonia globulifera L.f. (♦)	c	3955	
Tovomita brasiliensis (Mart.) Walp.	c, d	2595, 4109	
Tovomita umbellata Benth.	c	2562	species
Tovomitidium speciosum (Ducke) Ducke	(?)	3826	genus
Combretaceae			
Buchenavia guianensis Alwan & Stace	c	2600	
Commelinaceae			
Dichorisandra hexandra (Aubl.) Kuntze ex Hand.-Mazz. (♦)	m	4043	
Dichorisandra sp.	l	4015	
Costaceae			
Chamaecostus congestiflorus (Rich. ex Gagnep.) C. Specht & D.W. Stev.	h	2617	species
Elaeocarpaceae			
Sloanea garckeana K. Schum. (♦)	c	3966	species
Erythroxylaceae			
Erythroxylum anguifugum Mart.	i, n/o	3930, 3707	
Euphorbiaceae			
Acalypha cuneata Poepp. (♦)	n/o	3703	
Acalypha diversifolia Jacq. (♦)	e	4136	
Acalypha macrostachya Jacq. (♦)	e	4135	
Actinostemon amazonicus Pax. & K. Hoffm. (♦)	f	2585	
Alchornea schomburgkii Klotzsch (♦)	i	3928	
Alchorneopsis floribunda (Benth.) Müll.Arg. (♦)	c, f	3812, 3937	
Aparisthmium cordatum Baill. (♦)	d, f	4060, 3942	
Caryodendron amazonicum Ducke (♦)	d	4057	genus
Conceveiba guianensis Aubl. (♦)	n	3897	
Croton cajucara Benth.	m	4040	
Croton sp.	l	3980	
Dodecastigma amazonicum Ducke (♦)	c	2630	
Dodecastigma integrifolium (Lanj.) Lanj. & Sandwith	c	2531/2505	
Hevea brasiliensis (Willd. ex A. Juss.) Müll. Arg. (♦)	(?)	3828	
Mabea occidentalis Benth.	c	3961	
Mabea piriri Aubl. (♦)	a/b	2509	
Pausandra trianae (Müll.Arg.) Baill. (♦)	e	4129	
Sapium marmieri Huber (♦)	e, n/o	3748, 3690	
Sapium pallidum (Müll.Arg.) Huber (♦)	c	3873	
sp. 1	d	4050	
Gesneriaceae			
Drymonia coccinea (Aubl.) Wiehler (♦)	d	3717	

Table 1. ***Continued.***

SPECIES/FAMILY	AREA	*VOUCHER	NEW RECORD
Humiriaceae			
Endopleura uchi (Huber) Cuatrec. (♦)	(?)	4176	
Hypericaceae			
Vismia lateriflora Ducke (♦)	f	2567	species
Vismia sp.	c	2592	
Lauraceae			
Aiouea laevis (Nees ex Mart.) Kosterm	c, f	2501, 2588	
Aniba canelilla (Kunth) Mez (♦)	k	3809	
Endlicheria cf. *sericea* Nees	c	2554	species
Licaria cf. *pachycarpa* (Meisn.) Kosterm.	m	4035	species
Licaria sp.	n	3894	
Misanteca cf. *martiniana* (Mez) Lundell	n/o	3684	species
Nectandra cuspidata Nees (♦)	j	3786	
Ocotea canaliculata (Rich.) Mez	f	2589/3939	species
Ocotea cujumary Mart. (♦)	f	3945	
Ocotea glomerata (Nees) Mez	c	2602	species
Ocotea guianensis Aubl. (♦)	n/o	3709	
Ocotea tomentella Sandwith	k	3795	species
Ocotea sp.	c	2544	
Lecythidaceae			
Bertholletia excelsa Bonpl. (♦)	h	2610	
Cariniana micrantha Ducke (♦)	c	2561	
Couratari macrosperma A.C. Sm. (♦)	c, d	2565, 4054	
Couratari multiflora (Sm.) Eyma	k	3810	
Eschweilera decolorans Sandwith	(?)	3827	species
Eschweilera pedicellata (Rich.) S.A. Mori (♦)	a/b	2518	
Gustavia hexapetala (Aubl.) Smith (♦)	e	3744/4165	
Gustavia poeppigiana O. Berg (♦)	d, e	3715, 4143	
Leguminosae - Caesalpinioideae			
Apuleia leiocarpa (Vogel) J.F. Macbr. (♦)	c, e	3880, 3743	
Bauhinia ungulata L. (♦)	k	3806	
Campsiandra comosa var. *laurifolia* (Benth.) Cowan	c	3876	
Copaifera langsdorffii Desf.	d	4087	
Copaifera multijuga Hayne	e	3767	
Crudia amazonica Spruce ex Benth.	c	3958	
Cynometra marginata Benth.	c	2507	species
Cynometra spruceana var. *spruceana* Benth.	f	3946	species
Hymenaea courbaril L. (♦)	(?)	3841	
Hymenaea oblongifolia Huber (♦)	c	2527	
Macrolobium acaciifolium (Benth.) Benth. (♦)	f	2575	
Macrolobium angustifolium (Benth.) R.S. Cowan	c, f	2506, 2576	species
Macrolobium campestre Huber (♦)	c	3815	
Macrolobium limbatum Spruce ex Benth. (♦)	c	2549	species
Peltogyne paniculata Benth.	(?)	3868	
Peltogyne paniculata subsp. *paniculata* (Benth.) M.F. Silva	c	2553	subspecies
Poeppigia procera C. Presl (♦)	c, e, j, n/o	2533, 4112, 3781, 3697	
Tachigali paniculata Aubl. (♦)	(?)	3872	
Tachigali cf. *multijuga* Benth.	n/o	3694	species
Tachigali cf. *rugosa* (Mart. ex Benth.) Zarucchi & Pipoly	d	4079	species
Tachigali cf. *setifera* (Ducke) Zarucchi & Herend.	j	3778	
Zollernia paraensis Huber	h	2620	
Leguminosae - Mimosoideae			
Abarema jupunba (Willd.) Britton & Killip (♦)	c, n/o	2503, 3711	
Enterolobium schomburgki (Benth.) Benth. (♦)	e	3742	
Inga alba (Sw.) Willd. (♦)	c	2524	
Inga capitata Desv. (♦)	c	2540	
Inga flagelliformis (Vell.) Mart.	c	2596	
Inga ingoides (Rich.) Willd. (♦)	d	4086	
Inga pilosula (Rich.) J.F. Macbr.	e	4141	

Table 1. ***Continued.***

SPECIES/FAMILY	AREA	*VOUCHER	NEW RECORD
Inga sertulifera DC. (♦)	h	2615	
Inga thibaudiana DC. (♦)	k, m	3800, 4031	
Inga cf. *ruiziana* G.Don (♦)	n/o	3699	
Inga sp.	d, e	4076, 4124	
Parkia multijuga Benth. (♦)	c	2521	
Parkia nitida Miq. (♦)	c	2550	
Parkia cf. *gigantocarpa* Miq.	c	2537/2545	species
Pseudopiptadenia psilostachya (DC.) Brenan (♦)	c	2522	
Senegalia sp.	d	4084	
Stryphnodendron pulcherrimum (Willd.) Hochr. (♦)	c	2591	
Zygia inaequalis (Willd.) Pittier (♦)	d	3725	
sp. 1	n/o	3686	
Leguminosae - Papilionoideae			
Acosmium nitens (Vogel) Yakovlev	i	3929	
Andira inermis (W. Wright) Kunth ex DC. (♦)	i	3934	
Dinizia excelsa Ducke	a/b	2512	
Ormosia excelsa Benth.	c	3816/3969	
Ormosia paraensis Ducke	m	4028	
Swartzia arborescens (Aubl.) Pittier (♦)	h	2616	
Swartzia flaemingii var. *psilonema* (Harms) R.S. Cowan	d	4096	species and variety
Swartzia racemosa Benth.	c	3967	species
Swartzia cf. *laxiflora* Bong. ex Benth. (♦)	c	3813	
Taralea oppositifolia Aubl. (♦)	c	3875/3964	
Linaceae			
Hebepetalum humiriifolium (Planch.) Benth.	n	3905	
Roucheria columbiana Hallier f.	c	3885	species
Loganiaceae			
Potalia amara Aubl. (♦)	m	4027	species
Lythraceae			
Physocalymma scaberrimum Pohl (♦)	k, n/o	1591, 3689	
Malpighiaceae			
Byrsonima aerugo Sagot	c	3886	species
Byrsonima altissima DC.	m	4039	species
Byrsonima sp.	i, l	3936, 3986	
sp. 1	f	3951	
Malvaceae			
Apeiba albiflora Ducke	d, m	3734, 4025	
Apeiba echinata Gaertn.	c, f	2504, 3947	
Apeiba glabra Aubl. (♦)	e	4150	species
Ceiba crispiflora (Kunth) Ravenna	a/b	2514	species
Eriotheca globosa (Aubl.) A. Robyns (♦)	k	3794	
Helicteres pentandra L.	d	4080	
Heliocarpus americanus L. (♦)	l	4004	
Luehea speciosa Willd.	e	4153	species
Matisia cordata Bonpl. (♦)	e	4147	species
Matisia ochrocalyx K. Schum. (♦)	c, e	2539, 3756	
Matisia sp.	n/o	3698	
Mollia lepidota Spruce ex Benth.	n/o	3685	
Theobroma speciosum Willd. ex Spreng. (♦)	d	4095	
Marantaceae			
Monotagma secundum (Petersen) Schum.	d	3729	species
Marcgraviaceae			
Norantea guianensis Aubl.	h	2548	
Melastomataceae			
Acinodendron burchellii (Triana) Kuntze	n/o	3705	genus
Bellucia aequiloba Pilg. (♦)	c	2536	species
Graffenrieda rupestris Ducke (♦)	n	3901	species
Henriettella ovata Cogn.	f	2579	
Loreya strigosa Gleason (♦)	d	4069	

Table 1. ***Continued.***

SPECIES/FAMILY	AREA	*VOUCHER	NEW RECORD
Meriania urceolata Triana	c	2629	
Miconia affinis DC. (♦)	d	4078	
Miconia kappleri Naudin	m	4190	species
Miconia minutiflora (Bonpl.) DC.	(?)	4173	
Miconia mirabilis (Aubl.) L.O. Williams	n/o	3706	species
Miconia poeppigii Triana (♦)	f, k	2578, 3799	
Miconia prasina (Sw.) DC.	c	3821	
Miconia tomentosa (Rich.) D. Don ex DC. (♦)	e, m	4116, 4189	
Miconia sp.	c	2601	
Mouriri brachyanthera Ducke	e, j	3741, 3788	
Mouriri collocarpa Ducke	j	3790	
Mouriri guianensis Aubl.	e, j	3769, 3782	
Meliaceae			
Guarea gomma Pulle (♦)	k	3804	
Guarea grandifolia DC. (♦)	e	4118	
Guarea guidonia (L.) Sleumer (♦)	l, m	3972, 4038	
Guarea kunthiana A. Juss. (♦)	d, n	4089, 3900	
Guarea pubescens (Rich.) A. Juss. (♦)	d, n/o	4045, 3687	
Guarea silvatica C.DC. (♦)	d	4044	
Guarea velutina A.Juss.	e	4142	
Trichilia cipo (A. Juss) C. DC. (♦)	c, d	2631, 4088	
Trichilia martiana C. DC.	h	2552	
Trichilia pleeana (A. Juss.) C. DC. (♦)	k, n/o	1594, 3683	
Trichilia quadrijuga Kunth (♦)	h, k	2611, 3801	
Trichilia septentrionalis C. DC.	d, l	4093, 3971	
Trichilia cf. *micrantha* Benth. (♦)	d	4049	
Trichilia sp.	d, e	4099, 4114	
Menispermaceae			
Abuta grandifolia (Mart.) Sandwith (♦)	f	2573	
Monimiaceae			
Mollinedia lanceolata Ruiz & Pav. (♦)	l	4000	species
Moraceae			
Bagassa guianensis Aubl.	l, n/o	4011, 3704	
Brosimum acutifolium subsp. *interjectum* C.C. Berg	f	3941	species and subspecies
Brosimum lactescens (S. Moore) C.C. Berg (♦)	(?)	3835	
Brosimum potabile Ducke (♦)	(?)	3865	
Brosimum rubescens Taub. (♦)	c	3814	
Castilla ulei Warb. (♦)	e	4157	
Clarisia ilicifolia (Spreng.) Lanj. & Rossberg (♦)	m	4029	
Ficus insipida Willd. (♦)	e	3751	
Ficus maxima Mill. (♦)	n/o	3691	species
Ficus paraensis (Miq.) Miq. (♦)	h	2604	
Helicostylis pedunculata Benoist	d	4064	species
Helicostylis tomentosa (Poepp. & Endl.) Rusby (♦)	j	3772	
Naucleopsis caloneura (Huber) Ducke (♦)	a/b, c, e, h	2513, 2598, 4158, 2614	species
Naucleopsis oblongifolia (Kuhlm.) Carauta (♦)	c	3970	species
Perebea mollis subsp. *mollis* (Poepp. & Endl.) Huber (♦)	c	2563	
Pseudolmedia laevigata Trécul (♦)	c, d	3959, 3716	
Pseudolmedia laevis (Ruiz & Pav.) J.F. Macbr. (♦)	c, d, f	2542, 4075, 3938	
Sorocea guilleminiana Gaudich. (♦)	a/b	2508	
Sorocea muriculata Miq. (♦)	e	4160	
Myristicaceae			
Campsoneura ulei Warb. (♦)	d, f	4082, 2572	
Iryanthera juruensis Warb. (♦)	c, d, e, j	2627, 4081, 4131, 3779	
Iryanthera macrophylla (Benth.) Warb. (♦)	(?)	3833	
Osteophloeum platyspermum (Spruce ex A. DC.) Warb. (♦)	(?)	3847/3853	
Virola calophylla (Spruce) Warb. (♦)	e	4130	
Virola elongata (Benth.) Warb. (♦)	m	4024	

Table 1. ***Continued.***

SPECIES/FAMILY	AREA	*VOUCHER	NEW RECORD
Virola mollissima (Poepp. ex A. DC.) Warb. (♦)	c, k	3957, 3802	
Virola sebifera Aubl. (♦)	d, m	4072, 4023	
Virola surinamensis (Rol. ex Rottb.) Warb. (♦)	(?)	3857/3864	
Virola theiodora (Spruce ex Benth.) Warb.	(?)	3837	
Myrtaceae			
Calyptranthes crebra McVaugh (♦)	c	2525	
Calyptranthes macrophylla O.Berg (♦)	d, e	4073, 4121	species
Calyptranthes cf. *pullei* Burret ex Amshoff	f	2582	species
Eugenia anastomosans DC.	c	2625	
Eugenia flavescens DC.	l	3979	
Eugenia lambertiana DC.	e	4120	
Eugenia punicifolia (Kunth) DC.	i	3933	
Myrcia bracteata (Rich.) DC. (♦)	d	3731	
Myrcia cf. *eximia* DC.	c	3968	
Myrcia cf. *splendens* (Sw.) DC. (♦)	c, f, m	3891, 2566, 4020	
Myrciaria cf. *floribunda* (H. West ex Willd.) O. Berg (♦)	h	2619	
Nyctaginaceae			
Guapira sp.	d	3739	
Neea sp.	d	4056	
Olacaceae			
Aptandra tubicina (Poepp.) Benth. ex Miers (♦)	c, f	3878, 2580	
Brachynema ramiflorum Benth.	d	4055	
Dulacia candida (Poepp.) Kuntze (♦)	j	3775	
Heisteria acuminata (Humb. & Bonpl.) Engl. (♦)	e	4161/4162	
Heisteria barbata Cuatrec. (♦)	c	2532	
Heisteria duckei Sleumer (♦)	f	2590	
Heisteria laxiflora Engl. (♦)	c, e	2557, 2635	
Opiliaceae			
Agonandra brasiliensis Miers ex Benth. & Hook. f. (♦)	m	4022	
Peraceae			
Pera bicolor (Klotzsch) Müll. Arg.	(?)	4188	
Pera distichophylla (Mart.) Baill.	f	2586	
Pera eiteniorum Bigio & Secco	m, n/o	4018, 3693	
Pera glabrata (Schott) Poepp. ex Baill. (♦)	e, f	3749, 2587	
Phyllanthaceae			
Amanoa guianensis Aubl.	k	3807	
Hieronyma alchorneoides Allemão var. *alchorneoides*	l	3998	
Phyllanthus sp.	j	3785	
Richeria sp.	n	3893	
Picramniaceae			
Picramnia latifolia Tul. (♦)	f	3948	
Piperaceae			
Piper anonifolium Kunth	m	4034	
Piper sp.	k, l	2634, 3985	
Polygonaceae			
Symmeria paniculata Benth. (♦)	c	3884	
Primulaceae			
Clavija lancifolia Desf. (♦)	e	4144	
Cybianthus guyanensis subsp. *pseudoicacoreus* (Miq.) Pipoly	c	2628	subspecies
Proteaceae			
Roupala sp.	e	4117	
Putranjivaceae			
Drypetes sp.	c, l	2538, 4007	
Quiinaceae			
Lacunaria jenmanii (Oliv.) Ducke	c	3892	
Quiina paraensis Pires (♦)	e	4125	
Rhizophoraceae			
Cassipourea guianensis Aubl.	d	4083	
Cassipourea peruviana Alston	c	2559	

Table 1. ***Continued.***

SPECIES/FAMILY	AREA	*VOUCHER	NEW RECORD
Sterigmapetalum obovatum Kuhlm.	j	3789	
Rubiaceae			
Alibertia bertierifolia K. Schum. (♦)	f	2569	
Amaioua corymbosa Kunth (♦)	n/o	3708	
Amaioua sp.	c, i	2597, 3953	
Calycophyllum spruceanum (Benth.) Hook. f. ex K. Schum.(♦)	n/o	3692	species
Capirona decorticans Spruce (♦)	d	4059	
Carapichea ipecacuanha (Brot.) L.Andersson	i	3932	species
Chassalia subspicata K. Schum.	h	2607	genus
Cordiera macrophylla (K.Schum.) Kuntze	l, n	3992, 3899	species
Coussarea hirticalyx Standl. (♦)	(?)	4178	species
Coussarea cf. *macrophylla* (Mart.) Müll.Arg.	e	4140	species
Coussarea sp.	c	2535	
Dialypetalanthus fuscescens Kuhlm. (♦)	d, j, l	4052, 3780, 3982	
Duroia sp.	h, l	2606, 4009	
Faramea glandulosa Poepp. & Endl. (♦)	d	4101	species
Faramea sp.	f	3949	
Genipa americana L. (♦)	c	2523	
Genipa sp.	l	4012	
Hamelia sp.	l	4001	
Isertia hypoleuca Benth. (♦)	f	2571	
Psychotria poeppigiana Müll. Arg. (♦)	d	3724	
Psychotria cf. *racemosa* Rich. (♦)	(?)	4172	
Psychotria sp.	d, e	3713, 4051	
Randia armata (Sw.) DC. (♦)	e	4139	
Rudgea sp.	d	4100	
Stachyarrhena acuminata Standl. (♦)	(?)	4186	
Tocoyena cf. *brasiliensis* Mart.	f	2570	species
Rutaceae			
Conchocarpus ucayalinus (Huber) Kallunki & Pirani (♦)	d	4058	
Dictyoloma vandellianum A.Juss.	k	3808	
Galipea trifoliata Aubl. (♦)	h	2622	
Galipea sp.	l	3995	
Metrodorea flavida K. Krause (♦)	c, d, i, l	2626, 4098, 3927, 3983	
Zanthoxylum rhoifolium Lam. (♦)	m	4033	
Zanthoxylum cf. *gardneri* Engl.	n/o	3710	species
Zanthoxylum sp.	e, l	3764, 3991	
Salicaceae			
Casearia decandra Jacq. (♦)	j, n	3783, 3896	
Casearia gossypiosperma Briq. (♦)	n, n/o	3898, 3680	
Casearia grandiflora Cambess.	c	2555	
Casearia guianensis (Aubl.) Urb. (♦)	e	3746	species
Casearia javitensis Kunth (♦)	c	2564	
Casearia mariquitensis Kunth (♦)	d	3730	
Casearia negrensis Eichler	d	4046	
Casearia pitumba Sleumer (♦)	h	2603	
Casearia ulmifolia Vahl ex Vent.	j, n/o	3784, 3681	
Hasseltia floribunda Kunth (♦)	e	4155/4156	
Laetia procera (Poepp.) Eichler (♦)	(?)	3832	
Pleuranthodendron lindenii (Turcz.) Sleumer (♦)	d	4094	genus
Sapindaceae			
Allophylus floribundus (Poepp. & Endl.) Radlk. (♦)	e	4152/4154	
Cupania sp.	l	3974	
Paullinia pinnata L.	l	4005	
Talisia retusa R.S. Cowan (♦)	c	3883	
Sapotaceae			
Chrysophyllum argenteum subsp. *auratum* (Miq.) T.D. Penn.(♦)	c	2546	species and subspecies
Chrysophyllum lucentifolium subsp. *pachycarpum* Pires & T.D.Penn. (♦)	(?)	4166	
Chrysophyllum sp.	n	3902	

Table 1. ***Continued.***

SPECIES/FAMILY	AREA	*VOUCHER	NEW RECORD
Manilkara huberi (Ducke) Standl.	c	2551	
Micropholis guyanensis (A.DC.) Pierre (♦)	c	3874	
Micropholis venulosa (Mart. & Eichler) Pierre (♦)	k	3792	
Planchonella sp.	l	4014	genus
Pouteria cladantha Sandwith (♦)	(?)	3848	
Pouteria elegans (A. DC.) Baehni	c	3728	
Pouteria eugeniifolia (Pierre) Baehni	d	4071	species
Pouteria gongrijpii Eyma	(?)	4174	species
Pouteria macrophylla (Lam.) Eyma (♦)	l, m	4002, 4036	species
Pouteria torta subsp. *tuberculata* (Sleumer) T.D. Penn. (♦)	c	2558	subspecies
Sarcaulus brasiliensis (A.DC.) Eyma (♦)	(?)	4182	genus
Simaroubaceae			
Simaba orinocensis Kunth (♦)	c	3882	
Siparunaceae			
Siparuna cervicornis Perkins (♦)	h	2612	species
Siparuna decipiens (Tul.) A. DC. (♦)	e, f	3765, 2574	
Siparuna guianensis Aubl. (♦)	c, f	3888, 2583	
Siparuna thecaphora (Poepp. & Endl.) A. DC. (♦)	e	4115	
Siparuna sp.	e	4113	
Solanaceae			
Brunfelsia sp.	l	3988	
Lycianthes sancti-caroli (H. Winkl.) Bitter	l	3989	species
Solanum endopogon (Bitter) Bohs (♦)	d	3736	
Solanum cf. *leucocarpon* Dunal (♦)	m	4032	
Solanum sp.	l	3987	
Staphyleaceae			
Turpinia occidentalis (Sw.) G.Don (♦)	c, d, e, l, n	2519, 4063, 3755, 3993, 3903	
Styracaceae			
Styrax guianensis Aubl.	e	3762	species
Ulmaceae			
Ampelocera edentula Kuhlm. (♦)	e	4164	
Urticaceae			
Pourouma bicolor subsp. *bicolor* Mart. (♦)	f	3940	
Pourouma guianensis Aubl. (♦)	n	3904	
Pourouma velutina Mart. ex Miq.	k	3796/3797	
Pourouma cf. *minor* Benoist (♦)	e	4151	
Urera caracasana (Jacq.) Gaudich. ex Griseb. (♦)	e	4148	
Urera laciniata Wedd. (♦)	d	3718	species
Violaceae			
Leonia cymosa Mart. (♦)	d, e	4111, 3754	
Leonia glycycarpa Ruiz & Pav. (♦)	c, j	2593, 3777	
Rinorea flavescens (Aubl.) Kuntze (♦)	c	2560	
Rinorea lindeniana (Tul.) Kuntze (♦)	e	4126/4127	
Rinorea ovalifolia (Britton) S.F. Blake (♦)	d	3737	
Rinorea pubiflora (Benth.) Sprague & Sandwith (♦)	h	2613/2618	
Rinorea racemosa (Mart.) Kuntze (♦)	(?)	4168	
Rinoreocarpus ulei (Melch.) Ducke (♦)	e	3761	
Vochysiaceae			
Qualea acuminata Spruce ex Warm. (♦)	c	2526	
Qualea dinizii Ducke	(?)	3851	
Qualea grandiflora Mart. (♦)	n/o	3682	
Vochysia surinamensis Stafleu	(?)	3870	
Vochysia vismiifolia Spruce ex Warm.	c	3820	
Zingiberaceae			
Renealmia monosperma Miq. (♦)	h	2605	species

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