Floristic survey of the Mata do Junco Wildlife Refuge, Capela, Sergipe State, Brazil

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ABSTRACT - (Floristic survey of the Mata do Junco Wildlife Refuge, Capela, Sergipe State, Brazil). Seeking to expand the floristic studies for the Atlantic rainforest, we herein present, based on field trips (January 2011 to April 2013) and herbarium records, a list of vascular plants found in the Mata do Junco Wildlife Refuge, State of Sergipe, Northeastern Brazil. We registered a total of 380 species, 244 genera and 80 families, with 45 new occurrences for the Atlantic rainforest of the State of Sergipe. The most representative families were Fabaceae (36 species), Cyperaceae (29) and Poaceae (28). Herbs were the most representative regarding habit (167 species or 44%). We found two threatened species: *Caesalpinia echinata* Lam. and *Campylocentrum pernambucense* Hoehne, both in the "endangered" category. Overall, the results indicate that the Mata do Junco Wildlife Refuge is floristically similar to other areas of Atlantic rainforest in the State of Sergipe. Moreover, the existence of new records and of a threatened native species reinforces its importance for conservation.
Keywords: Atlantic Rainforest, Floristic Similarity, Protected Areas

RESUMO - (Levantamento florístico do Refúgio de Vida Silvestre Mata do Junco, Capela, Estado de Sergipe, Brasil). Buscando expandir os estudos florísticos para a Mata Atlântica, apresentamos, através de excursões de campo (janeiro/2011 a abril/2013) e registros de herbário, uma lista de plantas vasculares encontrados no Refúgio de Vida Silvestre Mata do Junco, no Estado de Sergipe. Foram registrados um total de 380 espécies, 244 gêneros e 80 famílias, com 45 novas ocorrências para a Mata Atlântica de Sergipe. As famílias mais representativas foram Fabaceae (36 espécies), Cyperaceae (29) e Poaceae (28). As ervas foram o hábito mais representativo (167 espécies ou 44%). Foram encontradas duas espécies ameaçadas: *Caesalpinia echinata* Lam. e *Campylocentrum pernambucense* Hoehne, ambas na categoria "em perigo". No geral, os resultados indicam que o Refúgio de Vida Silvestre Mata do Junco é floristicamente similar às outras áreas de Mata Atlântica de Sergipe. Além disso, a existência de novos registros e de uma espécie nativa ameaçada reforça a sua importância para conservação.
Palavras-chave: Mata Atlântica, Similaridade Florística, Unidades de Conservação

Introduction

The Atlantic rainforest encompasses a set of ecologically important ecosystems (Turner & Corlett 1996, Moore 1998, Moura 2006, Stehmann 2009, Forzza *et al.* 2012) with a high degree of endemism (Moura 2006, Forzza *et al.* 2012). These factors, associated to the risk of disappearance, were responsible for the inclusion of the Atlantic rainforest as one of the 25 biodiversity hotspots in the world (Myers *et al.* 2000).

According to IBGE (1993), the Atlantic rainforest occurs on an almost continuous coastline, between the States of Rio Grande do Sul and Rio Grande do Norte, and includes the inner regions of the continent, in the States of Goiás, Mato Grosso do Sul, Minas Gerais,

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Ceará and Piauí. This biome is very heterogeneous and consists of a series of phytophysiognomies (Capobianco 2001), from *stricto sensu* (dense, mixed and open) to seasonal forests (deciduous and semi-deciduous), mangroves, Restingas, montane forest and Brejos Interioranos (IBGE 1993, Tabarelli *et al.* 2005).

Regarding the richness of plants, it is estimated to house about 15,782 species, distributed in 2,257 genera and 348 families and, of this total, 7,155 species (45%) are endemic to the Atlantic rainforest. The angiosperms are represented by 13,708 species, followed by 1,230 species of bryophytes, 840 species of ferns and licophytes and four species of gymnosperms (Stehmann *et al.* 2009).

In the State of Sergipe, only 9.3% of the original Atlantic rainforest cover remains (Fundação SOS Mata Atlântica/INPE 2013). In this State, the Atlantic rainforest is distributed in 403 fragments (Santos 2009), small and isolated (Jerusalinsky *et al.* 2006), having become vulnerable enough to degradation (Landim *et al.* 2015). Currently, there are 19 conservation units, with only three of them in the "fully protected" category (Brasil 2000) and covering areas of Atlantic rainforest: the Biological Reserve of Santa Isabel (covered by Restingas and mangroves, both phytophysiognomies of the Atlantic rainforest), the Serra de Itabaiana National Park (transition ecotone of the Atlantic rainforest with the *Caatinga*) and the Mata do Junco Wildlife Refuge, a semideciduous Atlantic rainforest (Brasil 2010, 2011a, 2011b, Farias 2013, Souza-Alves *et al.* 2014).

Currently, there are few studies of the Atlantic rainforest in the State of Sergipe (Landim & Siqueira 2001, Vicente *et al.* 2005, Mendes *et al.* 2010, Dantas *et al.* 2010, Lucena *et al.* 2010, Souza-Alves *et al.* 2014, Landim *et al.* 2015). Nevertheless, recent studies have shown the importance of Atlantic rainforest fragments in Sergipe, such as its high richness of plants (Mendes *et al.* 2010, Landim *et al.* 2015) and the conservation of endemic species of fauna (Souza-Alves *et al.* 2014).

Considering the small number of floristic studies for the Atlantic rainforest of Sergipe and the urgent need for conservation action in this biome, we present and analyze a list of vascular plants collected in the Mata do Junco Wildlife Refuge (also indicating threatened species) in order to fill the scientific research lacunas for this biome in the State of Sergipe.

Materials and methods

Study site - the Mata do Junco Wildlife Refuge is located in the county of Capela (10°30'35"S and 37°03'17"W), in the State of Sergipe, Northeastern Brazil (figure 1). This protected area covers an area of 894.76 ha (Sergipe 2007), representing the second largest Atlantic rainforest reserve in Sergipe (Santos *et al.* 2007, Sergipe 2007). It was created in order to protect the Atlantic rainforest, its natural resources, and especially the Guigó monkey (*Callicebus coimbrai* Kobayashi & Langguth - 1999), endemic to the Atlantic rainforest of the States of Bahia and Sergipe (Jerusalinsky *et al.* 2006, Sergipe 2007).

In the Mata Junco Wildlife Refuge, altitude varies from 113 to 172 m (Souza-Alves 2013) and the soils are of type Argissolo Vermelho-Amarelo (EMBRAPA/SUDENE 1975). The vegetation is distributed in two isolated fragments (with 522 and 372.76 ha each), covered by secondary forest remnants, where individuals can reach an average height of over 15 m in advanced stages of regeneration, with the highest reaching up to 20 m (Santos *et al.* 2007, Santos 2009, Morato *et al.* 2011, Souza-Alves *et al.* 2014). In general, the forest canopy ranges from closed - with many epiphytes, lianas, climbers, and abundant litter - to open (Santos *et al.* 2007). In the latter, the understory is composed of a thin litter layer, broadleaf shrubs and small trees. When the opening of the canopy is increased, gaps are formed with higher density of herbs, as well as the edges of the fragments.

The climate is characterized as Type As - tropical rainy with dry summer according to the climatic classification of Köppen (Alvarez *et al.* 2014). The rainy season runs from March to August, while the dry season runs from September to February. The total precipitation ranges from 1500-1800 mm per year and the annual average temperature is around 26 °C (Sergipe 2011).

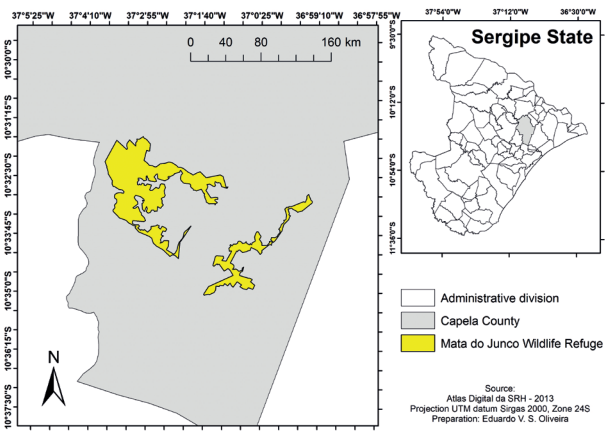

Figure 1. Location of the Mata Junco Wildlife Refuge, Sergipe State, Northeastern Brazil.

Data collection and analysis - The species listed in this study were compiled through field trips from January 2011 to April 2013, being four times a year in 2011 (intervals of three months), six times a year in 2012 (intervals of two months, however twice a month) and twice a year in 2013 (intervals of two months), totaling eighteen fields trips and including sampling in the dry and rainy season every year. Walks were carried out along trails and edges throughout the study area, seeking out fertile specimens (with flower and/or fruit). Then these specimens were herborized according to the usual standards (Mori *et al.* 1989) and placed in the Herbarium of the Federal University of Sergipe (ASE). The specimens were identified by experts and by comparison with herbarium vouchers from the Federal University of Sergipe - ASE (acronyms following Thiers 2016).

To complement the field trips, we searched information from plants collected in Mata do Junco Wildlife Refuge in the database of the Herbarium of the Federal University of Sergipe (ASE) and of the Herbarium of the Federal University of Pernambuco (UFP) using the speciesLink (CRIA 2016). Subsequently, the vouchers present at these herbaria were checked and, when possible, updated to the lowest taxonomic level. The vouchers with doubtful identification were excluded.

The adopted classification system was APG III (2009). To define the habit of the individuals (defining all their respective species), field observations were used as well as descriptions on the voucher labels (for the herbarium survey), following the literature settings (Gonçalves & Lorenzi 2007) and checked in the Flora do Brasil (2020) em construção. The spelling of names was checked in the Flora do Brasil (2020) em construção and the distribution of species in Brazil also in this database and recent papers for the Atlantic rainforest of the State of Sergipe (Prata *et al.* 2013, Oliveira & Landim 2014, Oliveira *et al.* 2014, Souza-Alves *et al.* 2014, Landim *et al.* 2015, Oliveira *et al.* 2015, Prata *et al.* 2015).

Based on the compiled floristic list, we searched for endemic species of the Atlantic rainforest (Stehmann *et al.* 2009) as well as threatened species (IUCN 2015, Martinelli & Moraes 2013).

In order to verify the floristic similarity between the study site and other areas of Atlantic rainforest (Alves-Araújo *et al*. 2008, Mendes *et al*. 2010, Amazonas & Barbosa 2011, Alves *et al*. 2015, Landim *et al*. 2015) and with areas of Caatinga (Ferreira *et al.* 2013, Silva *et al*. 2013), we generated a dendrogram obtained from a binary matrix (presence/absence) with the distribution of the species recorded in the papers analyzed using the unweighted pair group method with arithmetic mean (UPGMA) based on the Sørensen coefficient in the Past 2.17 software (Hammer *et al.* 2013).

Results

Altogether 380 species were found (24 or 6% endemic species for the Atlantic rainforest), with five fern species and 375 species of angiosperms (some examples, figures 5 and 6), distributed in 244 genera and 80 families, with 45 new occurrences for the Atlantic rainforest of the State of Sergipe (table 1). Considering angiosperms and ferns and lycophytes (table 2), the number of species found in the Mata do Junco Wildlife Refuge represent about 82% of the number of species and families recorded for the county of Capela and about 27% of the number of species and 53% of the families recorded for the Atlantic rainforest of the State of Sergipe (CRIA 2016, Flora do Brasil 2020 em construção).

Regarding the Atlantic rainforest of the northeast region and of Brazil, the Mata do Junco Wildlife Refuge has, respectively, about 5% and 2% of the species and about 36% and 32% of the families (Flora do Brasil 2020 em construção).

About 11% of the species have a wide distribution in Brazil (considering those occurring in 26 States as well as the Federal District) and about 4% of the species have restricted distribution (considering those occurring in three or fewer States).

The families with the highest number of species (figure 2) were Fabaceae (36 species), Cyperaceae (29), Poaceae (28), Asteraceae (25), Rubiaceae (22). Malvaceae (15) and Orchidaceae (14), corresponding to 44% of the total species and 9% of the number of families. The families with only one species account for 9% of all species and 41% of all families.

The most representative genera were *Cyperus* L. (eight species), *Rhynchospora* Vahl and *Solanum* L. (seven), *Miconia* Ruiz & Pav. (six) and *Senna* Mill., *Sida* L., *Myrcia* DC., *Paspalum* L. and *Psychotria* L. (five), corresponding to 14% of the species and 18% of all genera.

Herbs were the habit (figure 3) with the highest number of species (167 species), followed by trees (73 species), shrubs (63 species), climbers (55 species) and subshrubs (22 species).

We found two threatened species in the Mata do Junco Wildlife Refuge: *Caesalpinia echinata* Lam.

Table 1. List of the 380 vascular plants collected in the Mata Junco Wildlife Refuge, Sergipe State, Northeastern Brazil. *: endemic to the Atlantic rainforest. +: new occurrence for the Atlantic rainforest of Sergipe. Vouchers with (**) are deposited in the UFP herbarium, being the remainder deposited at the ASE herbarium.

Family/Species	Habit	Collector number	Voucher
Ferns			
Aspleniaceae			
Asplenium salicifolium L.+	Herb	Gomes, L.A. *et al*. 1061	27805
Lindsaeaceae			
Lindsaea lancea (L.) Bedd.	Herb	Gomes, L.A. *et al.* 93	21025
Lygodiaceae			
Lygodium venustum Sw.	Climber	Gomes, L.A. *et al.* 912	21036
Lygodium volubile Sw.	Herb	Nascimento-Júnior, J.E. *et al.* 3	10680
Thelypteridaceae			
Thelypteris serrata (Cav.) Alston	Herb	Gomes, L.A. *et al.* 102	21033
Angiosperms			
Acanthaceae			
Ruellia bahiensis (Nees) Morong+	Herb	Melo, L.M.S. *et al.* 89	25849
Ruellia ochroleuca Mart. *ex* Nees+	Herb	Melo, L.M.S. *et al.* 43	25803
Amaranthaceae			
Alternanthera tenella Colla	Herb	Melo, L.M.S. *et al.* 118	28282
Amaryllidaceae			
Hippeastrum stylosum Herb.	Herb	Gomes, L.A. *et al.* 399	24208
Anacardiaceae			
Anacardium occidentale L.	Tree	Nascimento-Júnior, J.E. *et al.* 560	13194
Tapirira guianensis Aubl.	Tree	Souza, C.A.S. *et al.* 86	19794
Thyrsodium sp.	Tree	Souza, C.A.S. *et al*. 87	19795
Annonaceae			
Annona montana Macfad.	Tree	Gomes, L.A. *et al*. 1058	27793
Xylopia frutescens Aubl*	Tree	Gomes, L.A. *et al*. 652	25542
Apiaceae			
Spananthe paniculata Jacq.+	Herb	Melo, L.M.S. *et al*. 35	25795
Apocynaceae			
Blepharodon pictum (Vahl) W.D.Stevens	Climber	Gomes, L.A. *et al*. 244	22220
Ditassa crassifolia Decne*	Climber	Prata, A.P. *et al*. 2611	21396
Himatanthus obovatus (Müll. Arg.) Woodson	Tree	Gomes, L.A. *et al*. 444	24236
Mandevilla scabra (Hoffmanns. *ex* Roem. & Schult.) K.Schum.	Climber	Gomes, L.A. *et al.* 1051	27800
Rauvolfia ligustrina Willd.	Shrub	Gomes, L.A. *et al*. 419	24230
Tabernaemontana pandacaqui Lam.	Shrub	Gomes, L.A. *et al*. 360	24169
Araceae			
Monstera adansonii Schott	Herb	Gomes, L.A. *et al.* 393	24202
Philodendron acutatum Schott	Herb	Gomes, L.A. *et al.* 379	24188
Araliaceae			
Hydrocotyle leucocephala Cham. & Schltdl.	Herb	Gomes, L.A. *et al*. 374	24183

continue

Table 1 (continuation)

Family/Species	Habit	Collector number	Voucher
Schefflera morototoni (Aubl.) Maguire, Steyerm. & Frodin	Tree	Gomes, L.A. *et al.* 1035	27775
Aristolochiaceae			
Aristolochia labiata Willd	Climber	Silva 205	13672
Asteraceae			
Acmella uliginosa (Sw.) Cass.+	Herb	Melo, L.M.S. *et al.* 41	25801
Ageratum conyzoides L.	Herb	Melo, L.M.S. *et al.* 44	25804
Ageratum fastigiatum (Gardner) R.M.King & H. Rob.	Herb	Melo, L.M.S. *et al.* 7	25767
Aspilia foliacea (Spreng.) Baker+	Herb	Nascimento-Júnior, J.E. *et al.* 50	11006
Aspilia martii Baker	Herb	Gomes, L.A. *et al.* 672	25562
Baccharis trinervis Pers.+	Herb	Gomes, L.A. *et al.* 407	24218
Blainvillea acmella (L.) Philipson	Herb	Melo, L.M.S. *et al*. 31	25791
Centratherum punctatum Cass.	Herb	Melo, L.M.S. *et al.* 108	28272
Chromolaena odorata (L.) R.M.King & H.Rob.	Herb	Melo, L.M.S. *et al.* 40	25800
Conyza bonariensis (L.) Cronquist	Herb	Melo, L.M.S. *et al.* 122	28286
Cyrtocymura scorpioides (Lam.) H. Rob.	Herb	Gomes, L.A. *et al.* 214	22190
Eclipta sp.	Herb	Melo, L.M.S. *et al.* 103	28267
Elephantopus mollis Kunth	Herb	Melo, L.M.S. *et al.* 70	25830
Eremanthus capitatus (Spreng.) MacLeish	Tree	Gomes, L.A. *et al.* 677	25567
Ichthyothere terminalis (Spreng.) S.F. Blake	Subshrub	Gomes, L.A. *et al.* 667	25557
Lepidaploa remotiflora (Rich.) H. Rob.+	Shrub	Gomes, L.A. *et al*. 657	25547
Mikania nodulosa Sch. Bip. *ex* Baker+	Climber	Gomes, L.A. *et al*. 85	21644
Moquiniastrum oligocephalum (Gardner) G. Sancho	Shrub	Gomes, L.A. *et al.* 448	24232
Platypodanthera melissifolia (DC.) R.M. King & H.Rob.	Herb	Gomes, L.A. *et al.* 645	25535
Pluchea sagittalis (Lam.) Cabrera	Herb	Gomes, L.A. *et al.* 388	24197
Rolandra fruticosa (L.) Kuntze	Herb	Melo, L.M.S. *et al.* 54	25814
Sphagneticola trilobata (L.) Pruski	Herb	Melo, L.M.S. *et al*. 126	28290
Tilesia baccata (L.f.) Pruski	Shrub	Gomes, L.A. *et al.* 658	25548
Verbesina macrophylla (Cass.) S.F. Blake+	Shrub	Gomes, L.A. *et al.* 661	25551
Vernonanthura brasiliana (L.) H. Rob.+	Herb	Melo, L.M.S. *et al.* 105	28269
Bignoniaceae			
Adenocalymma comosum (Cham.) DC.	Climber	Gomes, L.A. *et al.* 224	22200
Lundia corymbifera (Vahl) Sandwith+	Climber	Gomes, L.A. *et al.* 648	25538
Mansoa sp.	Climber	Gomes, L.A. *et al.* 1037	27778
Tabebuia aurea (Silva Manso) Benth. & Hook.f. *ex* S.Moore	Tree	Souza, C.A.S. *et al.* 90	19798
Tabebuia stenocalyx Sprague & Stapf	Tree	Gomes, L.A. *et al.* 441	24239

continue

Table 1 (continuation)

Family/Species	Habit	Collector number	Voucher
Boraginaceae			
Cordia nodosa Lam.	Shrub	Gomes, L.A. *et al.* 376	24185
Cordia superba Cham.	Shrub	Gomes, L.A. *et al.* 363	24172
Cordia toqueve Aubl.	Shrub	Gomes, L.A. *et al.* 409	24220
Euploca procumbens (Mill.) Diane & Hilger	Herb	Melo, L.M.S. *et al.* 115	28279
Euploca ternata (Vahl) J.I.M.Melo & Semir	Herb	Pereira, L.A. *et al.* 471	29799
Varronia multispicata (Cham.) Borhidi	Shrub	Gomes, L.A. *et al.* 477	24377
Bromeliaceae			
Aechmea aquilega (Salisb.) Griseb.	Herb	Gomes, L.A. *et al.* 472	24373
Aechmea lingulata (L.) Baker	Herb	Gomes, L.A. *et al.* 471	24372
Aechmea mertensii (G. Mey.) Schult. & Schult.f.	Herb	Gomes, L.A. *et al.* 400	24211
Ananas bracteatus (Lindl.) Schult. & Schult.f.	Herb	Melo, D.S. *et al.* 2	14739
Bromelia laciniosa Mart. *ex* Schult. & Schult.f.	Herb	Gomes, L.A. *et al.* 433	24247
Tillandsia bulbosa Hook.f.	Herb (Epiphyte)	Gomes, L.A. *et al.* 470	24371
Tillandsia polystachia (L.) L.	Herb (Epiphyte)	Gomes, L.A. *et al.* 458	24359
Vriesea procera (Mart. *ex* Schult. & Schult.f.) Wittm.	Herb (Epiphyte)	Silva 190	13658
Burseraceae			
Protium heptaphyllum (Aubl.) Marchand	Tree	Gomes, L.A. *et al.* 367	24176
Calophyllaceae			
Kielmeyera argentea Choisy*	Subshrub	Gomes, L.A. *et al.* 680	25570
Kielmeyera rugosa Choisy*	Shrub	Delgado-Junior, G. *et al.* 550	71556**
Kielmeyera neglecta Saddi*	Shrub	Gomes, L.A. *et al.* 395	24204
Campanulaceae			
Centropogon cornutus (L.) Druce	Shrub	Melo, L.M.S. *et al.* 37	25797
Cannabaceae			
Celtis iguanaea (Jacq.) Sarg.	Shrub	Nascimento-Júnior, J.E. *et al.* 66	11200
Chrysobalanaceae			
Hirtella ciliata Mart. & Zucc.	Tree	Souza, C.A.S. *et al.* 92	19800
Hirtella racemosa Lam.	Tree	Gomes, L.A. *et al.* 473	24374
Clusiaceae			
Clusia nemorosa G.Mey.	Tree	Gomes, L.A. *et al.* 451	24352
Clusia paralicola G. Mariz*	Shrub (Epiphyte)	Nascimento-Júnior, J.E. *et al.* 68	10998
Commelinaceae			
Commelina diffusa Burm.f.	Herb	Melo, L.M.S. *et al.* 52	25812
Commelina rufipes var. *glabrata* (D.R. Hunt) Faden & D.R.Hunt	Herb	Gomes, L.A. *et al.* 671	25561

continue

Table 1 (continuation)

Family/Species	Habit	Collector number	Voucher
Dichorisandra procera Mart. *ex* Schult & Schult.f.	Herb	Gomes, L.A. *et al.* 674	25564
Convolvulaceae			
Evolvulus glomeratus Nees & Mart.	Herb	Gomes, L.A. *et al.* 437	24243
Ipomoea asarifolia (Desr.) Roem. & Schult.	Climber	Silva 198	13665
Ipomoea bahiensis Willd. ex Roem. & Schult.	Climber	Gomes, L.A. *et al.* 684	25574
Ipomoea batatoides Choisy	Climber	Gomes, L.A. *et al.* 239	22215
Ipomoea eriocalyx Mart*	Climber	Gomes, L.A. *et al.* 394	24203
Jacquemontia blanchetii Moric.	Climber	Gomes, L.A. *et al.* 655	25545
Jacquemontia choisyana Meisn.	Climber	Melo, L.M.S. *et al.* 48	25808
Jacquemontia glaucescens Choisy	Climber	Gomes, L.A. *et al.* 424	24256
Merremia macrocalyx (Ruiz & Pav.) O' Donell	Climber	Gomes, L.A. *et al.* 217	22193
Merremia umbellata (L.) Hallier f.	Climber	Gomes, L.A. *et al.* 687	25577
Costaceae			
Costus spiralis (Jacq.) Roscoe	Subshrub	Gomes, L.A. *et al.* 94	21026
Cucurbitaceae			
Cayaponia sp.+	Climber	Costa-Silva, R. *et al.* 46	30675
Cucurbita sp.	Climber	Gomes, L.A. *et al.* 1052	27795
Gurania lobata (L.) Pruski	Climber	Gomes, L.A. *et al.* 639	25529
Gurania subumbellata (Miq.) Cogn.	Climber	Gomes, L.A. *et al.* 685	25575
Melothria pendula L.	Climber	Melo, L.M.S. *et al.* 38	25798
Psiguria sp.+	Climber	Gomes, L.A. *et al.* 480	24379
Cyperaceae			
Bulbostylis conifera (Kunth) C.B. Clarke	Herb	Gomes, L.A. *et al.* 450	24351
Bulbostylis truncata (Nees) M.T. Strong	Herb	Silva 246	13713
Cyperus distans L.	Herb	Melo, L.M.S. *et al.* 42	25802
Cyperus haspan L.	Herb	Silva 92	9564
Cyperus laxus Lam.	Herb	Silva 84	10285
Cyperus luzulae (L.) Retz.	Herb	Gomes, L.A. *et al.* 405	24216
Cyperus mundtii (Nees) Kunth+	Herb	Melo, L.M.S. *et al.* 47	25807
Cyperus odoratus L.	Herb	Melo, L.M.S. *et al.* 72	25832
Cyperus simplex Kunth	Herb	Melo, L.M.S. *et al.* 39	25799
Cyperus surinamensis Rottb.	Herb	Melo, L.M.S. *et al.* 129	28293
Eleocharis flavescens (Poir.) Urb.+	Herb	Silva 79	10281
Eleocharis interstincta (Vahl) Roem. & Schult.	Herb	Silva 115	10049
Eleocharis maculosa (Vahl) Roem. & Schult.	Herb	Silva 242	13709
Fimbristylis autumnalis (L.) Roem. & Schult.	Herb	Silva 88	9563
Fimbristylis dichotoma (L.) Vahl	Herb	Silva 81	10283
Fuirena umbellata Rottb.	Herb	Melo, L.M.S. *et al.* 128	28292
Kyllinga brevifolia Rottb.	Herb	Melo, L.M.S. *et al.* 99	28263

continue

Table 1 (continuation)

Family/Species	Habit	Collector number	Voucher
Kyllinga pumila Michx.	Herb	Silva 80	10282
Rhynchospora barbata (Vahl) Kunth	Herb	Silva 118	10035
Rhynchospora cephalotes (L.) Vahl	Herb	Melo, L.M.S. *et al.* 81	25841
Rhynchospora corymbosa (L.) Britton	Herb	Melo, L.M.S. *et al.* 134	28298
Rhynchospora holoschoenoides (Rich.) Herter	Herb	Souza, C.A.S. *et al.* 95	19803
Rhynchospora nervosa (Vahl) Boeckeler	Herb	Melo, L.M.S. *et al.* 109	28273
Rhynchospora tenerrima Nees *ex* Spreng.	Herb	Silva 244	13711
Rhynchospora tenuis Link	Herb	Silva 85	10286
Scleria bracteata Cav.	Herb	Gomes, L.A. *et al.* 218	22194
Scleria gaertneri Raddi	Herb	Silva *et al.* 116	10050
Scleria latifolia Sw.	Herb	Melo, L.M.S. *et al*. 60	25820
Scleria mitis P.J.Bergius	Herb	Gomes, L.A. *et al.* 246	22222
Dilleniaceae			
Curatella americana L.	Tree	Gomes, L.A. *et al.* 247	22223
Davilla nitida (Vahl) Kubitzki	Climber	Vale, C.O. *et al.* 1	19774
Erythroxylaceae			
Erythroxylum rimosum O. E. Schulg	Shrub	Déda, R.M. *et al.* 255	28249
Erythroxylum squamatum Sw.	Tree	Gomes, L.A. *et al.* 911	21642
Erythroxylum subrotundum A.St. Hil	Tree	Gomes, L.A. *et al.* 103	21038
Euphorbiaceae			
Croton fuscescens Spreng.	Shrub	Gomes, L.A. *et al.*103	21034
Croton heliotropiifolius Kunth	Shrub	Melo, L.M.S. *et al.* 67	25827
Croton lundianus (Didr.) Müll.Arg.	Shrub	Déda, R.M. *et al.* 254	28248
Croton triqueter Lam.	Shrub	Gomes, L.A. *et al.* 211	22187
Dalechampia convolvuloides Lam.+	Climber	Gomes, L.A. *et al.* 688	25578
Euphorbia phosphorea Mart.	Shrub	Gomes, L.A. *et al.* 673	25563
Fabaceae			
Abarema cochliacarpos (Gomes) Barneby & J.W.Grimes	Tree	Córdula, E. 1077	76575**
Aeschynomene ciliata Vogel	Herb	Gomes, L.A. *et al.* 220	22196
Aeschynomene martii Benth.	Herb	Melo, L.M.S. *et al*. 82	25842
Bowdichia virgilioides Kunth	Tree	Gomes, L.A. *et al.* 213	22189
Caesalpinia echinata Lam+*	Tree	Melo, L.M.S. *et al.* 136	28300
Camptosema sp.+	Climber	Gomes, L.A. *et al.* 222	22198
Cassia grandis L.f.	Tree	Silva 192	13659
Centrosema brasilianum (L.) Benth.	Climber	Gomes, L.A. *et al.* 692	25582
Chamaecrista flexuosa (L.) Greene	Herb	Melo, L.M.S. *et al.* 101	28265
Chamaecrista ramosa (Vogel) H.S.Irwin & Barneby	Subshrub	Gomes, L.A. *et al.* 697	25586
Crotalaria sp.	Herb	Nascimento-Júnior, J.E. *et al.* 52	11004
Desmodium incanum (Sw.) DC.	Herb	Melo, L.M.S. *et al.* 83	25843

continue

Table 1 (continuation)

Family/Species	Habit	Collector number	Voucher
Dioclea lasiophylla Mart. *ex* Benth.	Climber	Nascimento-Júnior, J.E. *et al.* 562	13196
Dioclea virgata (Rich.) Amshoff	Climber	Silva *et al.* 176	12384
Discolobium hirtum Benth.+	Shrub	Melo, L.M.S. *et al.* 25	25785
Enterolobium sp.	Tree	Gomes, L.A. *et al.* 227	22203
Galactia sp.	Climber	Silva *et al.* 174	12382
Hymenaea courbaril L.	Tree	Gomes, L.A. *et al.* 404	24215
Inga subnuda Salzm. *ex* Benth*	Tree	Gomes, L.A. *et al.* 245	22221
Inga thibaudiana DC.	Tree	Gomes, L.A. *et al.* 384	24193
Mimosa pudica L.	Herb	Gomes, L.A. *et al.* 206	22182
Mimosa velloziana Mart.	Shrub	Gomes, L.A. *et al.* 689	25579
Mucuna sp.	Climber	Gomes, L.A. *et al.* 238	22214
Parkia pendula (Willd.) Benth. *ex* Walp.	Tree	Gomes, L.A. *et al.* 468	24369
Senna angulata (Vogel) H.S.Irwin & Barneby	Shrub	Silva *et al.* 167	12375
Senna cana (Nees & Mart.) H.S.Irwin & Barneby	Tree	Gomes, L.A. *et al.* 230	22206
Senna georgica H.S.Irwin & Barneby+	Tree	Silva, A.C. 199	62935**
Senna macranthera (DC. *ex* Collad.) H.S.Irwin & Barneby	Shrub	Gomes, L.A. *et al.* 1063	27783
Senna pinheiroi H.S.Irwin & Barneby	Shrub	Melo, L.M.S. *et al.* 45	25805
Stryphnodendron pulcherrimum (Willd.) Hochr.	Tree	Vale, C.O. *et al.* 5	19778
Stylosanthes guianensis (Aubl.) Sw.	Herb	Melo, L.M.S. *et al.* 20	25780
Stylosanthes scabra Vogel	Herb	Melo, L.M.S. *et al.* 13	25773
Swartzia apetala Raddi*	Tree	Gomes, L.A. *et al.* 1036	27789
Tachigali densiflora (Benth.) L.G.Silva & H.C.Lima*	Tree	Gomes, L.A. *et al.* 664	25554
Vigna sp.	Climber	Gomes, L.A. *et al.* 237	22213
Zornia leptophylla (Benth.) Pittier	Herb	Melo, L.M.S. *et al.* 21	25781
Gentianaceae			
Chelonanthus purpurascens (Aubl.) Struwe, S.Nilsson & V.A.Albert	Herb	Melo, L.M.S. *et al.* 87	25847
Coutoubea spicata Aubl.	Herb	Melo, L.M.S. *et al.* 69	25829
Heliconiaceae			
Heliconia psittacorum L.f.	Herb	Melo, L.M.S. *et al.* 113	28277
Hypericaceae			
Vismia guianensis (Aubl.) Choisy	Tree	Souza, C.A.S. *et al.* 93	19801
Hypoxidaceae			
Hypoxis decumbens L.	Herb	Melo, L.M.S. *et al.* 34	25794
Iridaceae			
Cipura paludosa Aubl.	Herb	Melo, L.M.S. *et al.* 19	25779
Trimezia martinicensis (Jacq.) Herb.	Herb	Gomes, L.A. *et al.* 690	25580
Krameriaceae			
Krameria tomentosa A.St.-Hil.	Shrub	Melo, L.M.S. *et al.* 112	28276

continue

Table 1 (continuation)

Family/Species	Habit	Collector number	Voucher
Lamiaceae			
Eplingiella fruticosa (Salzm. *ex* Benth.) Harley & J.F.B. Pastore	Subshrub	Melo, L.M.S. *et al.* 93	26979
Hyptis brevipes Poit.+	Subshrub	Gomes, L.A. *et al.* 366	24175
Rhaphiodon echinus Schauer	Herb	Melo, L.M.S. *et al.* 22	25782
Vitex rufescens A.Juss.	Tree	Gomes, L.A. *et al.* 387	24196
Lauraceae			
Cassytha filiformis L.	Climber (Holoparasite)	Gomes, L.A. *et al.* 249	22225
Nectandra grandiflora Nees+	Tree	Prata, A.P. *et al.* 2614	21399
Ocotea canaliculata (Rich.) Mez	Tree	Chagas, R.R.D. s/n	30144
Ocotea glomerata (Nees) Mez	Tree	Gomes, L.A. *et al.* 371	24180
Ocotea notata (Nees & Mart.) Mez*	Tree	Gomes, L.A. *et al.* 479	24378
Lecythidaceae			
Eschweilera ovata (Cambess.) Mart. *ex* Miers	Tree	Gomes, L.A. *et al.* 370	24179
Linderniaceae			
Micranthemum umbrosum (Walter *ex* J.F.Gmel.) S.F.Blake	Herb	Gomes, L.A. *et al.* 1062	27777
Loganiaceae			
Spigelia anthelmia L.	Herb	Gomes, L.A. *et al.* 406	24217
Loranthaceae			
Struthanthus syringifolius (Mart.) Mart	Herb (Hemiparasite)	Vale, C.O. *et al.* 11	19784
Lythraceae			
Cuphea calophylla Cham. & Schltdl.+	Subshrub	Prata, A.P. *et al.* 2620	21405
Cuphea campestris Koehne+	Subshrub	Melo, L.M.S. *et al.* 65	25825
Cuphea carthagenensis (Jacq.) J.Macbr.	Herb	Melo, L.M.S. *et al.* 1	25853
Cuphea racemosa (L.f.) Spreng.	Herb	Melo, L.M.S. *et al.* 100	28264
Malpighiaceae			
Banisteriopsis muricata (Cav.) Cuatrec.	Climber	Silva *et al.* 181	12389
Banisteriopsis nummifera (A. Juss.) B. Gates	Climber	Gomes, L.A. *et al.* 221	22197
Banisteriopsis sp.	Climber	Gomes, L.A. *et al.* 1042	27780
Byrsonima sericea DC.	Tree	Gomes, L.A. *et al.* 358	24167
Byrsonima verbascifolia (L.) DC.	Shrub	Gomes, L.A. *et al.* 442	24238
Stigmaphyllon paralias A. Juss.	Shrub	Gomes, L.A. *et al.* 243	22219
Malvaceae			
Guazuma ulmifolia Lam.	Tree	Gomes, L.A. *et al.* 233	22209
Luehea ochrophylla Mart*	Tree	Chagas, R.R.D. 650	30130
Malachra fasciata Jacq.	Herb	Melo, L.M.S. *et al.* 46	25806
Pavonia cancellata (L.) Cav.	Herb	Melo, L.M.S. *et al.* 117	28281
Pavonia malacophylla (Link & Otto) Garcke	Shrub	Silva 201	13668
Sida ciliaris L.	Herb	Souza, C.A.S. *et al.* 103	19811
Sida cordifolia L.	Shrub	Gomes, L.A. *et al.* 683	25573
Sida linifolia Cav.	Herb	Melo, L.M.S. *et al.* 98	28262

continue

Table 1 (continuation)

Family/Species	Habit	Collector number	Voucher
Sida spinosa L.	Subshrub	Gomes, L.A. *et al.* 466	24367
Sida urens L. +	Subshrub	Prata, A.P. *et al.* 2618	21403
Sidastrum micranthum (A.St.-Hil.) Fryxell+	Subshrub	Gomes, L.A. *et al.* 434	24246
Triumfetta rhomboidea Jacq.	Subshrub	Gomes, L.A. *et al.* 691	25581
Triumfetta semitriloba Jacq.	Subshrub	Pereira, L.A. *et al.* 462	29790
Urena lobata L.	Subshrub	Melo, L.M.S. *et al.* 3	25763
Waltheria indica L.	Herb	Melo, L.M.S. *et al.* 116	28280
Marantaceae			
Goeppertia effusa Saka & Lombardi	Herb	Gomes, L.A. *et al.* 397	24206
Goeppertia sellowii (Körn.) Borchs. & S. Suárez+	Herb	Gomes, L.A. *et al.* 1050	27804
Melastomataceae			
Aciotis sp.	Herb	Melo, L.M.S. *et al.* 119	28283
Clidemia hirta (L.) D.Don	Shrub	Nascimento-Júnior, J.E. *et al.* 2	10675
Comolia ovalifolia (DC.) Triana	Shrub	Gomes, L.A. *et al.* 357	24166
Miconia albicans (Sw.) Triana	Shrub	Déda, R.M. *et al.* 256	28250
Miconia amoena Triana*	Shrub	Melo, L.M.S. *et al.* 91	25851
Miconia ciliata (Rich.) DC.	Shrub	Gomes, L.A. *et al.* 681	25571
Miconia ferruginata DC.	Tree	Gomes, L.A. *et al.* 676	25566
Miconia holosericea (L.) DC.	Shrub	Gomes, L.A. *et al.* 455	24356
Miconia prasina (Sw.) DC.	Shrub	Prata, A.P. *et al.* 2607	21392
Ossaea congestiflora (Naudin) Cogn.+	Subshrub	Melo, L.M.S. *et al.* 79	25839
Meliaceae			
Guarea guidonia (L.) Sleumer	Tree	Gomes, L.A. *et al.* 420	24231
Menispermaceae			
Cissampelos glaberrima A.St.-Hil.	Climber	Gomes, L.A. *et al.* 298	22056
Cissampelos sympodialis Eichler	Climber	Porto, N.M. *et al.* 17	27169
Odontocarya acuparata Miers+	Climber	Brandão, G.S. 420	76376**
Myrtaceae			
Campomanesia dichotoma (O. Berg) Mattos*	Tree	Gomes, L.A. *et al.* 109	21040
Eugenia astringens Cambess.	Tree	Gomes, L.A. *et al.* 654	22544
Eugenia hirta O. Berg*	Shrub	Gomes, L.A. *et al.* 113	21042
Myrcia decorticans DC.	Tree	Prata, A.P. *et al.* 2617	21402
Myrcia guianensis (Aubl.) DC.	Tree	Gomes, L.A. *et al.* 414	24225
Myrcia polyantha DC*	Tree	Melo, L.M.S. *et al.* 86	25846
Myrcia splendens (Sw.) DC.	Tree	Gomes, L.A. *et al.* 378	24187
Myrcia tomentosa (Aubl.) DC.	Tree	Vale, C.O. *et al.* 14	19787
Psidium guineense Sw.	Tree	Gomes, L.A. *et al.* 241	22217
Psidium oligospermum Mart. *ex* DC.	Tree	Gomes, L.A. *et al.* 421	24259
Nyctaginaceae			
Guapira noxia (Netto) Lundell	Tree	Gomes, L.A. *et al.* 422	24258
Guapira obtusata (Jacq.) Little	Tree	Chagas, R.R.D. s/n	30145

continue

Table 1 (continuation)

Family/Species	Habit	Collector number	Voucher
Guapira opposita (Vell.) Reitz	Tree	Gomes, L.A. *et al.* 651	25541
Pisonia sp.	Tree	Vale, C.O. *et al.* 18	19792
Ochnaceae			
Ouratea hexasperma (A.St.-Hil.) Baill.	Tree	Gomes, L.A. *et al.* 86	21645
Sauvagesia erecta L.	Herb	Gomes, L.A. *et al*. 1055	27828
Sauvagesia tenella Lam.	Herb	Silva, F.O. 179	71113**
Onagraceae			
Ludwigia octovalvis (Jacq.) P.H. Raven	Herb	Melo, L.M.S. *et al.* 56	25816
Orchidaceae			
Alatiglossum barbatum (Lindl.) Baptista	Herb (Epiphyte)	Gomes, L.A. *et al.* 210	22186
Campylocentrum pernambucense Hoehne*	Herb (Epiphyte)	Melo, L.M.S. *et al.* 64	25824
Cyrtopodium holstii L.C.Menezes*	Herb	Gomes, L.A. *et al.* 1047	27788
Epidendrum cinnabarinum Salzm*	Herb	Melo, L.M.S. *et al.* 110	28274
Epidendrum rigidum Jacq.	Herb (Epiphyte)	Pessoa, M.C. 758	75329**
Epidendrum secundum Jacq.	Herb	Gomes, L.A. *et al.* 1064	27827
Habenaria obtusa Lindl.	Herb	Melo, L.M.S. *et al.* 12	25772
Habenaria petalodes Lindl.	Herb	Gomes, L.A. *et al.* 694	25583
Habenaria pratensis (Salzm. *ex* Lindl.) Rchb.f.	Herb	Melo, L.M.S. *et al.* 36	25796
Habenaria trifida Kunth	Herb	Prata, A.P. *et al*. 2596	21381
Liparis nervosa (Thumb.) Lindl.	Herb	Prata, A.P. *et al*. 2594	21379
Polystachya estrellensis Rchb.f.	Herb (Epiphyte)	Silva 187	13655
Prosthechea aemula (Lindl.) W.E.Higgins	Herb (Epiphyte)	Gomes, L.A. *et al*. 1060	27776
Sacoila lanceolata (Aubl.) Garay	Herb	Gomes, L.A. *et al*. 1041	27779
Orobanchaceae			
Indeterminado	Herb	Pereira, L.A. *et al.* 423	29788
Oxalidaceae			
Oxalis cratensis Oliv. *ex* Hook.	Herb	Costa-Lima, J.L. *et al.* 650	28192
Oxalis frutescens L.	Herb	Melo, L.M.S. *et al*. 14	25774
Oxalis hedysarifolia Raddi	Herb	Melo, L.M.S. *et al*. 29	25789
Passifloraceae			
Passiflora misera Kunth	Climber	Prata, A.P. *et al.* 2604	21389
Passiflora silvestris Vell.	Climber	Gomes, L.A. *et al*. 212	22188
Turnera coerulea Sessé & Moc. *ex* DC.	Herb	Melo, L.M.S. *et al.* 107	28271
Piperaceae			
Piper arboreum Aubl.	Subshrub	Gomes, L.A. *et al.* 389	24198
Piper crassinervium Kunth	Subshrub	Gomes, L.A. *et al.* 216	22192
Piper divaricatum G.Mey.	Shrub	Gomes, L.A. *et al.* 410	24221
Piper hispidum Sw.	Shrub	Gomes, L.A. *et al.* 411	24222
Plantaginaceae			
Stemodia foliosa Benth.	Herb	Melo, L.M.S. *et al.* 111	28275
Poaceae			
Andropogon leucostachyus Kunth	Herb	Silva *et al.* 100	10032
Aristida longifolia Trin.	Herb	Melo, L.M.S. *et al.* 62	25822

continue

Table 1 (continuation)

Family/Species	Habit	Collector number	Voucher
Aristida setifolia Kunth+	Herb	Silva *et al.* 112	10046
Chloris barbata Sw.	Herb	Silva *et al.* 114	10048
Chloris gayana Kunth+	Herb	Silva *et al.* 105	10039
Cortaderia selloana (Schult. & Schult. f.) Asch. & Graebn.	Herb	Melo, L.M.S. *et al.* 58	25818
Dactyloctenium aegyptium (L.) Willd.	Herb	Silva *et al.* 109	10044
Digitaria horizontalis Willd+.	Herb	Melo, L.M.S. *et al.* 104	28268
Echinolaena inflexa (Poir.) Chase	Herb	Silva *et al.* 101	10033
Eleusine indica (L.) Gaertn.	Herb	Silva *et al.* 106	10040
Eragrostis ciliaris (L.) R. Br.	Herb	Melo, L.M.S. *et al.* 9	28291
Eragrostis secundiflora J. Presl+	Herb	Melo, L.M.S. *et al.* 127	25769
Ichnanthus calvescens (Nees *ex* Trin.) Döll	Herb	Nascimento-Júnior, J.E. *et al.* 546	13190
Ichnanthus dasycoleus Tutin+	Herb	Melo, L.M.S. *et al.* 55	25815
Ichnanthus nemoralis (Schrad. *ex* Schult.) Hitchc. & Chase	Herb	Gomes, L.A. 219	71741**
Ichnanthus tenuis (J. Presl & C. Presl) Hitchc. & Chase	Herb	Silva *et al.* 110	10043
Lasiacis divaricata (L.) Hitchc.	Herb	Gomes, L.A. *et al.* 219	22195
Ocellochloa sp.+	Herb	Melo, L.M.S. *et al.* 95	28259
Olyra latifolia L.	Herb	Gomes, L.A. *et al.* 90	21649
Parodiolyra micrantha (Kunth) Davidse & Zuloaga	Herb	Melo, L.M.S. *et al.* 75	25835
Parodiolyra ramosissima (Trin.) Soderstr. & Zuloaga+*	Herb	Melo, L.M.S. *et al.* 30	25790
Paspalum conjugatum P.J.Bergius	Herb	Silva *et al.* 102	10036
Paspalum maritimum Trin.	Herb	Melo, L.M.S. *et al.* 121	28285
Paspalum millegrana Schrad. ex Schult.	Herb	Melo, L.M.S. *et al.* 120	28284
Paspalum molle Poir.	Herb	Silva *et al.* 104	10038
Paspalum pilosum Lam.	Herb	Silva *et al.* 113	10047
Rugoloa pilosa (Sw.) Zuloaga+	Herb	Silva *et al.* 103	10037
Sporobolus tenuissimus (Schrank) Kuntze+	Herb	Silva *et al.* 107	10041
Polygalaceae			
Bredemeyera laurifolia (A.St.-Hil. & Moq.) Klotzsch *ex* A.W.Benn.	Shrub	Prata, A.P. *et al.* 2625	21410
Polygala glochidiata Kunth	Herb	Melo, L.M.S. *et al.* 15	25775
Polygala longicaulis Kunth	Herb	Gomes, L.A. *et al.* 644	25534
Polygala paniculata L.	Herb	Melo, L.M.S. *et al.* 8	25768
Polygala trichosperma Jacq.	Herb	Gomes, L.A. *et al.* 461	24362
Securidaca diversifolia (L.) S.F.Blake	Climber	Gomes, L.A. *et al.* 240	22216
Polygonaceae			
Coccoloba laevis Casar*	Shrub	Prata, A.P. *et al.* 2613	21398
Coccoloba paraensis Meisn.	Climber	Gomes, L.A. *et al.* 662	25552
Polygonum punctatum Elliott	Herb	Gomes, L.A. *et al.* 1087	28047

continue

Table 1 (continuation)

Family/Species	Habit	Collector number	Voucher
Primulaceae			
Myrsine guianensis (Aubl.) Kuntze	Tree	Gomes, L.A. *et al.* 653	25543
Rhamnaceae			
Gouania blanchetiana Miq.	Climber	Costa-Lima, J.L. 1051	77899**
Ziziphus joazeiro Mart.	Tree	Gomes, L.A. *et al*. 432	24248
Rubiaceae			
Borreria humifusa Mart.	Herb	Melo, L.M. *et al*. 5	25765
Borreria ocymifolia (Roem. & Schult.) Bacigalupo & E.L.Cabral+	Subshrub	Gomes, L.A. *et al*. 381	24190
Borreria verticillata (L.) G.Mey.	Herb	Melo, L.M.S. *et al.* 11	25771
Chomelia obtusa Cham. & Schltdl.	Shrub	Gomes, L.A. *et al*. 250	22226
Coutarea hexandra (Jacq.) K.Schum.	Shrub	Melo, L.M.S. *et al.* 59	25819
Diodella radula (Willd. *ex* Roem. & Schult.) Delprete	Herb	Melo, L.M.S. *et al.* 97	28261
Emmeorhiza umbellata (Spreng.) K.Schum.	Climber	Melo, L.M.S. *et al.* 27	25687
Genipa americana L.	Tree	Gomes, L.A. *et al.* 460	24361
Guettarda viburnoides Cham. & Schltdl.	Shrub	Chagas, R.R.D. 381	30131
Malanea macrophylla Bartl. *ex* Griseb.	Climber	Melo, L.M.S. *et al.* 84	25844
Mitracarpus frigidus (Willd. *ex* Roem. & Schult.) K.Schum.	Herb	Melo, L.M.S. *et al*. 4	25764
Palicourea crocea (Sw.) Roem. & Schult.	Shrub	Gomes, L.A. *et al*. 670	25560
Posoqueria latifolia (Rudge) Schult.	Tree	Gomes, L.A. *et al*. 469	24370
Psychotria bracteocardia (DC.) Müll. Arg.	Shrub	Melo, L.M.S. *et al.* 71	25831
Psychotria breviflora (Schltdl.) Müll. Arg.+	Shrub	Freire, G.S. *et al.* 63	28230
Psychotria capitata Ruiz & Pav.	Shrub	Melo, L.M.S. *et al*. 77	25837
Psychotria carthagenensis Jacq.	Shrub	Gomes, L.A. *et al*. 663	25553
Psychotria hoffmannseggiana (Willd. *ex* Schult.) Müll.Arg.	Shrub	Prata, A.P. *et al.* 2592	21377
Randia armata (Sw.) DC.	Shrub	Gomes, L.A. *et al*. 403	24214
Sabicea grisea Cham. & Schltdl.	Climber	Gomes, L.A. *et al.* 100	21032
Salzmannia nitida DC*	Shrub	Melo, L.M.S. *et al* 94	26980
Tocoyena formosa (Cham. & Schltdl.) K.Schum.	Tree	Gomes, L.A. *et al*. 112	21041
Rutaceae			
Ertela trifolia (L.) Kuntze	Subshrub	Gomes, L.A. *et al*. 368	24177
Zanthoxylum sp.	Tree	Gomes, L.A. *et al*. 390	24199
Salicaceae			
Casearia decandra Jacq.	Shrub	Gomes, L.A. *et al*. 431	24249
Casearia lasiophylla Eichler	Shrub	Gomes, L.A. *et al*. 412	24223
Casearia sylvestris Sw.	Tree	Gomes, L.A. *et al*. 429	24251
Sapindaceae			
Allophylus edulis (A.St.-Hil., A.Juss. & Cambess.) Radlk.	Tree	Gomes, L.A. *et al*. 425	24255

continue

Table 1 (continuation)

Family/Species	Habit	Collector number	Voucher
Cupania impressinervia Acev.-Rodr.	Tree	Pereira, L.A. *et al.* 449	29796
Paullinia pinnata L.	Climber	Gomes, L.A. *et al.* 660	25550
Paullinia racemosa Wawra	Climber	Pereira, L.A. 451	71689**
Paullinia trigonia Vell.	Climber	Gomes, L.A. *et al.* 428	24252
Serjania salzmanniana Schltdl.	Climber	Vale, C.O. *et al.* 17	19791
Sapotaceae			
Pouteria gardneri (Mart. & Miq.) Baehni	Tree	Gomes, L.A. *et al.* 475	24376
Sarcaulus brasiliensis (A.DC.) Eyma+	Tree	Delgado-Junior, G.C. 531	71554**
Schoepfiaceae			
Schoepfia brasiliensis A.DC.	Tree	Gomes, L.A. *et al*. 647	25537
Simaroubaceae			
Simarouba versicolor A.St.-Hil.+	Tree	Gomes, L.A. *et al*. 232	22208
Smilacaceae			
Smilax rufescens Griseb.	Climber	Gomes, L.A. *et al*. 415	24226
Solanaceae			
Aureliana fasciculata (Vell.) Sendtn.+	Tree	Gomes, L.A. *et al*. 386	24195
Cestrum axillare Vell.	Tree	Gomes, L.A. *et al*. 204	22180
Solanum americanum Mill.	Herb	Prata, A.P. *et al.* 2593	21378
Solanum asperum Rich.	Shrub	Gomes, L.A. *et al*. 235	22211
Solanum caavurana Vell.	Shrub	Gomes, L.A. *et al*. 205	22181
Solanum paludosum Moric.	Shrub	Nascimento-Júnior, J.E. *et al.* 54	11005
Solanum paniculatum L.	Shrub	Freire, G.S. *et al.* 73	28231
Solanum rhytidoandrum Sendtn.+	Shrub	Gomes, L.A. *et al*. 682	25572
Solanum rupincola Sendtn*	Climber	Nascimento-Júnior, J.E. *et al.* 70	10939
Urticaceae			
Cecropia pachystachya Trécul	Tree	Gomes, L.A. *et al.* 377	24186
Verbenaceae			
Lantana camara L.	Shrub	Gomes, L.A. *et al*. 1046	27785
Lantana canescens Kunth	Subshrub	Vale, C.O. *et al.* 15	19788
Lantana fucata Lindl.	Subshrub	Melo, L.M.S. *et al.* 138	28302
Lantana radula Sw.	Subshrub	Melo, L.M.S. *et al.* 137	28301
Priva bahiensis A.DC.	Herb	Melo, L.M.S. *et al.* 96	28260
Stachytarpheta angustifolia (Mill.) Vahl	Herb	Córdula, E. 999b	76560**
Stachytarpheta cayennensis (Rich.) Vahl	Herb	Melo, L.M.S. *et al.* 28	25788
Stachytarpheta trispicata Nees & Mart.+	Shrub	Melo, L.M.S. *et al.* 74	25834
Violaceae			
Pombalia calceolaria (L.) Paula-Souza	Herb	Gomes, L.A. *et al*. 695	25584
Vitaceae			
Cissus erosa Rich.	Climber	Gomes, L.A. *et al*. 1057	27798

(Fabaceae) and *Campylocentrum pernambucense* Hoehne (Orchidaceae), both in the "Endagered" category (IUCN 2015, Martinelli & Moraes 2013).

The cluster analyses showed the formation of two distinct groups: a group formed by studies in areas of Atlantic rainforest and other in areas of the Caatinga. The Mata do Junco Wildlife Refuge showed greater floristic similarity with the areas of Atlantic rainforest of the State of Sergipe (figure 4).

Discussion

The number of species and families found for the Mata do Junco Wildlife Refuge was higher than three of four surveys analyzed in the Atlantic rainforest of the State of Sergipe (table 3) with similar sampling efforts (Vicente *et al.* 2005, Dantas *et al.* 2010, Mendes *et al.* 2010, Landim *et al.* 2015).

Ageratum conyzoides L., *Casearia sylvestris* Sw., *Cyperus surinamensis* Rottb., *Coutarea hexandra* (Jacq.) K. Schum. and *Mandevilla scabra* (Hoffmanns. *ex* Roem. & Schult.) K. Schum, present in the compiled floristic list (table 1), are examples of widely distributed species in Brazil (Flora do Brasil 2020 em construção). Some of these (*A. conyzoides*, *C. sylvestris* and *C. surinamensis*) occur in all biomes in Brazil (Flora do Brasil 2020 em construção), being than *A. conyzoides* is recognized as an invasive species of crops (Klein & Fellipe 1991). In the Atlantic rainforest, *C. surinamensis* and *M. scabra* are typical of edges and *capoeiras* (Nascimento *et al.* 2012, Ribeiro *et al.* 2015), while *C. sylvestre* and *C. hexandra* are tree species classified in early secondary about the ecological group and are common in both the Atlantic rainforest and the *Cerrado* (Silva *et al.* 2003, Paula *et al.* 2004).

Stachytarpheta trispicata Nees & Mart. *Psychotria breviflora* (Schltdl.) Müll.Arg., *Kielmeyera argentea* Choisy, *Aechmea lingulat*a (L.) Baker and *Parodiolyra ramosissima* (Trin.) Soderstr. & Zuloaga, present in the compiled floristic list (table 1), are examples of species that are poorly distributed in Brazil (Flora do Brasil 2020 em construção). These species have recorded occurrences for only two or fewer States of Brazil (Flora do Brasil 2020 em construção), being that *Psychotria breviflora* (Schltdl.) Müll. Arg. and *Aechmea lingulata* (L.) Baker each occur in only one State of Northern Brazil (Pará and Amapá States, respectively) in the Flora do Brasil (2020) em construção.

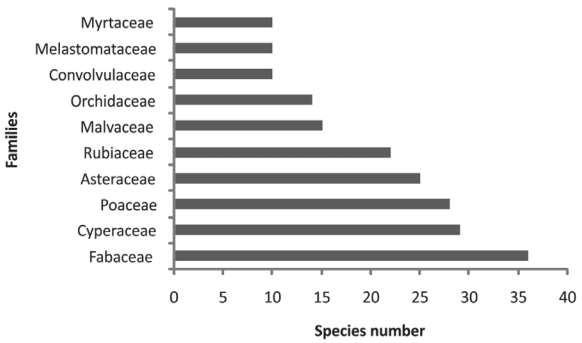

Figure 2. Vascular plant families with the highest number of species in the Mata do Junco Wildlife Refuge, Sergipe State, Northeastern Brazil.

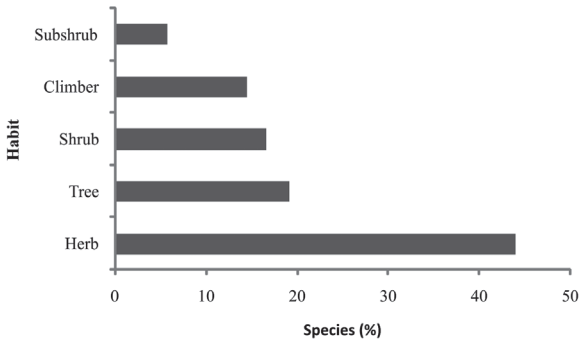

Figure 3. Species (%) for each habit in the Mata do Junco Wildlife Refuge, Sergipe State, Northeastern Brazil.

Table 2. Richness of the species and families of the Atlantic rainforest. Source: CRIA (2016); Flora do Brasil (2020) em construção.

Place	Number of species	Number of families
Brazil	16,394	251
Northeast Brazil	7,316	224
Sergipe state	1,427	152
County of capela	465	98
This paper	380	80

In relation to new records, the species *Cayaponia* sp. (Cucurbitaceae), *Cuphea calophylla* Cham. & Schltdl. (Lythraceae), *Goeppertia sellowii* (Korn.) Borchs. & S. Suárez (Marathaceae), *Jacquemontia choisyana* Meisn. (Convolvulaceae), *Lundia corymbifera* (Vahl) Sandwith (Bignoniaceae), *Nectandra grandiflora* Nees (Lauraceae), *Odontocarya acuparata* Miers (Menispermaceae), *Psychotria breviflora* (Schltdl.) Müll.Arg. (Rubiaceae), as well as being new records for the Atlantic rainforest of Sergipe, are new records for the Northeastern Brazil (Flora do Brasil 2020 em construção). The number of new records for the Atlantic rainforest of the State of Sergipe could have been higher if we considered only the database of Flora do Brasil (2020) em construção. However, due to the increase of papers in recent years for the Atlantic rainforest of Sergipe, the number of new occurrences decreased. Therefore, we suggest an update in the database of this platform, to reflect the new species occurring in the Atlantic rainforest of the State of Sergipe.

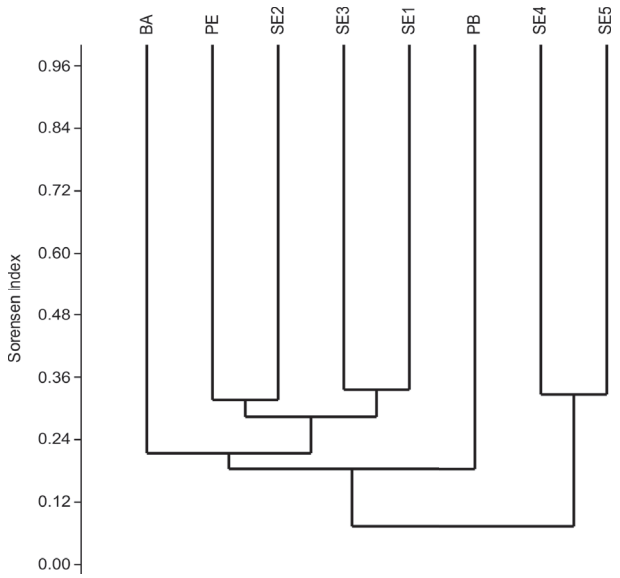

Figure 4. Dendrogram generated by the cluster analysis (based on the Sørensen coefficient) of the distribution of species recorded in this paper and other papers analyzed in areas of Atlantic rainforest and *Caatinga*. SE1: this paper; SE2: Mendes *et al*. (2010); SE3: Landim *et al.* (2015); SE4: Ferreira *et al*. (2013); SE5: Silva *et al*. (2013); BA: Alves *et al*. (2015); PE: Alves-Araújo *et al*. (2008); PB: Amazonas & Barbosa (2011).

The number of endemic species found in the Mata do Junco Wildlife Refuge was lower, considering that about 48% (6,933) of all vascular species of the Atlantic rainforest are endemic (Stehmann *et al.* 2009). Among the endemic species, we found *Caesalpinia echinata* Lam. (Fabaceae), a species for which there are no accurate records of natural populations in the State of Sergipe (Ferreira & Barreto 2015). Even after consulting the forest managers of the Mata do Junco Wildlife Refuge, it was not possible to confirm if the individual collected is native to the area. Considering the high probability that no native populations of *Caesalpinia echinata* Lam currently exist in Sergipe State (Rocha 2010), we believe that this collected individual was cultivated.

Table 3. Results from selected papers on the flora of the Atlantic rainforest in the state of Sergipe. *: considering only the method of sampling by plots. **: disregarding data of phytosociological studies.

Counties	Number of species	Number of families	Families most representative	Method of sampling	Reference
Capela	380	80	Fabaceae, Cyperaceae and Poaceae	Random walking and survey of herbarium	This Paper
Capela	60	38	Fabaceae, Myrtaceae and Moraceae	Plots	Souza-Alves *et al.* (2014)*
Santa Luzia do Itanhy	324	84	Fabaceae, Rubiaceae e and Myrtaceae	Random walking and survey of herbarium	Landim *et al.* (2015)
Areia Branca and Itabaiana	215	75	Myrtaceae, Moraceae and Sapindaceae	Random walking and plots	Vicente *et al.* (2005)*
Areia Branca, Itabaiana and Itaporanga D'Ajuda	552	99	Fabaceae, Cyperaceae and Poaceae	Random walking	Mendes *et al.* (2010)
Areia Branca	193	60	Fabaceae, Rubiaceae e Asteraceae	Random walking and survey of herbarium	Dantas *et al.* (2010)**

The most representative families (Fabaceae, Cyperaceae and Poaceae) were also those with the greatest richness in the study by Mendes *et al.* (2010) in the Serra de Itabaiana National Park, Agreste region of the State of Sergipe (table 3). Moreover, they were also the most representative families in some fragments of Atlantic rainforest of the State of Pernambuco (Alves-Araújo *et al.* 2008). In the paper by Souza-Alves *et al.* (2015), also based in data gathered in the Mata do Junco Wildlife Refuge, specifically with trees and climbers, only the family Fabaceae was similar among the three most representative families of this present paper (table 3).

Furthermore, Fabaceae was the most representative in five of six papers analysed for the Atlantic rainforest of the State of Sergipe (table 3). In relation to the northeast of Brazil, it was the most representative family in a remnant of Atlantic rainforest on the northern coast of the State of Bahia (Alves *et al.* 2015), located near the border with Sergipe and in an area of Atlantic rainforest of Paraíba (Amazonas & Barbosa 2011), for example. The family is cited as the second most representative for the Atlantic rainforest, with a richness estimated at 945 species (Stehmann *et al.* 2009). Moreover, it is the largest family in number of species in Brazil and one of the largest in the world (Souza & Lorenzi 2012). Part of success of this family is mainly explained by its great morphological diversity and symbiotic relationships with nitrogen-fixing bacteria that live in nodules on the roots of the plants (Queiroz 2009).

Among the most representative families of this study, Poaceae, Asteraceae, Rubiaceae and Malvaceae are on the list of the ten most diverse families of the Atlantic rainforest, and only Cyperaceae, the second family with the most species in this study, is not mentioned in this list (Stehmann *et al.* 2009). The presence of water resources in the Mata do Junco Wildlife Refuge (Morato *et al.* 2011) can provide micro-habitats for the species of Cyperaceae which are abundant in flooded areas (Souza & Lorenzi 2012); this fact may have contributed to their richness in this area.

The presence of Cyperaceae and Poaceae among the most representative families in the Mata do Junco Wildlife Refuge, may be a consequence of the existence of some open and disturbed areas (Santos *et al.* 2007, Morato *et al.* 2011), where Cyperaceae and Poaceae are typical (Souza & Lorenzi 2012). Besides, we conducted an intense sampling effort in this paper for the herbaceous layer, mainly due to the presence of two experts of these families in the herbarium ASE.

The Orchidaceae family was only the seventh in richness for the Mata do Junco Wildlife Refuge (figure 2). Nevertheless, the family had the second highest number of species (14) among the areas analyzed in the Atlantic rainforest in the State of Sergipe (Mendes *et al.* 2010 - 30 species, Dantas *et al.* 2010 - five species, Landim *et al.* 2015 - three species, Vicente *et al.* 2005 - zero species). This family was not cited as being between the most representatives in none of the papers analysed for the Atlantic rainforest in the State of Sergipe (table 3). The family Orchidaceae is cited as the most diverse of the Atlantic rainforest (Stehmann *et al.* 2009) and presents some species listed as biological indicators for conservation (Hietz 1999, Pessoa & Alves 2012). We believe that the occurrence of degradation in the Mata do Junco Wildlife Refuge (Souza-Alves *et al.* 2014) may have contributed to the low observed richness of this family.

Myrtaceae is another family that did not show a high number of species in the study area (figure 2), but that is cited as the sixth most diverse family of the Atlantic rainforest (Stehmann *et al.* 2009). Among the papers analyzed with similar samplings, only in Landim *et al.* (2015), was the Myrtaceae family among the most representative families (table 3). Despite this family not being representative in the Mata do Junco Wildlife Refuge, its richness was similar to most areas of Atlantic rainforest in the State of Sergipe (except Landim *et al.* 2015) and various areas of Atlantic rainforest in the northeast of Brazil, for example in the State of Bahia (Alves *et al.* 2015), Pernambuco (Costa-Jr *et al.* 2007) and Paraíba (Pereira & Alves 2006, Amazonas & Barbosa 2011).

In some areas of Atlantic rainforest in Sergipe, as in this study, the herbaceous component had the highest number of species, as noted for vegetation of areias brancas of Serra de Itabaiana National Park (Dantas *et al.* 2010), however, it is an open shrubby vegetation type. In addition, the herbaceous-shrub phytophysiognomy was the one with the greatest number of species in the Serra de Itabaiana National Park, considering a focus on all plant phytophysiognomies (Mendes *et al.* 2010). However, these areas actually represent an ecotone transition from the Atlantic rainforest to the Caatinga (Mendes *et al.* 2010). Moreover, the herbaceous habit was the most representative in fragments of Atlantic rainforest of the State of Pernambuco (Alves-Araújo *et al.* 2008). In an Ombrophilous Lowland Forest remnant located in the southern State of Sergipe (called Mata do Crasto), the habit of trees prevailed in vegetation in the number of species (Landim *et al.* 2015). We

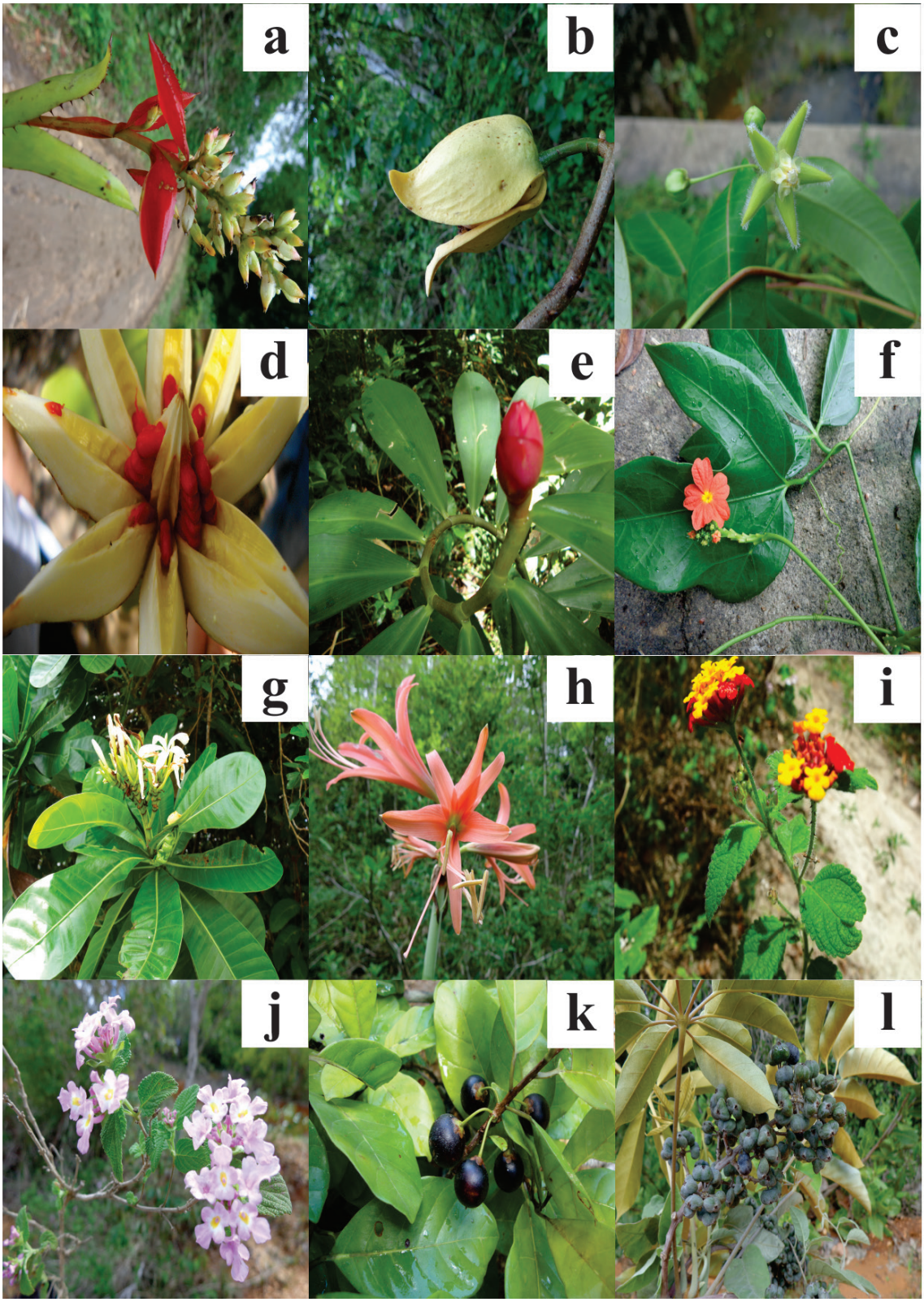

Figure 5. Some of the plant species commonly found in the Mata do Junco Wildlife Refuge, Sergipe State, Northeastern Brazil. a. *Aechmea mertensii* (G.Mey.) Schult. & Schult.f. b. *Annona montana* Macfad. c. *Blepharodon pictum* (Vahl) W.D. Stevens. d. *Clusia nemorosa* G.Mey. e. *Costus spiralis* (Jacq.) Roscoe. f. *Gurania lobata* (L.) Pruski. g. *Himatanthus obovatus* (Müll. Arg.) Woodson. h. *Hippeastrum stylosum* Herb. i. *Lantana camara* L. j. *Lantana fucata* Lindl. k. *Pouteria gardneri* (Mart. & Miq.) Baehni. l. *Schefflera morototoni* (Aubl.) Maguire, Steyerm. & Frodin (Photos by L.A. Gomes).

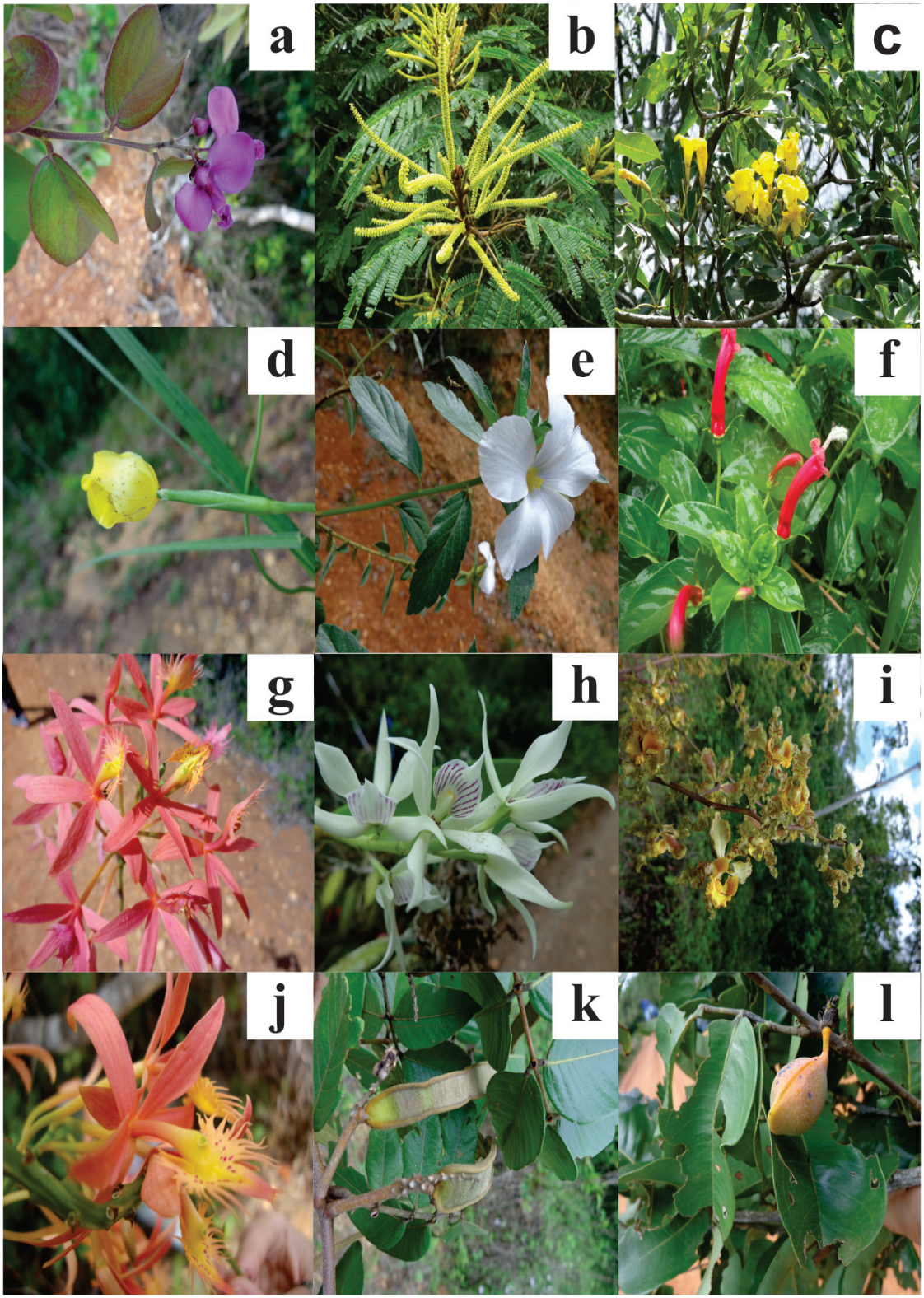

Figure 6. Some of the plant species common (a-e), rare (f-h) or endemic (i-l) to Atlantic rainforest found in the Mata do Junco Wildlife Refuge, Sergipe State, Northeastern Brazil. a. *Securidaca diversifolia* (L.) S.F. Blake. b. *Stryphnodendron pulcherrimum* (Willd.) Hochr. c. *Tabebuia aurea* (Silva Manso) Benth. & Hook. f. *ex* S. Moore. d. *Trimezia martinicensis* (Jacq.) Herb. e. *Turnera coerulea* Sessé & Moc. *ex* DC. f. *Centropogon cornutus* (L.) Druce. g. *Epidendrum secundum* Jacq. h. *Prosthechea aemula* (Lindl.) W.E. Higgins. i. *Cyrtopodium holstii* L.C. Menezes. j. *Epidendrum cinnabarinum* Salzm. k. *Inga subnuda* Salzm. *ex* Benth. l. *Swartzia apetala* Raddi (Photos by L.A. Gomes).

believe that the intense sampling effort carried out for the herbaceous layer has contributed to this group being the most representative in the Mata do Junco Wildlife Refuge.

Among the threatened species, *Caesalpinia echinata* Lam. (Fabaceae) is a tree with a restricted distribution between the States of Rio Grande do Norte and Rio de Janeiro, with the exception of Sergipe (Flora do Brasil 2020 em construção). As previously discussed, we believe that this collected individual of *C. echinata* was cultivated. The other threatened species, *Campylocentrum pernambucense* Hoehne (Orchidaceae) is an epiphytic herb, restricted to the Atlantic rainforest of the States of Alagoas, Paraíba, Pernambuco and Sergipe (Flora do Brasil 2020 em construção). According to the criteria of IUCN (2015), species in the "endangered" category are facing a very high risk of extinction, mainly because of the reduction in their population size and their geographic distribution which is currently an area less than 5000 km² and limited to severely fragmented areas. The presence of a threatened native species in the Mata do Junco Wildlife Refuge - *Campylocentrum pernambucense* Hoehne - reinforces the need for conservation of this area. Besides, we suggest that this species become the focus of new population studies to investigate its vulnerability.

Despite the presence of common species of the Brazilian Caatinga in the compiled floristic list (Flora do Brazil 2020 em construção), the Mata do Junco Wildlife Refuge was very dissimilar - regarding floristic composition - to the Caatinga areas analyzed of the State of Sergipe. We believe that the greater floristic similarity observed between the areas of Atlantic rainforest of Sergipe was influenced by the geographical proximity of these areas, because the phytophysionomic differences between them contribute to their floristic heterogeneity.

The existence of some degraded areas or in regeneration (Santos *et al.* 2007, Morato *et al.* 2011, Souza-Alves *et al.* 2014) in the Mata do Junco Wildlife Refuge and intense sampling effort carried out for the herbaceous layer may has contributed to the richness of herbs and lower number of endemic species found. Moreover, it is possible that the isolation of the two fragments that make up the vegetation of the Mata do Junco Wildlife Refuge can act to diminish the richness of tree species (Souza-Alves *et al.* 2014). The most degraded portion of Atlantic rainforest of the State of Sergipe is located in the region of the Mata do Junco Wildlife Refuge, characterized by the smallest fragments with the greatest distances between them (Santos 2009).

In general, the vegetation of the Mata do Junco Wildlife Refuge was considered similar to the other areas of Atlantic rainforest already studied in the State of Sergipe, in relation to species number and composition of species and families. Most species have a wide distribution in the Atlantic rainforest of Brazil and even in other biomes such as the Caatinga.

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