

Floristic composition and similarity of a conservation area in the semiarid region of Paraíba State, Northeastern Brazil

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Abstract: We present here a floristic survey of the angiosperms found in the Reserva Ecológica Olho d'Água das Onças (REODO) in the semiarid region of Paraíba State, Brazil, to provide a basis for proactive conservation projects there. Fifteen excursions were carried out between August/2022 and April/2024 employing traditional methods of collecting and herborization of botanical material. The collections obtained were incorporated into the Manuel de Arruda Câmara Herbarium (HACAM) at the State University of Paraíba (UEPB), Campus I. We examined the floristic relationships between the study area and 15 other floristic surveys throughout the semiarid region of Paraíba State using a similarity analysis based on the Jaccard index. Two hundred and fifty species distributed among 168 genera and 50 families of angiosperms were identified with the following growth forms: herbaceous (74 spp.), subshrub (60 spp.), shrub (48 spp.), climber (45 spp.), arboreal (17 spp.), epiphytic (3 spp.), and parasitic (3 spp.). The most representative families were Fabaceae (38 spp.), Euphorbiaceae (24 spp.), Convolvulaceae (19 spp.), Malvaceae (18 spp.), Asteraceae (11 spp.), and Poaceae (11 spp.). The most representative genera were *Ipomoea* L. (8 spp.), *Croton* L. (7 spp.), *Sida* L. (7 spp.), *Chamaecrista* (L.) Moench (6 spp.), and *Mimosa* L. (5 spp.). *Heteropterys arcuata* C. Pessoa & Amorim (Malpighiaceae) and *Solanum fernandesii* V.S. Samp. & R. Moura (Solanaceae) were recorded for the first time in Paraíba State; *Urvillea stipitata* Radlk (Sapindaceae) represents a new record for the Caatinga. Similarity analysis revealed that the flora of REODO is more closely related to that of protected areas throughout the semiarid region of Paraíba State, underscoring its conservation priority. The study area was therefore found to contain significant floristic richness, especially within the context of the Caatinga, with 30 species endemics to this domain.

Keywords: Angiosperms; biodiversity; Caatinga; conservation; new records.

Composição florística e similaridade de uma área de conservação do semiárido paraibano, Nordeste brasileiro

Resumo: O presente estudo compreende o levantamento florístico das angiospermas da Reserva Ecológica Olho d'Água das Onças (REODO), Picuí, semiárido da Paraíba, Brasil, objetivando fornecer a base para projetos conservacionistas na área. Foram realizadas 15 incursões durante o período de agosto de 2022 e abril de 2024, seguindo os métodos usuais de coleta e herborização de material botânico. A coleção obtida foi incorporada ao Herbário Manuel de Arruda Câmara (HACAM), pertencente à Universidade Estadual da Paraíba (UEPB), Campus I. Verificaram-se as conexões da flora da área estudada com outras áreas do semiárido paraibano por meio de uma análise de similaridade com base no índice de Jaccard, considerando outros 15 estudos florísticos. Nós encontramos 250 espécies distribuídas em 168 gêneros e 50 famílias de angiospermas pertencentes aos hábitos: herbáceo (74 spp.), subarborescente (60 spp.), arbustivo (48 spp.), trepador (45 spp.), arbóreo (17 spp.), epifítico (3 spp.) e parasita (3 spp.). As famílias mais representativas foram: Fabaceae (38 spp.), Euphorbiaceae (24 spp.), Convolvulaceae (19 spp.), Malvaceae (18 spp.), Asteraceae (11 spp.) e Poaceae (11 spp.), e dentre os gêneros, *Ipomoea* L.

(8 spp.), *Croton* L. (7 spp.), *Sida* L. (7 spp.), *Chamaecrista* (L.) Moench (6 spp.) e *Mimosa* L. (5 spp.) foram os mais numerosos. *Heteropterys arcuata* C. Pessoa & Amorim (Malpighiaceae) e *Solanum fernandesii* V.S. Samp. & R. Moura (Solanaceae) são registradas pela primeira vez para o Estado da Paraíba, e *Urvillea stipitata* Radlk (Sapindaceae) é um novo registro para a Caatinga. A análise de similaridade evidenciou que a flora da REODO é mais similar às das áreas protegidas no Estado da Paraíba, demonstrando a importância do seu reconhecimento como área prioritária para a conservação. Em suma, evidenciamos que a área de estudo apresenta uma expressiva riqueza florística especialmente no contexto da Caatinga, contando com 30 espécies endêmicas deste domínio.

Palavras-chave: Angiospermas; biodiversidade; Caatinga; conservação; novos registros.

Introduction

Caatinga (2°45' S, 17°21' S) is the predominant phytogeographic domain in Northeastern Brazil, covering 912,529 km², which is equivalent to 10.7% of the area of that nation (Silva et al. 2017). According to Silva et al. (2017), the Caatinga domain is classified as a seasonally dry tropical forest and woodland (SDTFW), with at least 13 different phytophysiognomies, ranging from rock outcrops (or inselbergs) in the driest areas to semi-deciduous forests where the soils are richer, and being found in the Brazilian states of Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia, and Minas Gerais (Silva et al. 2017).

The Caatinga was long considered the least known phytogeographical domain in Brazil (Giulietti et al. 2004) – which was reinforced by the idea that this domain had been greatly modified by human action and held only low plant biodiversity. That latter view is especially misleading and should not be disseminated, as the plant diversity of the Caatinga is now known to be quite high, with many rare and endemic species (Giulietti et al. 2004). The Caatinga domain is known to contain 180 angiosperm families comprising 1249 genera and 5060 species (Flora e Funga do Brasil, continually updated). Fernandes and Queiroz (2018) observed that 29 genera and approximately 23% of the plant species known to the Caatinga are endemic and restricted to only a few locations. Moro et al. (2014) cited the families with the greatest species richness in the Caatinga phytogeographic domain, with Fabaceae, Euphorbiaceae, Malvaceae, Asteraceae, and Convolvulaceae being the five richest.

The predominant Caatinga vegetation type is xerophytic and deciduous, being adapted to low annual rainfall (varying between 250 and 900 mm), with a rainy period generally lasting from three to five months (Alves 2007). Despite this general definition, there are great taxonomic disparities between different areas due to physiognomic, floristic, and seasonal climatic variations (Alves 2007). Considering the particularities of the flora, which is adapted to long water deficit periods, high solar irradiance, and high temperatures, Silva et al. (2021) highlighted the importance of the Caatinga vegetation in maintaining its regional fauna. Additionally, income generated by wood from arboreal plant communities, combined with the edible fruits, the medicinal, useful, and forage plants of the Caatinga domain have long supported local human communities, and can continue to do so as long as those resources are used in sustainable manners (Silva et al. 2021).

European/African colonization of the Caatinga region dates back approximately 500 years. However, the indiscriminate use of its resources, in activities such as grazing, deforestation, and mineral extraction has resulted in serious damage to the Caatinga and has resulted in impoverished water resources, soil erosion, and decreased biodiversity (Alves 2007, Alves et al. 2008). The urgency of conserving

areas of Caatinga has become quite evident, and floristic studies have emerged as an essential tool in this process. It is impossible to consider conserving an area that is only poorly known. Understanding which species occur in a given area and which plant groups are most diverse form the basis for any ecological study seeking to preserve and/or maintain a biome and rationally manage its natural resources (Chaves et al. 2013).

The number of floristic surveys undertaken in Caatinga environments has grown in the last 20 years (personal observation). Among the numerous floristic inventories developed in this region we highlight in the Seridó region: Amorim et al. (2005), who focused on the shrub/arboreal flora of an area of Caatinga within the Seridó Ecological Station (ESEC) in Rio Grande do Norte State, and a floristic survey and species association undertaken by Santana et al. (2009) at the same location. Two studies addressing the flora of specific taxonomic groups were undertaken in the western Curimataú microregion: one dealing with the Asteraceae family (Soares et al. 2021) and the other encompassing the order Boraginales (Sousa et al. 2021). Additionally, other studies have been published in the last two decades focusing on the flora of the Paraíba Caatinga: in the Cariri microregion (Barbosa et al. 2007, Lacerda et al. 2007, Araújo et al. 2010, Santos and Melo 2010, Trovão et al. 2010, Pereira-Júnior et al. 2012, Lima and Barbosa 2014, Farias et al. 2017, Marques et al. 2020); in the Agreste mesoregion (Porto et al. 2008), and in the Sertão mesoregion (Silva et al. 2012, Lucena et al. 2015, Silva et al. 2015, Sabino et al. 2016, Medeiros et al. 2021, Sales et al. 2021, Fernando et al. 2022).

Considering the scarcity of floristic surveys carried out in areas of Caatinga in the Curimataú and Seridó regions of Paraíba State (PB), and recognizing the importance of a detailed knowledge of the floras of these areas to be able to elaborate recovery and conservation plans, a floristic survey and a similarity analysis of the angiosperms in the Reserva Ecológica Olho d'Água das Onças (REODO), a conservation area located in the municipality of Picuí in the semiarid region of Paraíba State, Northeastern Brazil, was undertaken, aiming to understand the diversity and floristic relationships within the study area and in comparison with other floristic surveys conducted in the semiarid region of Paraíba State.

Material and Methods

1. Study area

The municipality of Picuí (6°28'– 6°69'S, 36°21'– 36°46'W) is located in Paraíba State in Northeastern Brazil (Francisco et al. 2011). The municipality covers 667 km² (IBGE 2022) and is situated in the intermediate region of Campina Grande, more specifically in the

immediate region of Cuité - Nova Floresta (IBGE 2017). The Reserva Ecológica Olho d'Água das Onças (6°27'S, 36°18'W) is located 11 km distant from the administrative center of Picuí (Figure 1). The Ecological Reserve comprises an area of 20.73 ha, of which 18.26 ha were allocated to the conservation of the Caatinga phytogeographical domain in 2005 (Silva 2021). Elevations in the reserve range between 590 m and 659 m.a.s.l. (pers. comm.).

The regional climate is tropical hot and dry, with prolonged droughts (type BSh according to the Köppen classification, adapted by Francisco et al. 2015). The average annual regional temperatures are between approximately 23° and 24° C (Francisco and Santos 2017). Two representative soil types were identified by Silva et al. (2022): Yellow Oxisol in the Chapada area and Litholic Neosol at the edge of the Chapada. In the study area, the present vegetation range from open sketches to shrubby and shrubby-arboreal phytophysiognomies. The expected precipitation in the municipality of Picuí is 339.1mm/year, but in the years during which this study was undertaken (2022 and 2023), the precipitation rates were 453.1 and 481.5mm/year respectively (AESA, continually updated).

2. Fieldwork

Fieldwork was conducted between August/2022 and April/2024 (except May and June/2023) employing random walks throughout the entire length of the reserve to obtain fertile plant specimens (with flowers and/or fruits). A total of 15 incursions were carried out, covering both the dry and rainy periods (Figure 2). The collections and herborization processes were based on the recommendations of Walters (2011)

for succulents and Peixoto and Maia (2013) for other groups. The material obtained was incorporated into the Manuel de Arruda Câmara Herbarium (HACAM) at the State University of Paraíba (UEPB), *Campus I*. Geographic coordinates were obtained using a handheld GPS; photographic images were captured using a cell phone.

3. Data analysis

The specialized literature was consulted to identify the species, including florulas, regional floras, unpublished taxonomic texts (TCC, master's dissertations, and doctoral theses), and, principally, floristic and/or floristic-taxonomic articles published in Botany journals in Brazil and abroad. Additionally, comparisons were made based on collections (exsiccates) deposited in herbaria in Paraíba and surrounding states and made available on online platforms (GBIF, Re flora, SpeciesLink). The Flora e Funga do Brasil platform (continuously updated) was used to verify endemism. The checklist of the flora of the Reserva Ecológica Olho d'Água das Onças is based on the Angiosperm Phylogeny Group (APG) IV (2016) and the Flora e Funga do Brasil (continuously updated) and includes the names of the families, genera, and species, accompanied by their respective habit types and testimonial material. The spelling of the authors' names were based on the Flora e Funga do Brasil (continuously updated) and Tropicos (continuously updated) platforms.

4. Similarity

The similarity analysis was based on floristic surveys undertaken in Caatinga areas throughout Paraíba State on the crystalline basement.

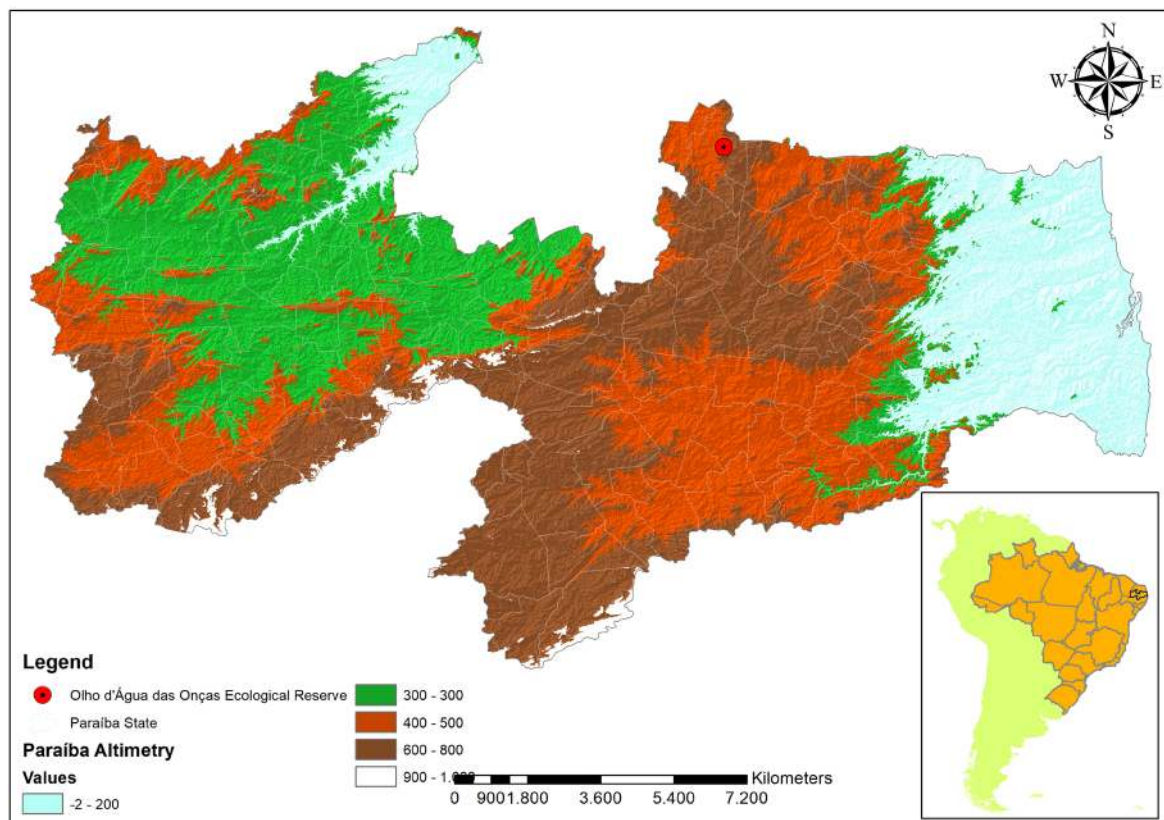


Figure 1. Location map of the study area, Reserva Ecológica Olho d'Água das Onças, municipality of Picuí, Paraíba State, Brazil. Produced by E. M. Rodrigues (2022).

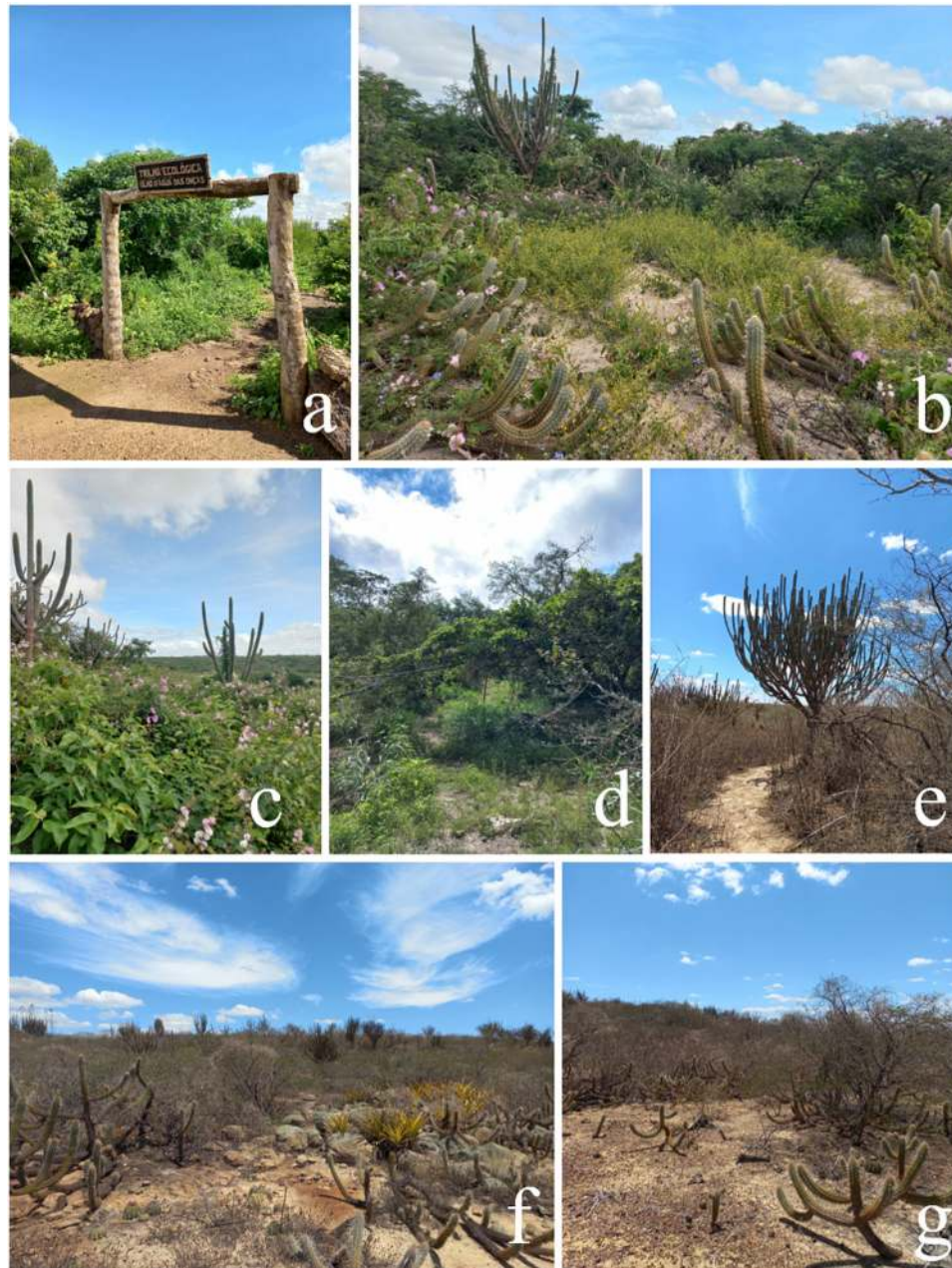


Figure 2. Physiognomies of the Reserva Ecológica Olho d'Água das Onças, Picuí, Paraíba State, Brazil. a-d. Rainy season. e-g. Dry season. Photos: B. F. Rocha.

These studies were identified through the Google Scholar platform using the descriptors “floristics”, “Caatinga” and “Paraíba” as well as studies obtained through the authors themselves (Costa et al. 2015, Lima and Melo 2015, Melo et al. 2016, Cordeiro and Souza 2024, Machado-Filho et al. 2024). The selected studies employed similar methodologies to ours, and were published between 2009 and 2024, totaling 15 studies. Based on these floristic surveys, a binary matrix of presence/absence was produced, following the recommendations of Hubálek (1984).

Species names were thoroughly verified, and identifications at the family or genus levels, as well as names marked as (*cf.*) and morphospecies were excluded from the binary matrix. Synonyms were checked using the Flora e Funga do Brasil (continuously updated) and Tropicos (continuously updated) platforms, to avoid erroneous results.

The analysis was performed using the UPGMA (Unweighted Pair Group Method with Arithmetic mean) method, based on Jaccard's similarity index, with the PAST 4.17 software (Hammer et al. 2001), resulting a similarity dendrogram.

Results

We collected and classified 250 species in the Reserva Ecológica Olho d'Água das Onças belonging to 168 genera and 50 angiosperm families (Figures 3–10). Of those species, 248 were identified to the specific level, one species could only be determined to the generic level, and one remains undetermined (Table 1). Among the families recorded, five are monocotyledons (10%) and 45 are eudicots (90%).

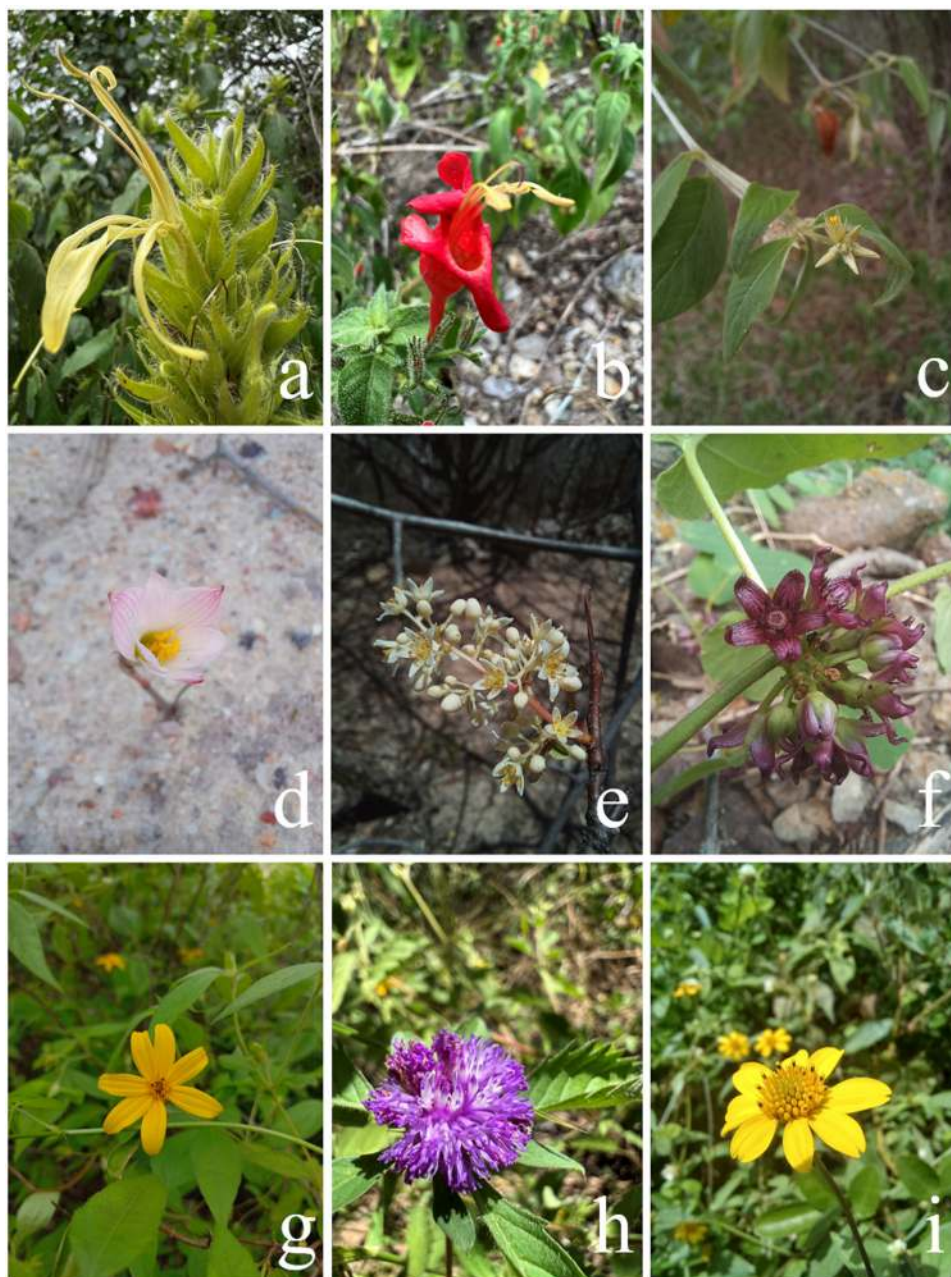


Figure 3. a. *Harpochilus paraibanus* (Acanthaceae). b. *Ruellia asperula* (Acanthaceae). c. *Gomphrena vasa* (Amaranthaceae). d. *Zephyranthes cearensis* (Amaryllidaceae). e. *Spondias tuberosa* (Anacardiaceae). f. *Ibatia nigra* (Apocynaceae). g. *Aspilula bonplandiana* (Asteraceae). h. *Centratherum punctatum* (Asteraceae). i. *Tilesia baccata* (Asteraceae). Photos: a-b, h. M. G. M. Gonçalves; c-g, i. B. F. Rocha.

The most representative families in terms of the number of species were: Fabaceae (38 spp.), Euphorbiaceae (24 spp.), Convolvulaceae (19 spp.), Malvaceae (18 spp.), Asteraceae (11 spp.), and Poaceae (11 spp.), representing approximately 48.4% of the total number of species found (Figure 11). The genera with the highest species richness were: *Ipomoea* L. (8 spp.), *Croton* L. (7 spp.), *Sida* L. (7 spp.), *Chamaecrista* (L.) Moench (6 spp.), and *Mimosa* L. (5 spp.). With regard to monocotyledons, the following family richness were recorded: Poaceae (11 spp.), Bromeliaceae (6 spp.), Commelinaceae (5 spp.), Cyperaceae (4 spp.) and Amaryllidaceae (1 spp.).

Two species constitute new records for the flora of Paraíba State: *Heteropterys arcuata* C.Pessoa & Amorim (Malpighiaceae) and *Solanum fernandesii* V.S. Samp. & R. Moura (Solanaceae). *Urvillea stipitata* Radlk (Sapindaceae) is recorded here for the Caatinga for the first time. These findings reinforce the importance of undertaking floristic surveys in areas of Caatinga.

In terms of growth form, an herbaceous phytophysiognomy predominated, with 74 species (29.6%) (Figure 12), this stratum being essentially restricted to the rainy season, followed by subshrub (60 spp.; 24%), shrub (48 spp.; 19.2%), climbing plants (45 spp.; 18%),

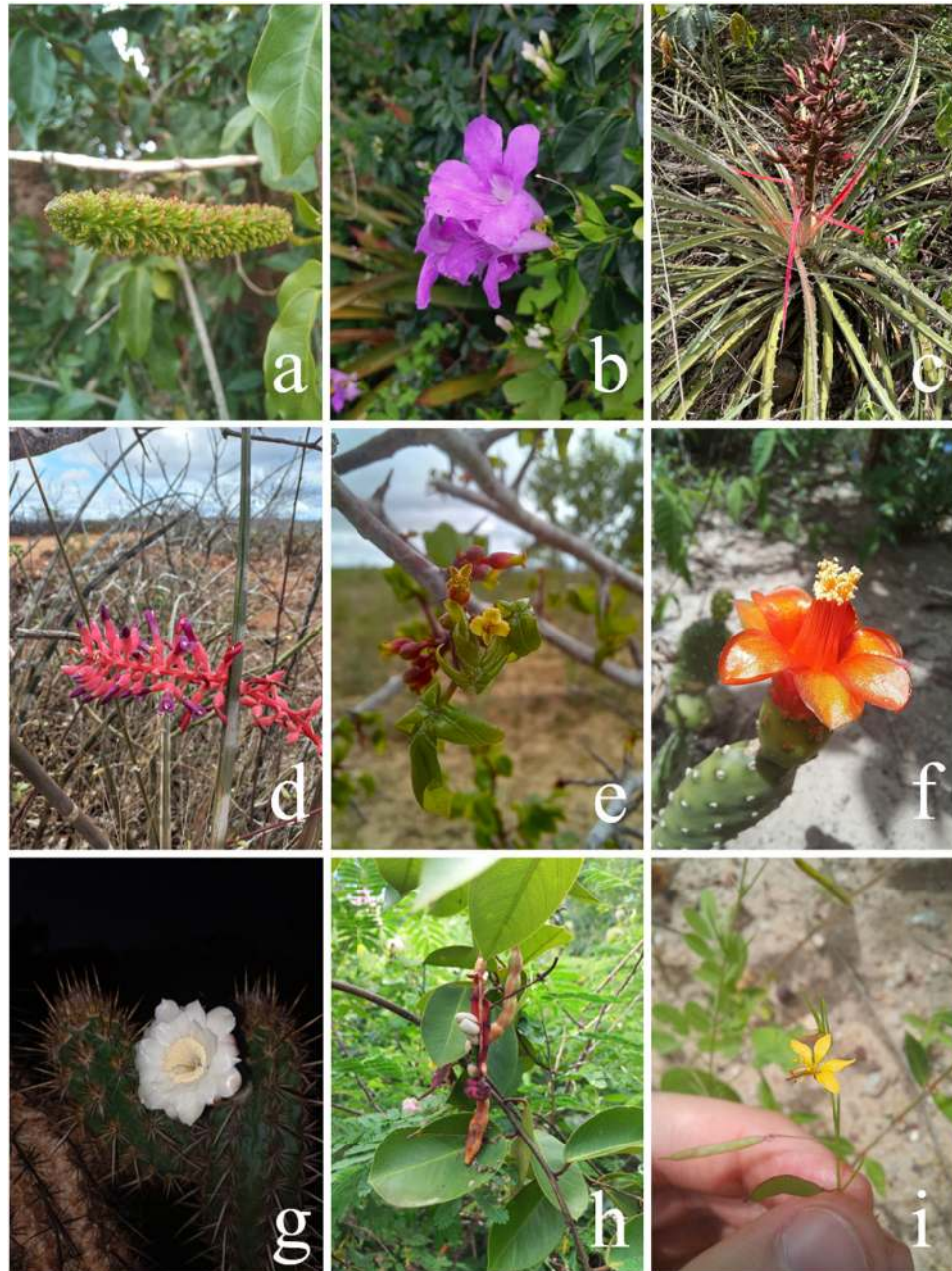


Figure 4. a. *Mansoa onohualcoides* (Bignoniaceae). b. *Mansoa paganuccii* (Bignoniaceae). c. *Bromelia laciniosa* (Bromeliaceae). d. *Neoglaziovia variegata* (Bromeliaceae). e. *Commiphora leptophloeos* (Burseraceae). f. *Tacinga subcylindrica* (Cactaceae). g. *Xiquexique gounellei* (Cactaceae). h. *Cynophalla flexuosa* (Capparaceae). i. *Physostemon guianense* (Cleomaceae). Photos: a-b, d-i. B. F. Rocha; c. M. G. M. Gonçalves.

and tree (17 spp.; 6.8%) components. Three epiphytic species (1.2%) were also found attached to shrubs and trees, all belonging to the genus *Tillandsia* L. (Bromeliaceae). Three parasitic plant species (1.2%) were also identified: two holoparasites belonging to the genus *Cuscuta* L. (Convolvulaceae), characterized by being leafless and achlorophyllous, and one hemiparasitic plant belonging to the family Loranthaceae, *Pusillanthus pubescens* (Rizzini) Caires, the latter having leaves and chlorophyll; both had modified roots (haustoria) to obtain nutrients from the host plant.

Among the total species found, 79 are endemic to Brazil (31.6%); the other species have extra-Brazilian distributions (68.4%). It is important to highlight that 30 species (12%) are restricted to the Caatinga

phytogeographical domain, indicating the RE Olho d'Água das Onças as a priority conservation center for plant diversity in the Paraíba Caatinga.

Based on the Jaccard similarity index, the cophenetic correlation coefficient for the dendrogram is 82.2%, indicating a relatively strong analysis. The flora of the REODO exhibits greater similarity to floristic surveys carried out in protected areas (Figure 13), forming a well-defined group with them (Lima and Barbosa 2014, Fernando et al. 2022). This group shows greater similarity with studies conducted in inselbergs located in the municipality of Patos, in the Sertão mesoregion (Lucena et al. 2015, Lopes-Silva et al. 2019). Another group includes the rocky outcrops situated in the Borborema Plateau, specifically in the

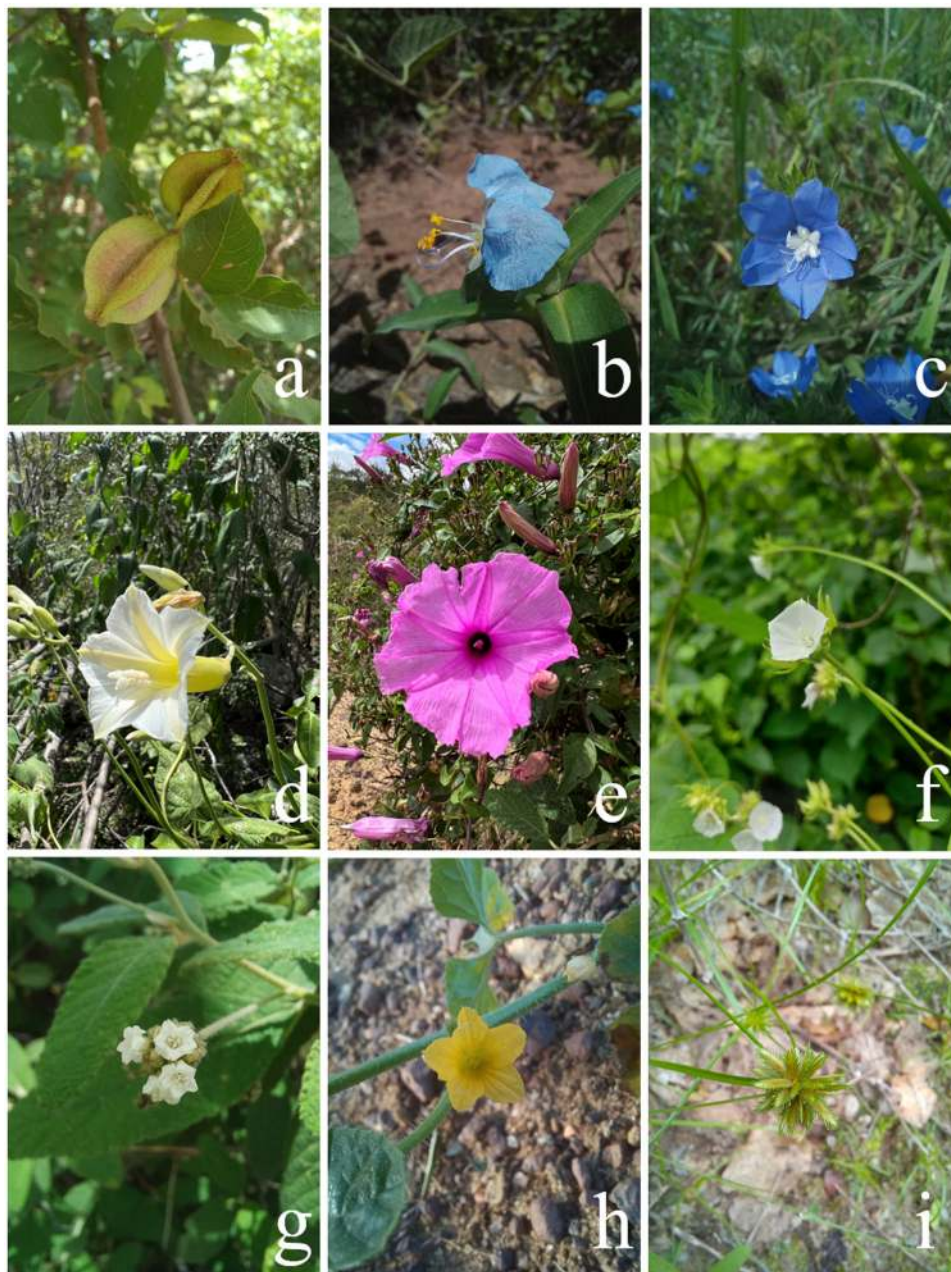


Figure 5. a. *Combretum leprosum* (Combretaceae). b. *Commelina obliqua* (Commelinaceae). c. *Evolvulus glomeratus* (Convolvulaceae). d. *Ipomoea marcellia* (Convolvulaceae). e. *Ipomoea rosea* (Convolvulaceae). f. *Jacquemontia pentanthos* (Convolvulaceae). g. *Varronia leucomalloides* (Cordiaceae). h. *Cucumis anguria* (Cucurbitaceae). i. *Cyperus uncinulatus* (Cyperaceae). Photos: a-c, f-i. B. F. Rocha; c-d. M. G. M. Gonçalves.

Paraíba Cariri and Agreste regions (Tölke et al. 2011, Sales-Rodrigues et al. 2014, Costa et al. 2015, Lima and Melo 2015, Melo et al. 2016, Machado-Filho et al. 2024). Furthermore, a separate group comprises floristic surveys undertaken in the eastern region of the Caatinga phytogeographical domain in Paraíba (Cordeiro et al. 2015, Cordeiro et al. 2018, Cordeiro and Souza 2024).

Discussion

Barbosa et al. (2007) identified 396 species for the flora of the entire Cariri region of Paraíba State (29 municipalities, 11,236,391 km²). The

number of species found in the present study (250 species) was therefore equivalent to more than 60% of that total, despite the study area being considerably smaller (20.73 ha). Other surveys carried out in Caatinga areas in Paraíba reported greater numbers of species: Fernando et al. (2022) encountered 320 angiosperm species in an area of Caatinga in the municipality of Passagem, Paraiban Sertão mesoregion; Lima and Barbosa (2014) identified 290 angiosperm species in the RPPN Fazenda Almas, an area of Caatinga located in Paraiban Cariri microregion. The greater numbers of species found by these authors probably reflect the longer durations of their field excursions with longer collection times during flowering and/or fruiting periods (Fernando et al. 2022 – four

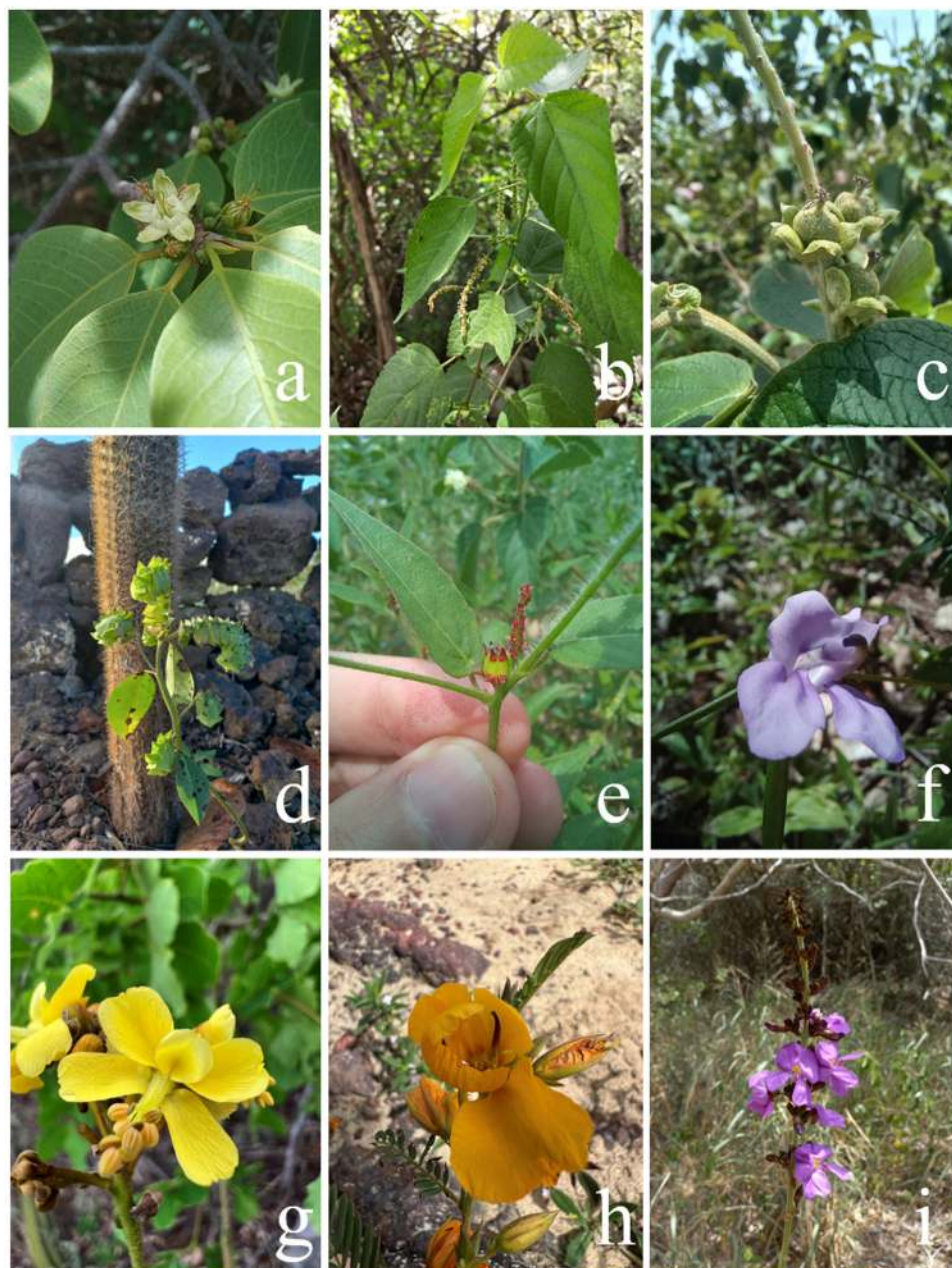


Figure 6. a. *Erythroxylum caatingae* (Erythroxylaceae). b. *Acalypha multicaulis* (Euphorbiaceae). c. *Croton blanchetianus* (Euphorbiaceae). d. *Euphorbia comosa* (Euphorbiaceae). e. *Microstachys corniculata* (Euphorbiaceae). f. *Ancistrotropis peduncularis* (Fabaceae). g. *Cenostigma nordestinum* (Fabaceae). h. *Chamaecrista repens* (Fabaceae). i. *Macropsyчанthus grandiflorus* (Fabaceae). Photos: a-f, i. B. F. Rocha; g-h. M. G. M. Gonçalves.

collection years; Lima and Barbosa 2014 – ten collection years) and the larger sizes of their study areas (Fernando et al. 2022 – 350 hectares; Lima and Barbosa 2014 – 3,505 hectares).

Our study evidenced high species richness as compared to other surveys carried out in Caatinga regions in Paraíba, such as inselbergs (Porto et al. 2008, Tölke et al. 2011, Sales-Rodrigues et al. 2014, Lima and Melo 2015, Lucena et al. 2015, Melo et al. 2016), riparian forests (Lacerda et al. 2007, Trovão et al. 2010, Silva et al. 2015, Farias et al. 2017, Marques et al. 2020), and even areas of preserved Caatinga (Pereira-Júnior et al. 2012, Silva et al. 2012, Cordeiro and Souza 2024, Machado-Filho et al. 2024). It is important to note that some of these

studies focused only on certain types of plant habits (only the herbaceous or only the shrub/tree layer).

Fabaceae (38 spp.) was the most species-rich family in the present study, corroborating the findings of Moro et al. (2014) who likewise identified it as the richest family in the Caatinga. Several studies carried out in Paraíba State had previously identified Fabaceae as the richest family in this domain (Porto et al. 2008, Santos and Melo 2010, Lima and Barbosa 2014, Sales-Rodrigues et al. 2014, Lima and Melo 2015, Lucena et al. 2015, Silva et al. 2015, Melo et al. 2016, Fernando et al. 2022, Cordeiro and Souza 2024, Machado-Filho et al. 2024). Surveys undertaken in the Caatinga domain employing different methodologies

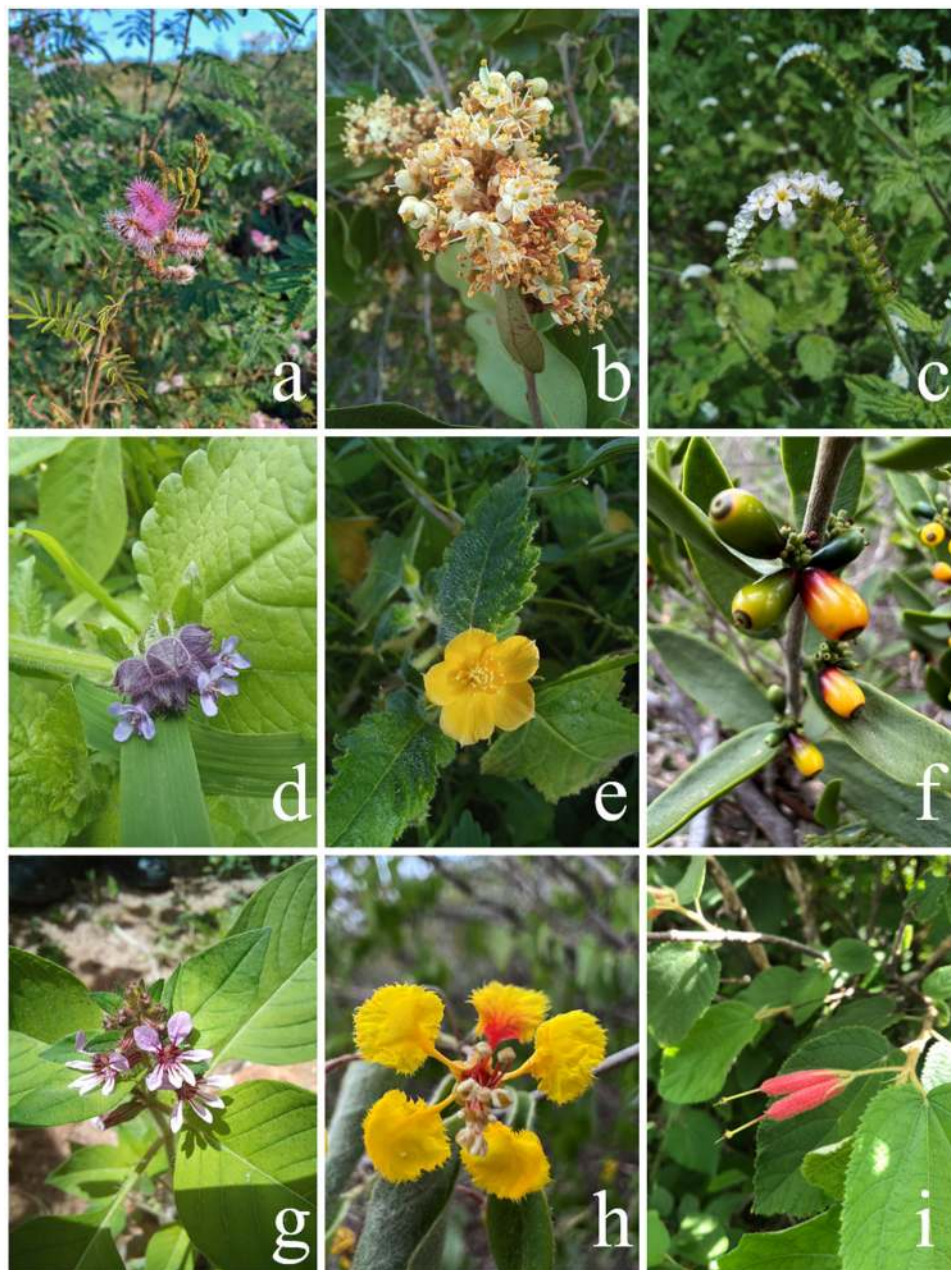


Figure 7. a. *Mimosa invisa* (Fabaceae). b. *Peltogyne pauciflora* (Fabaceae). c. *Heliotropium angiospermum* (Heliotropiaceae). d. *Marsypianthes chamaedrys* (Lamiaceae). e. *Mentzelia aspera* (Loasaceae). f. *Pusillanthus pubescens* (Loranthaceae). g. *Cuphea impatientifolia* (Lythraceae). h. *Diplopterys lutea* (Malpighiaceae). i. *Helicteres eichleri* (Malvaceae). Photos: a-e, g. B. F. Rocha; f, h. M. G. M. Gonçalves; i. L. G. Sá.

(focusing only on the herbaceous component - Andrade et al. [2009], or only on the woody component [Lacerda et al. 2007, Trovão et al. 2010, Pereira-Júnior et al. 2012, Farias et al. 2017, Marques et al. 2020]) have consistently shown Fabaceae to be the richest family, demonstrating the diverse habits of its component species. Even among surveys in which it is not the richest family, it appears among the three most prominent in terms of the number of species (Costa et al. 2009, Tölke et al. 2011, Silva et al. 2012).

Chamaecrista (6 spp.) and *Mimosa* (5 spp.) were the richest genera of Fabaceae, corroborating Moro et al. (2014), who identified these

genera as being among the four richest in the Caatinga, and the two richest genera of Fabaceae in the caatinga phytogeographic domain. Furthermore, Lima et al. (2015) highlighted that most Fabaceae species have associations with nitrogen-fixing bacteria in their roots, which are largely responsible for the entry of nitrogen compounds into terrestrial ecosystems.

Euphorbiaceae (24 spp.) was found to be the second richest family, again in agreement with Moro et al. (2014), who identified it as the second richest family in the Caatinga. Euphorbiaceae appeared as the second richest family in other studies undertaken in Caatinga regions

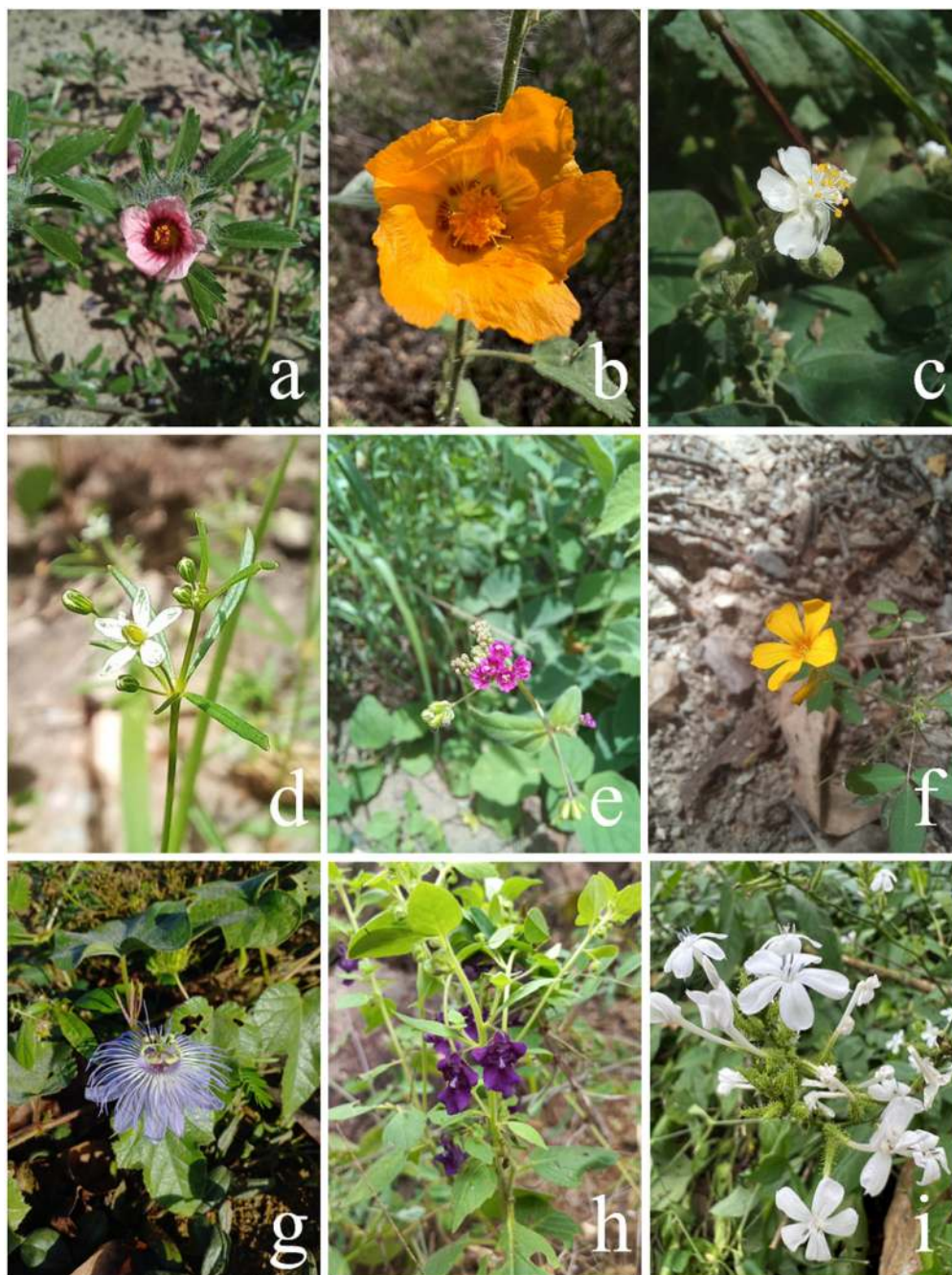


Figure 8. a. *Sida anomala* (Malvaceae). b. *Sida galheirensis* (Malvaceae). c. *Wissadula contracta* (Malvaceae). d. *Mollugo verticillata* (Molluginaceae). e. *Boerhavia coccinea* (Nyctaginaceae). f. *Oxalis divaricata* (Oxalidaceae). g. *Passiflora foetida* (Passifloraceae). h. *Angelonia pubescens* (Plantaginaceae). i. *Plumbago scandens* (Plumbaginaceae). Photos: a, c-h. B. F. Rocha; b, i. M. G. M. Gonçalves.

(Lucena et al. 2015, Fernando et al. 2022), and as the richest in the study by Costa et al. (2009), who analyzed the flora of one hectare of Caatinga in the mid São Francisco depression in Pernambuco State. Additionally, Euphorbiaceae stood out among the richest families in terms of the number of species in studies undertaken in areas of the Caatinga sedimentary basement (Gomes et al. 2006, Lima et al. 2009, Sousa et al. 2021).

Additionally, in studies focusing exclusively on woody Caatinga components, Euphorbiaceae is often cited among the most species-

rich families (Lacerda et al. 2007, Trovão et al. 2010, Pereira-Júnior et al. 2012, Farias et al. 2017, Marques et al. 2020). In the present study, there were 17 woody Euphorbiaceae species among shrubs and subshrubs, which is equivalent to approximately 70.8% of the total species of the family encountered in the study area, and approximately 15.7% of all shrub and subshrub species there. Five herbaceous species and two climbing plants (*Dalechampia scandens* L. and *Tragia cearensis* Pax & K.Hoffm.) were also identified. The most numerous genus in the family in the present study was *Croton* L.

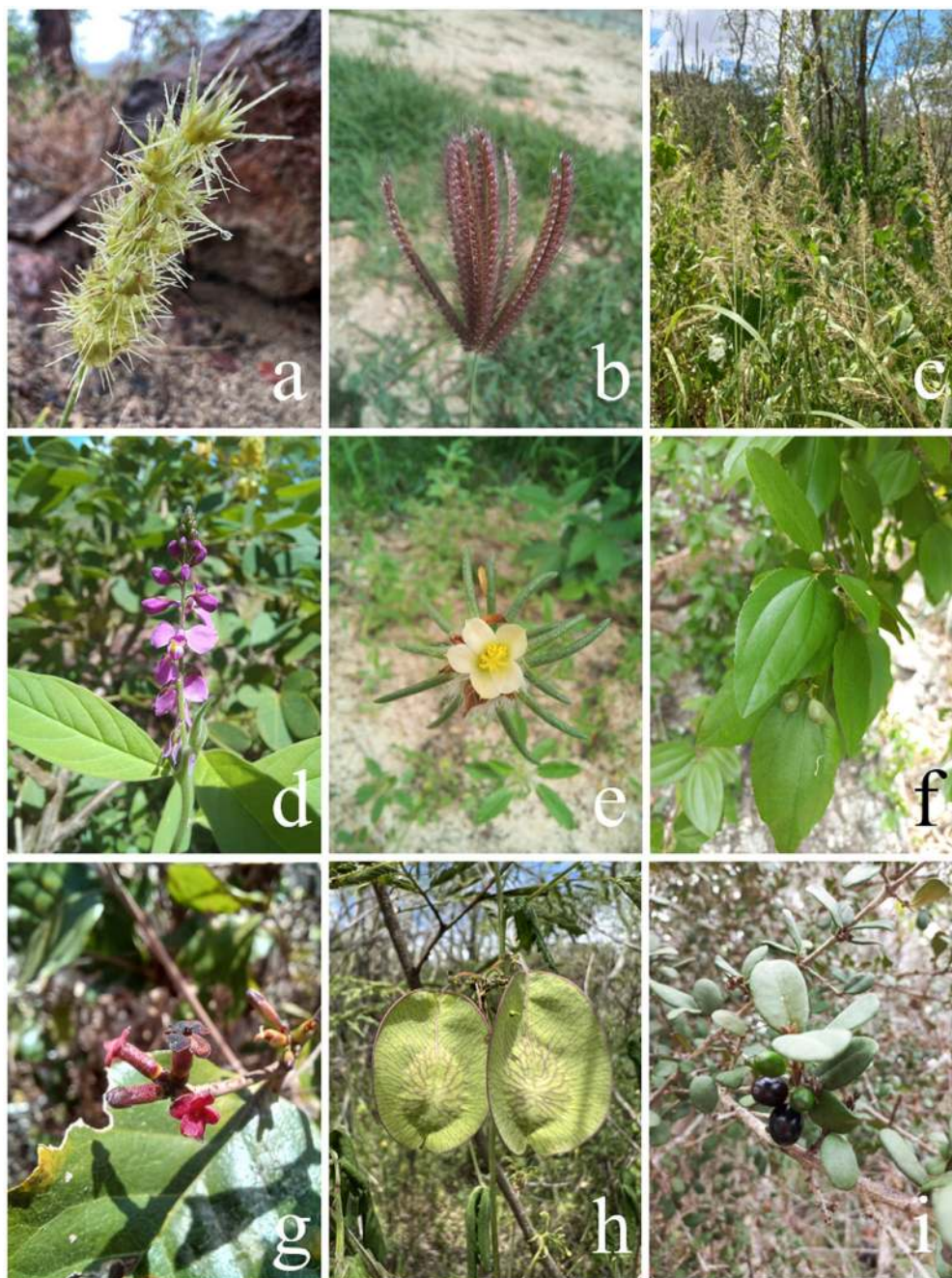


Figure 9. a. *Cenchrus echinatus* (Poaceae). b. *Chloris barbata* (Poaceae). c. *Setaria parviflora* (Poaceae). d. *Asemeia violacea* (Polygalaceae). e. *Portulaca elatior* (Portulacaceae). f. *Sarcomphalus joazeiro* (Rhamnaceae). g. *Cordiera rigida* (Rubiaceae). h. *Urvillea stipitata* (Sapindaceae). i. *Sideroxylon obtusifolium* (Sapotaceae). Photos: a, h. M. G. M. Gonçalves; b-g, i. B. F. Rocha.

(7 spp.), which, according to Moro et al. (2014), is the richest Caatinga genus. The prominence of *Croton* was likewise observed in other studies carried out in Caatinga areas (e.g., Farias et al. 2017, Sousa et al. 2021, Cordeiro and Souza 2024).

Convolvulaceae (19 spp.) and Malvaceae (18 spp.) stood out for their floristic importance in this study, being the third and fourth richest families respectively. Convolvulaceae was notable for its high number of climbing species: of the 19 species found in this study, 12 were climbers, beyond hosting the two species of holoparasites plants found, both of the

genus *Cuscuta*. Convolvulaceae represented approximately 26.7% of all of the climbing species identified in the study, emerging as an important floristic component of climbing plants in the study area. Tree species of Malvaceae, belonging to the Bombacoideae subfamily, are frequently found in areas of Caatinga vegetation (Lacerda et al. 2007, Santos and Melo 2010, Guedes et al. 2012, Pereira-Júnior et al. 2012, Lima and Barbosa 2014, Lima and Melo 2015, Sabino et al. 2016, Fernando et al. 2022, Machado-Filho et al. 2024), but no arboreal species of the family was encountered in the study area.

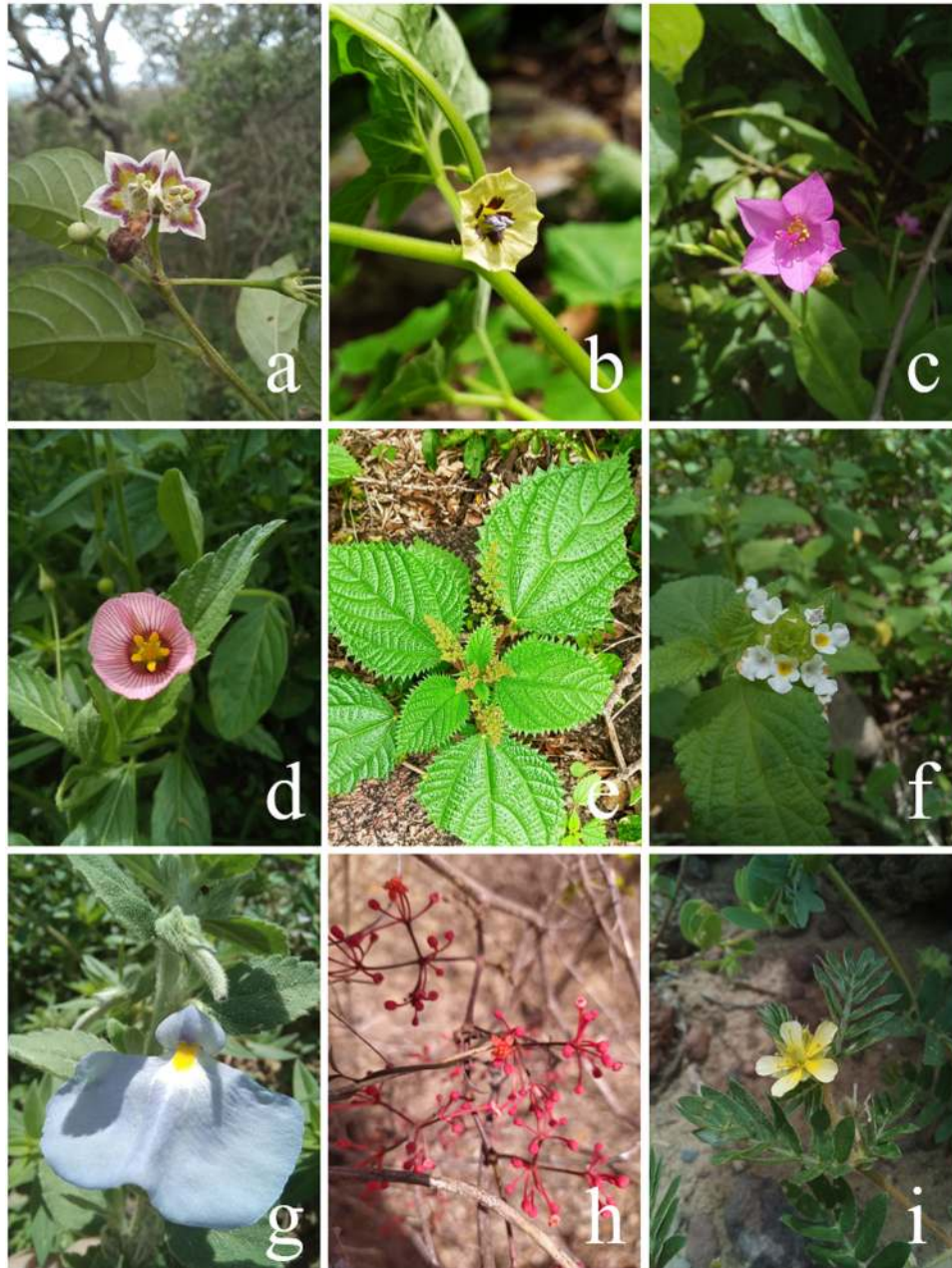


Figure 10. a. *Capsicum parvifolium* (Solanaceae). b. *Physalis pubescens* (Solanaceae). c. *Talinum fruticosum* (Talinaceae). d. *Piriqueta viscosa* (Turneraceae). e. *Laportea aestuans* (Urticaceae). f. *Lantana achyranthifolia* (Verbenaceae). g. *Pombalia arenaria* (Violaceae). h. *Cissus erosa* (Vitaceae). i. *Tribulus terrestris* (Zygophyllaceae). Photos: a, c-d, f-g, i. B. F. Rocha; b, h. M. M. Rodrigues; e. M. F. B. Sousa.

Convolvulaceae and Malvaceae are cited as among the most species-rich families in several floristic studies of Caatinga vegetation (Araújo et al. 2008, Andrade et al. 2009, Santos and Melo 2010, Tölke et al. 2011, Silva et al. 2012, Lima and Barbosa 2014, Lima and Melo 2015, Lucena et al. 2015, Silva et al. 2021, Fernando et al. 2022, Cordeiro and Souza 2024, Machado-Filho et al. 2024). Species of Convolvulaceae and Malvaceae are not generally included among the richest genera in studies that analyze only the shrub/tree component of Caatinga areas (Lacerda et al. 2007, Trovão et al. 2010, Pereira-Júnior et al. 2012, Farias et al. 2017, Marques et al. 2020), probably due to the predominance of

climbers (in Convolvulaceae) and subshrubs (in Malvaceae) in these families, as evidenced in the present study. Additionally, *Ipomoea* L. (Convolvulaceae) (8 spp.) and *Sida* L. (Malvaceae) (7 spp.) represent the two richest genera of those families in the area, corroborating the results presented by Moro et al. (2014), with *Ipomoea* appearing as the third richest genus and *Sida* as the ninth most taxonomically diverse genus in the Caatinga domain.

The Asteraceae (11 spp.) and Poaceae (11 spp.) families ranked fifth among the richest families. Large numbers of species of both families were found in recently anthropized environments (areas invaded by

Table 1. List of Angiosperm families and species from Reserva Ecológica Olho d'Água das Onças, Picuí, Paraíba State, Brazil. * Endemic to Brazil; ** Endemic to the Caatinga.

Family/Species	Habit	Voucher			
Acanthaceae			<i>Aspilia bonplandiana</i> (Gardner) S.F. Blake**	Shrub	B. F. Rocha et al. 299
<i>Dicliptera ciliaris</i> Juss.	Subshrub	B. F. Rocha et al. 50	<i>Bidens bipinnata</i> L.	Herb	B. F. Rocha et al. 354
<i>Harpochilus paraibanus</i> F.K.S. Monteiro, J.I.M. Melo & E.M.P. Fernando**	Shrub	B. F. Rocha et al. 62	<i>Bidens subalternans</i> DC.	Herb	B. F. Rocha et al. 24
<i>Justicia aequilabris</i> (Nees) Lindau*	Subshrub	B. F. Rocha et al. 52	<i>Blainvillea acmella</i> (L.) Philipson	Herb	B. F. Rocha et al. 310
<i>Ruellia asperula</i> (Mart. ex Nees) Lindau**	Subshrub	B. F. Rocha et al. 7	<i>Centratherum punctatum</i> Cass.	Subshrub	B. F. Rocha et al. 37
<i>Ruellia geminiflora</i> Kunth	Subshrub	B. F. Rocha et al. 69	<i>Simsia dombeyana</i> DC.	Subshrub	B. F. Rocha et al. 353
<i>Ruellia paniculata</i> L.	Subshrub	B. F. Rocha et al. 4	<i>Tilesia baccata</i> (L.) Pruski	Shrub	B. F. Rocha et al. 446
Amaranthaceae			<i>Tridax procumbens</i> L.	Herb	B. F. Rocha et al. 18
<i>Alternanthera brasiliana</i> (L.) Kuntze var. <i>brasiliana</i>	Subshrub	B. F. Rocha et al. 71	<i>Wedelia goyazensis</i> Gardner*	Shrub	B. F. Rocha et al. 312
<i>Alternanthera pungens</i> Kunth	Herb	B. F. Rocha et al. 238	Bignoniaceae		
<i>Alternanthera tenella</i> Colla	Subshrub	B. F. Rocha et al. 70	<i>Bignonia ramentacea</i> (Mart. ex DC.) L.G. Lohmann*	Climbing plant	B. F. Rocha et al. 263
<i>Amaranthus viridis</i> L.	Subshrub	B. F. Rocha et al. 217	<i>Fridericia pubescens</i> (L.) L.G.Lohmann	Climbing plant	B. F. Rocha et al. 318
<i>Froelichia humboldtiana</i> (Roem. & Schult.) Seub.	Subshrub	B. F. Rocha et al. 469	<i>Fridericia</i> sp.	Climbing plant	A. B. Silva et al. 10
<i>Gomphrena vaga</i> Mart.	Subshrub	B. F. Rocha et al. 172	<i>Mansoa onohualcoides</i> A.H.Gentry*	Climbing plant	B. F. Rocha et al. 423
<i>Quaternella ephedroides</i> Pedersen*	Subshrub	B. F. Rocha et al. 102	<i>Mansoa paganuccii</i> M.M.Silva-Castro**	Climbing plant	B. F. Rocha et al. 20
Amaryllidaceae			<i>Tanaecium parviflorum</i> (Mart. ex DC.) Kaehler & L.G.Lohmann*	Climbing plant	B. F. Rocha et al. 180
<i>Zephyranthes cearensis</i> (Herb.) Baker*	Herb	B. F. Rocha et al. 116	Bromeliaceae		
Anacardiaceae			<i>Aechmea aquilega</i> (Salisb.) Griseb.*	Herb	B. F. Rocha et al. 113
<i>Anacardium occidentale</i> L.	Tree	B. F. Rocha et al. 457	<i>Bromelia laciniosa</i> Mart. ex Schult. & Schult.f.**	Herb	B. F. Rocha et al. 103
<i>Astronium urundeuva</i> (M.Allemão) Engl.	Tree	B. F. Rocha et al. 454	<i>Neoglaziovia variegata</i> (Arruda) Mez**	Herb	B. F. Rocha et al. 316
<i>Schinopsis brasiliensis</i> Engl.	Tree	B. F. Rocha et al. 234	<i>Tillandsia loliacea</i> Mart. ex Schult. & Schult.f.	Epiphyte	B. F. Rocha et al. 417
<i>Spondias tuberosa</i> Arruda*	Tree	B. F.Rocha et al. 451	<i>Tillandsia recurvata</i> (L.) L.	Epiphyte	B. F. Rocha et al. 100
Apocynaceae			<i>Tillandsia streptocarpa</i> Baker	Epiphyte	B. F. Rocha et al. 101
<i>Aspidosperma pyrifolium</i> Mart. & Zucc.	Tree	B. F. Rocha et al. 121	Burseraceae		
<i>Ibatia ganglinosa</i> (Vell.) Morillo*	Climbing plant	B. F. Rocha et al. 210	<i>Commiphora leptophloeos</i> (Mart.) J.B. Gillett	Tree	B. F. Rocha et al. 122
<i>Ibatia nigra</i> (Decne.) Morillo *	Climbing plant	B. F. Rocha et al. 346	Cactaceae		
<i>Petalostelma dardanoi</i> Fontella**	Climbing plant	G. A. Luz et al. 97	<i>Cereus jamacaru</i> DC.*	Tree	B. F. Rocha et al. 237
Asteraceae			<i>Melocactus zehntneri</i> (Britton & Rose) Luetzelb.*	Subshrub	B. F. Rocha et al. 188
<i>Acanthospermum australe</i> (Loefl.) Kuntze	Herb	B. F. Rocha et al. 412	<i>Pilosocereus pachycladus</i> subsp. <i>viridis</i> N.P. Taylor & Albuquerque-Lima**	Shrub	B. F. Rocha et al. 186

<i>Tacinga inamoena</i> (K.Schum.) N.P. Taylor & Stuppy**	Subshrub	B. F. Rocha et al. 105	<i>Ipomoea longeramosa</i> Choisy	Climbing plant	B. F. Rocha et al. 247
<i>Tacinga palmadora</i> (Britton & Rose) N.P. Taylor & Stuppy**	Subshrub	B. F. Rocha et al. 106	<i>Ipomoea marcellia</i> Meisn.**	Climbing plant	B. F. Rocha et al. 53
<i>Tacinga subcylindrica</i> M. Machado & N.P. Taylor**	Subshrub	B. F. Rocha et al. 236	<i>Ipomoea nil</i> (L.) Roth	Climbing plant	B. F. Rocha et al. 23
<i>Xiquexique gounellei</i> (F.A.C. Weber) Lavor & Calvente subsp. <i>gounellei</i> **	Subshrub	B. F. Rocha et al. 187	<i>Ipomoea rosea</i> Choisy*	Climbing plant	B. F. Rocha et al. 55
Capparaceae			<i>Jacquemontia confusa</i> Meisn.	Climbing plant	B. F. Rocha et al. 64
<i>Cynophalla flexuosa</i> (L.) J. Presl	Shrub	B. F. Rocha et al. 120	<i>Jacquemontia evolvuloides</i> (Moric.) Meisn.	Climbing plant	B. F. Rocha et al. 65
<i>Neocalyptocalyx longifolium</i> (Mart.) Cornejo & Iltis**	Tree	B. F. Rocha et al. 170	<i>Jacquemontia mucronifera</i> (Choisy) Hallier f.*	Climbing plant	B. F. Rocha et al. 254
Cleomaceae			<i>Jacquemontia pentanthos</i> (Jacq.) G. Don*	Climbing plant	B. F. Rocha et al. 351
<i>Physostemon guianense</i> (Aubl.) Malme	Herb	B. F. Rocha et al. 344	Cordiaceae		
Combretaceae			<i>Cordia trichotoma</i> (Vell.) Arráb. ex Steud.	Tree	B. F. Rocha et al. 33
<i>Combretum hilarianum</i> D. Dietr.	Shrub	B. F. Rocha et al. 261	<i>Varronia globosa</i> Jacq.	Shrub	B. F. Rocha et al. 171
<i>Combretum leprosum</i> Mart.	Shrub	B. F. Rocha et al. 270	<i>Varronia leucomalloides</i> (Taroda) J.S.Mill.**	Shrub	B. F. Rocha et al. 231
Commelinaceae			<i>Varronia mariana</i> E.C.O. Chagas & Costa-Lima**	Shrub	B. F. Rocha et al. 134
<i>Aneilema brasiliense</i> C. B. Clarke	Herb	B. F. Rocha et al. 2	Cucurbitaceae		
<i>Callisia repens</i> (Jacq.) L.	Herb	B. F. Rocha et al. 415	<i>Cucumis anguria</i> L.	Climbing plant	B. F. Rocha et al. 407
<i>Commelina diffusa</i> Burm.f.	Herb	B. F. Rocha et al. 144	Cyperaceae		
<i>Commelina erecta</i> L.	Herb	B. F. Rocha et al. 8	<i>Bulbostylis</i> (cf.) <i>capillaris</i> (L.) C.B. Clarke	Herb	B. F. Rocha et al. 333
<i>Commelina obliqua</i> Vahl	Herb	B. F. Rocha et al. 258	<i>Cyperus</i> (cf.) <i>distans</i> L.	Herb	B. F. Rocha et al. 429
Convolvulaceae			<i>Cyperus fugax</i> Liebm.	Herb	B. F. Rocha et al. 29
<i>Cuscuta americana</i> L.	Holoparasitic plant	B. F. Rocha et al. 382	<i>Cyperus uncinulatus</i> Schrad. ex Need	Herb	B. F. Rocha et al. 269
<i>Cuscuta tinctoria</i> Mart.	Holoparasitic plant	B. F. Rocha et al. 15	Erythroxylaceae		
<i>Distimake aegyptius</i> (L.) A.R. Simões & Staples	Climbing plant	B. F. Rocha et al. 81	<i>Erythroxylum caatingae</i> Plowman**	Shrub	B. F. Rocha et al. 166
<i>Evolvulus filipes</i> Mart.	Herb	B. F. Rocha et al. 330	<i>Erythroxylum pyan</i> Costa-Lima**	Shrub	B. F. Rocha et al. 163
<i>Evolvulus frankenioides</i> Moric.	Herb	B. F. Rocha et al. 46	Euphorbiaceae		
<i>Evolvulus glomeratus</i> Nees & Mart.	Herb	B. F. Rocha et al. 5	<i>Acalypha multicaulis</i> Müll.Arg.	Subshrub	B. F. Rocha et al. 203
<i>Evolvulus ovatus</i> Fernald	Herb	B. F. Rocha et al. 335	<i>Argythamnia malpighiacea</i> Ule**	Subshrub	B. F. Rocha et al. 112
<i>Ipomoea acanthocarpa</i> (Choisy) Aschers. & Schweinf.	Climbing plant	B. F. Rocha et al. 387	<i>Bernardia sidoides</i> (Klotzsch) Müll.Arg.	Herb	B. F. Rocha et al. 279
<i>Ipomoea bahiensis</i> Wild. ex Roem. & Schult.*	Climbing plant	B. F. Rocha et al. 63	<i>Cnidoscolus urens</i> (L.) Arthur	Subshrub	B. F. Rocha et al. 104
<i>Ipomoea brasiliana</i> (Choisy) Meisn. *	Climbing plant	B. F. Rocha et al. 83	<i>Croton adenocalyx</i> Baill.**	Shrub	B. F. Rocha et al. 274
<i>Ipomoea carnea</i> subsp. <i>fistulosa</i> (Mart. ex Choisy) D.F. Austin	Shrub	B. F. Rocha et al. 388	<i>Croton blanchetianus</i> Baill.**	Shrub	B. F. Rocha et al. 148
			<i>Croton glandulosus</i> L.	Subshrub	B. F. Rocha et al. 260

<i>Croton grewoides</i> Baill.	Shrub	B. F. Rocha et al. 168	<i>Chamaecrista rotundifolia</i> (Pers.) Greene	Subshrub	B. F. Rocha et al. 221
<i>Croton heliotropiifolius</i> Kunth	Subshrub	B. F. Rocha et al. 126	<i>Chamaecrista zygophylloides</i> (Taub.) H.S.Irwin & Barneby var. <i>zygophylloides</i> *	Shrub	B. F. Rocha et al. 124
<i>Croton hirtus</i> L'Hér.	Herb	B. F. Rocha et al. 185	<i>Chloroleucon foliolosum</i> (Benth.) G.P.Lewis	Shrub	B. F. Rocha et al. 229
<i>Croton urticifolius</i> Lam.	Shrub	B. F. Rocha et al. 470	<i>Crotalaria incana</i> L.	Herb	B. F. Rocha et al. 441
<i>Dalechampia scandens</i> L.	Climbing plant	B. F. Rocha et al. 155	<i>Desmodium glabrum</i> (Mill.) DC.	Shrub	B. F. Rocha et al. 440
<i>Euphorbia comosa</i> Vell.	Herb	B. F. Rocha et al. 399	<i>Indigofera suffruticosa</i> Mill.	Subshrub	B. F. Rocha et al. 342
<i>Euphorbia hyssopifolia</i> L.	Herb	B. F. Rocha et al. 273	<i>Leucaena leucocephala</i> (Lam.) de Wit	Shrub	B. F. Rocha et al. 146
<i>Euphorbia insulana</i> Vell.	Herb	B. F. Rocha et al. 282	<i>Libidibia ferrea</i> (Mart. ex Tul.) L.P.Queiroz*	Tree	B. F. Rocha et al. 193
<i>Gymnanthes boticario</i> Esser, M. F. A. Lucena & M. Alves	Shrub	B. F. Rocha et al. 461	<i>Macropsychanthus grandiflorus</i> (Mart. ex Benth.) L.P.Queiroz & Snak**	Climbing plant	B. F. Rocha et al. 196
<i>Jatropha mollissima</i> (Pohl) Baill.	Shrub	B. F. Rocha et al. 54	<i>Macroptilium gracile</i> (Poepp. ex Benth.) Urb.*	Climbing plant	B. F. Rocha et al. 435
<i>Jatropha ribifolia</i> (Pohl) Baill.*	Subshrub	B. F. Rocha et al. 127	<i>Macroptilium martii</i> (Benth.) Maréchal & Baudet	Climbing plant	B. F. Rocha et al. 59
<i>Manihot</i> (cf.) <i>carthagenensis</i> (Jacq.) Müll.Arg.	Shrub	B. F. Rocha et al. 191	<i>Mimosa arenosa</i> (Wild.) Poir.	Tree	B. F. Rocha et al. 90
<i>Microstachys corniculata</i> (Vahl) Griseb.	Subshrub	B. F. Rocha et al. 367	<i>Mimosa candollei</i> R.Grether	Subshrub	B. F. Rocha et al. 61
<i>Ricinus communis</i> L.	Subshrub	B. F. Rocha et al. 460	<i>Mimosa invis</i> a Mart. ex Colla	Climbing plant	B. F. Rocha et al. 66
<i>Sebastiania jacobinensis</i> (Müll. Arg.) Müll. Arg.*	Shrub	B. F. Rocha et al. 233	<i>Mimosa paraibana</i> Barneby*	Shrub	B. F. Rocha et al. 149
<i>Stillingia trapezoidea</i> Ule **	Subshrub	B. F. Rocha et al. 192	<i>Mimosa tenuiflora</i> (Willd.) Poir.	Shrub	G. A. Luz et al. 7
<i>Tragia cearensis</i> Pax & K. Hoffm.	Climbing plant	A. B. Silva et al. 11	<i>Neltuma juliflora</i> (Sw.) Raf.	Tree	B. F. Rocha et al. 462
Fabaceae			<i>Nissolia vincentina</i> (Ker Gawl.) T.M. Moura & Fort.-Perez	Climbing plant	B. F. Rocha et al. 16
<i>Albizia polycephala</i> (Benth.) Killip ex Record*	Tree	B. F. Rocha et al. 439	<i>Peltogyne pauciflora</i> Benth.**	Shrub	B. F. Rocha et al. 182
<i>Ancistrotropis peduncularis</i> (Kunth) A. Delgado	Climbing plant	B. F. Rocha et al. 3	<i>Pityrocarpa moniliformis</i> (Benth.) Luckow & R.W. Jobson**	Shrub	B. F. Rocha et al. 232
<i>Bauhinia cheilantha</i> (Bong.) Steud.	Tree	B. F. Rocha et al. 308	<i>Rhynchosia minima</i> (L.) DC.	Climbing plant	B. F. Rocha et al. 434
<i>Canavalia brasiliensis</i> Mart. ex Benth.	Climbing plant	B. F. Rocha et al. 245	<i>Senna macranthera</i> (DC. ex Collad.) H.S. Irwin & Barneby	Shrub	B. F. Rocha et al. 13
<i>Cenostigma nordestinum</i> Gagnon & G.P. Lewis**	Tree	B. F. Rocha et al. 139	<i>Senna trachypus</i> (Benth.) H.S. Irwin & Barneby*	Shrub	B. F. Rocha et al. 154
<i>Centrosema pascuorum</i> Mart. ex Benth.	Climbing plant	B. F. Rocha et al. 27	<i>Stylosanthes</i> (cf.) <i>viscosa</i> (L.) Sw.	Subshrub	B. F. Rocha et al. 219
<i>Centrosema pubescens</i> Benth.	Climbing plant	B. F. Rocha et al. 194	<i>Zornia brasiliensis</i> Vogel	Subshrub	B. F. Rocha et al. 179
<i>Chamaecrista absus</i> (L.) H.S. Irwin & Barneby	Subshrub	B. F. Rocha et al. 360	<i>Zornia leptophylla</i> (Benth.) Pittier	Subshrub	B. F. Rocha et al. 36
<i>Chamaecrista calycioides</i> (DC. ex Collad.) Greene	Subshrub	B. F. Rocha et al. 38	<i>Zornia reticulata</i> Sm.	Subshrub	B. F. Rocha et al. 26
<i>Chamaecrista duckeana</i> (P. Bezerra & Afr. Fern.) H.S. Irwin & Barneby**	Subshrub	B. F. Rocha et al. 298			
<i>Chamaecrista repens</i> (Vogel) H.S. Irwin & Barneby	Subshrub	B. F. Rocha et al. 51			

Heliotropiaceae				
<i>Euploca procumbens</i> (Mill.) Diane & Hilger	Herb	B. F. Rocha et al. 32	<i>Sida angustissima</i> A.St.-Hil.*	Subshrub B. F. Rocha et al. 369
<i>Heliotropium angiospermum</i> Murray	Herb	B. F. Rocha et al. 9	<i>Sida anomala</i> A.St.-Hil.	Subshrub B. F. Rocha et al. 28
<i>Myriopus rubicundus</i> (Salzm. ex DC.) Luebert*	Climbing plant	B. F. Rocha et al. 184	<i>Sida caulorrhiza</i> Krapov.*	Herb B. F. Rocha et al. 85
<i>Myriopus salzmännii</i> (DC.) Diane & Hilger	Climbing plant	B. F. Rocha et al. 128	<i>Sida cordifolia</i> L.	Subshrub B. F. Rocha et al. 47
Lamiaceae			<i>Sida galheirensis</i> Ulbr.*	Subshrub B. F. Rocha et al. 140
<i>Hypenia salzmännii</i> (Benth.) Harley	Herb	B. F. Rocha et al. 22	<i>Sida nordestinensis</i> S.S. Figueiredo & J.I.M. Melo**	Herb B. F. Rocha et al. 152
<i>Marsypianthes chamaedrys</i> (Vahl) Kuntze	Subshrub	B. F. Rocha et al. 280	<i>Sida spinosa</i> L.	Subshrub B. F. Rocha et al. 224
<i>Mesosphaerum pectinatum</i> (L.) Kuntze	Subshrub	F. K. S. Monteiro 280	<i>Sidastrum paniculatum</i> (L.) Fryxell	Shrub B. F. Rocha et al. 235
<i>Mesosphaerum suaveolens</i> (L.) Kuntze	Shrub	B. F. Rocha et al. 442	<i>Waltheria indica</i> L.	Subshrub B. F. Rocha et al. 201
Loasaceae			<i>Wissadula contracta</i> (Link) R.E.Fr.	Shrub B. F. Rocha et al. 433
<i>Mentzelia aspera</i> L.	Herb	B. F. Rocha et al. 315	Microteaceae	
Loranthaceae			<i>Microtea celosioides</i> Moq. ex Sennikov & Sukhor.	Herb B. F. Rocha et al. 30
<i>Pusillanthus pubescens</i> (Rizzini) Caires	Hemiparasite	B. F. Rocha et al. 89	Molluginaceae	
Lythraceae			<i>Mollugo verticillata</i> L.	Herb B. F. Rocha et al. 117
<i>Cuphea impatientifolia</i> A. St.- Hil.*	Subshrub	B. F. Rocha et al. 359	Nyctaginaceae	
Malpighiaceae			<i>Boerhavia coccinea</i> Mill.	Herb B. F. Rocha et al. 226
<i>Callaeum</i> (cf.) <i>psilophyllum</i> (A.Juss) D.M. Johnson	Climbing plant	B. F. Rocha et al. 327	<i>Boerhavia erecta</i> L.	Herb B. F. Rocha et al. 276
<i>Diplopterys lutea</i> (Griseb.) W.R. Anderson & C.C. Davis	Climbing plant	B. F. Rocha et al. 130	<i>Guapira darwinii</i> (Hemsl.) E.C.O. Chagas & Costa-Lima**	Shrub B. F. Rocha et al. 123
<i>Heteropterys arcuata</i> C. Pessoa & Amorim*	Shrub	B. F. Rocha et al. 268	Oxalidaceae	
<i>Heteropterys trichanthera</i> A. Juss*	Climbing plant	B. F. Rocha et al. 256	<i>Oxalis divaricata</i> Mart. ex Zucc.*	Herb B. F. Rocha et al. 145
<i>Stigmaphyllon auriculatum</i> (Cav.) A. Juss.*	Climbing plant	B. F. Rocha et al. 132	Passifloraceae	
<i>Thryallis longifolia</i> Mart. *	Shrub	B. F. Rocha et al. 307	<i>Passiflora foetida</i> L.	Climbing plant B. F. Rocha et al. 400
Malvaceae			Plantaginaceae	
<i>Corchorus hirtus</i> L.	Subshrub	B. F. Rocha et al. 141	<i>Angelonia pubescens</i> Benth.*	Herb B. F. Rocha et al. 447
<i>Gaya domingensis</i> Urb.	Subshrub	B. F. Rocha et al. 228	<i>Scoparia dulcis</i> L.	Subshrub B. F. Rocha et al. 218
<i>Helicteres eichleri</i> K. Schum**	Shrub	B. F. Rocha et al. 108	Plumbaginaceae	
<i>Herissantia tiubae</i> (K. Schum.) Brizicky*	Subshrub	B. F. Rocha et al. 12	<i>Plumbago scandens</i> L.	Subshrub B. F. Rocha et al. 1
<i>Malachra fasciata</i> Jacq.	Herb	B. F. Rocha et al. 443	Poaceae	
<i>Malvastrum tomentosum</i> (L.) S.R. Hill subsp. <i>tomentosum</i>	Subshrub	B. F. Rocha et al. 88	<i>Aristida</i> (cf.) <i>setifolia</i> Kunth	Herb B. F. Rocha et al. 421
<i>Melochia tomentosa</i> L.	Subshrub	B. F. Rocha et al. 173	<i>Cenchrus ciliaris</i> L.	Herb B. F. Rocha et al. 227
<i>Pavonia cancellata</i> (L.) Cav.	Herb	B. F. Rocha et al. 43	<i>Cenchrus echinatus</i> L.	Herb B. F. Rocha et al. 40
			<i>Chloris barbata</i> Sw.	Herb B. F. Rocha et al. 216

<i>Chloris virgata</i> Sw.	Herb	B. F. Rocha et al. 198	<i>Physalis pubescens</i> L.	Shrub	B. F. Rocha et al. 350
<i>Dactyloctenium aegyptium</i> (L.) Willd.	Herb	B. F. Rocha et al. 200	<i>Schwenckia americana</i> Rooyen ex L.	Herb	B. F. Rocha et al. 25
<i>Digitaria ciliaris</i> (Retz.) Koeler	Herb	B. F. Rocha et al. 199	<i>Solanum agrarium</i> Sendtn. *	Subshrub	B. F. Rocha et al. 107
<i>Megathyrsus maximus</i> (Jacq.) B.K. Simon & S.W.L. Jacobs	Herb	B. F. Rocha et al. 197	<i>Solanum fernandesii</i> V.S. Samp. & R. Moura **	Subshrub	B. F. Rocha et al. 143
<i>Setaria parviflora</i> (Poir.) Kerguelen	Herb	B. F. Rocha et al. 34	<i>Solanum paniculatum</i> L.	Shrub	B. F. Rocha et al. 246
<i>Tragus berteronianus</i> Schult.	Herb	B. F. Rocha et al. 222	Talinaceae		
<i>Urochloa mollis</i> (Sw.) Morrone & Zuloaga	Herb	B. F. Rocha et al. 262	<i>Talinum fruticosum</i> (L.) Juss.	Herb	B. F. Rocha et al. 17
Polygalaceae			<i>Talinum paniculatum</i> (Jacq.) Gaertn.	Herb	B. F. Rocha et al. 79
<i>Asemeia martiana</i> (A.W. Benn.) J.F.B. Pastore & J.R. Abbott	Subshrub	B. F. Rocha et al. 142	Turneraceae		
<i>Asemeia violacea</i> (Aubl.) J.F.B. Pastore & J.R. Abbott	Herb	B. F. Rocha et al. 259	<i>Piriqueta racemosa</i> (Jacq.) Sweet	Subshrub	B. F. Rocha et al. 467
Portulacaceae			<i>Piriqueta viscosa</i> Griseb.	Herb	M. M. Rodrigues et al. 60
<i>Portulaca elatior</i> Mart. ex Rohrb.	Herb	B. F. Rocha et al. 272	<i>Turnera blanchetiana</i> Urb.	Shrub	B. F. Rocha et al. 177
<i>Portulaca halimoides</i> L.	Herb	B. F. Rocha et al. 35	<i>Turnera pumilea</i> L.	Herb	B. F. Rocha et al. 42
<i>Portulaca mucronata</i> Link	Herb	B. F. Rocha et al. 338	<i>Turnera subulata</i> Sm.	Herb	B. F. Rocha et al. 215
<i>Portulaca oleracea</i> L.	Herb	B. F. Rocha et al. 288	Urticaceae		
<i>Portulaca umbraticola</i> Kunth	Herb	B. F. Rocha et al. 468	<i>Laportea aestuans</i> (L.) Chew	Herb	B. F. Rocha et al. 349
Rhamnaceae			Verbenaceae		
<i>Crumenaria decumbens</i> Mart.	Herb	B. F. Rocha et al. 432	<i>Lantana achyranthifolia</i> Desf.	Shrub	B. F. Rocha et al. 251
<i>Sarcomphalus joazeiro</i> (Mart.) Hauenschild	Tree	B. F. Rocha et al. 169	<i>Lantana canescens</i> Kunth	Shrub	B. F. Rocha et al. 110
Rubiaceae			<i>Lantana</i> (aff.) <i>tiliaefolia</i> Cham. *	Shrub	B. F. Rocha et al. 137
<i>Cordia rigida</i> (K. Schum.) Kuntze*	Subshrub	B. F. Rocha et al. 109	<i>Stachytarpheta coccinea</i> Schauer *	Shrub	B. F. Rocha et al. 119
<i>Hexasepalum teres</i> (Walter) J.H. Kirkbr.	Subshrub	B. F. Rocha et al. 39	Violaceae		
<i>Mitracarpus baturitensis</i> Sucre*	Herb	B. F. Rocha et al. 31	<i>Pombalia arenaria</i> (Ule) Paula-Souza*	Herb	B. F. Rocha et al. 41
<i>Richardia scabra</i> L.	Herb	B. F. Rocha et al. 44	Vitaceae		
Sapindaceae			<i>Cissus erosa</i> Rich.*	Climbing plant	B. F. Rocha et al. 138
<i>Cardiospermum corindum</i> L.	Climbing plant	B. F. Rocha et al. 93	Zygophyllaceae		
<i>Serjania marginata</i> Casar.	Climbing plant	B. F. Rocha et al. 266	<i>Tribulus terrestris</i> L.	Herb	B. F. Rocha et al. 368
<i>Urvillea stipitata</i> Radlk.*	Climbing plant	B. F. Rocha et al. 176	Indeterminada		
Sapotaceae				Shrub	B. F. Rocha et al. 111
<i>Sideroxylon obtusifolium</i> (Roem. & Schult.) T.D. Penn.	Tree	B. F. Rocha et al. 115	<i>Neltuma juliflora</i> (Sw.) Raf. and close to the administrative center of the reserve), indicating their colonization of habitats in the initial stages of regeneration. Among the 11 Poaceae species found, seven were cited by Ferreira et al. (2009) in their study at the Seridó Ecological Station (ESEC) in Rio Grande do Norte State as pioneer and/or invasive species:		
Solanaceae					
<i>Capsicum parvifolium</i> Sendtn.*	Shrub	B. F. Rocha et al. 347			

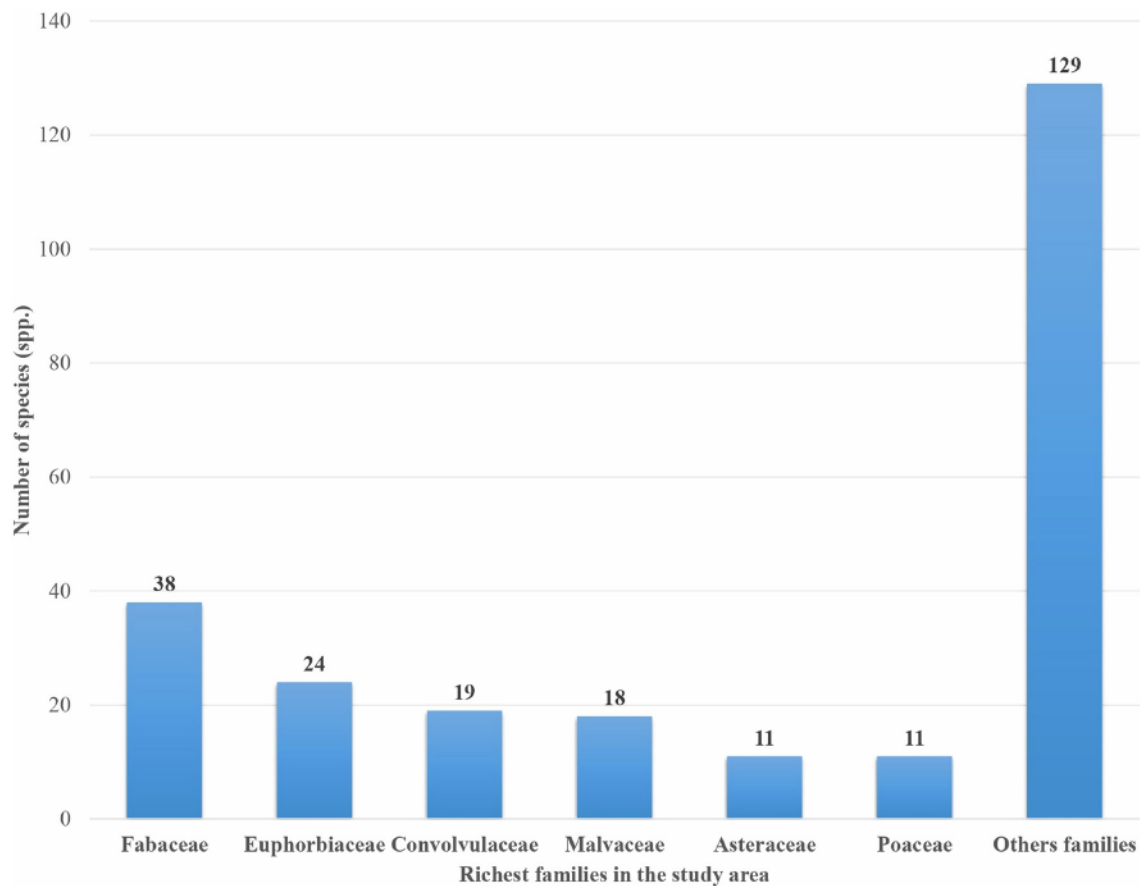


Figure 11. Number of species of the richest families in comparison with the others families in the Reserva Ecológica Olho d'Água das Onças, Picuí, Paraíba State, Brazil.

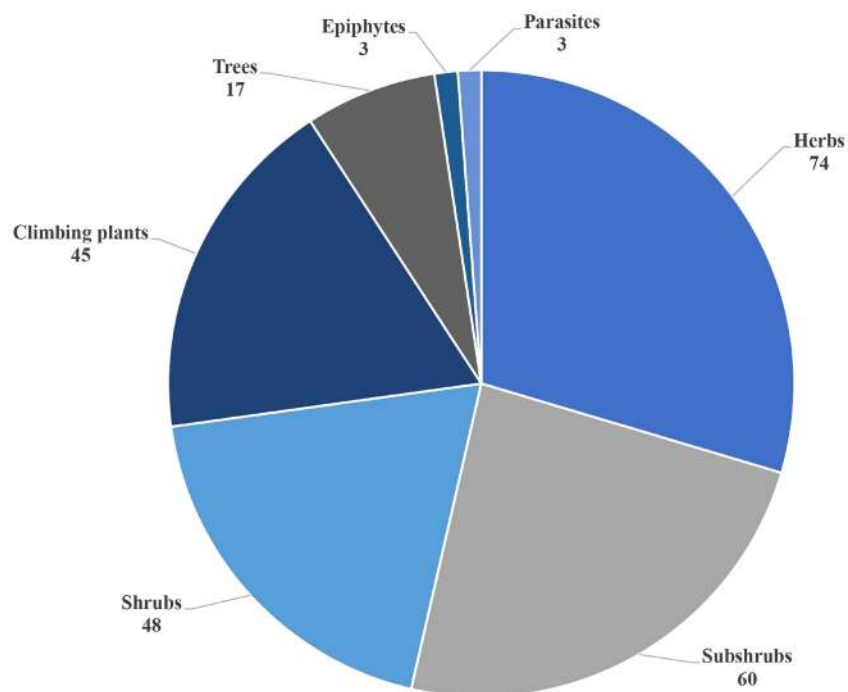


Figure 12. Distribution of Angiosperm growth form from Reserva Ecológica Olho d'Água das Onças, Picuí, Paraíba State, Brazil.

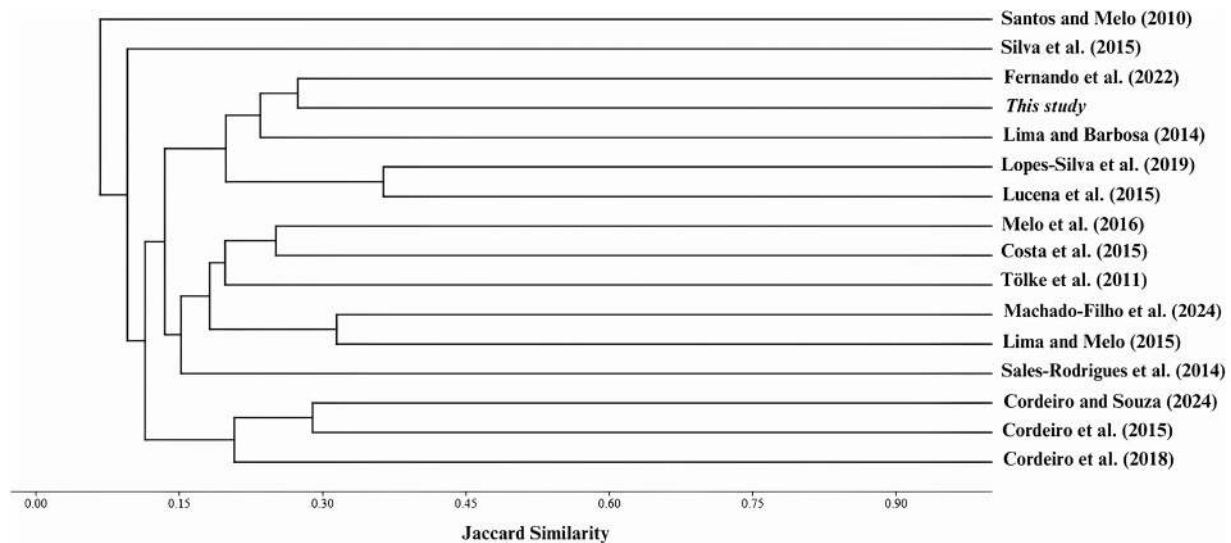


Figure 13. Dendrogram of floristic similarity including the present study and others floristic surveys conducted in the Caatinga domain throughout Paraíba State, Brazil.

Aristida setifolia Kunth, *Cenchrus ciliaris* L., *Chloris barbata* Sw., *Chloris virgata* Sw., *Dactyloctenium aegyptium* (L.) Willd., *Tragus berteronianus* Schult., and *Urochloa mollis* (Sw.) Morrone & Zuloaga, corroborating our results.

Asteraceae was the richest family on an inselberg located in the rural area of the municipality of Puxinanã, PB (Tölke et al. 2011), which exemplifies its ability to colonize this type of environment as pioneers. Poaceae was the richest family in a study carried out at Fazenda Tamanduá, Santa Terezinha, PB, where collections were carried out in both conserved and anthropized environments (Silva et al. 2012). This latter study focused only on the herbaceous component, which would tend to highlight the predominance of Poaceae species (generally herbaceous) (Silva et al. 2012); Poaceae is also the most taxonomically diverse monocot family in the Caatinga (Flora e Funga do Brasil, continuously updated). Asteraceae and Poaceae are cited in several other studies as being among the richest families (Araújo et al. 2008, Porto et al. 2008, Andrade et al. 2009, Costa et al. 2009, Lima and Barbosa 2014, Sales-Rodrigues et al. 2014, Lima and Melo 2015, Lucena et al. 2015, Silva et al. 2015, Melo et al. 2016, Fernando et al. 2022, Cordeiro and Souza 2024).

Several studies have shown that herbaceous plants predominate to the detriment of other growth form in crystalline basement Caatinga areas (Araújo et al. 2008, Porto et al. 2008, Costa et al. 2009, Tölke et al. 2011, Sales-Rodrigues et al. 2014, Lima e Melo 2015, Lucena et al. 2015, Silva et al. 2015, Melo et al. 2016, Fernando et al. 2022, Machado-Filho et al. 2024), differing from areas of sedimentary basement Caatinga (Gomes et al. 2006, Lima et al. 2009, Sousa et al. 2021), where arboreal and shrub habits predominate. The soils of crystalline basement Caatinga areas are shallow and stony, and water does not accumulate there for very long days after the rains (which themselves last only a few months) – which could explain the predominance of an herbaceous layer – with annual plants spending most of the year as seeds, developing and reproducing only when the rainy season begins again (Silva et al. 2017).

Regarding floristic similarity, the dendrogram indicates that the present study is most closely related to the surveys carried out by

Fernando et al. (2022) ($J = 27.4$) and Lima and Barbosa (2014) ($J = 23.2$), all of which were undertaken in protected areas, despite the relatively considerable distances between the REODO and these areas (107.3 km from Fazenda ABA – municipality of Passagem and 130.86 km from RPPN Fazenda Almas - municipality of São José dos Cordeiros). This finding reinforces the tendency of certain species of establish themselves in conserved areas. For instance, in our analysis, the species *Tanaecium parviflorum* (Mart. ex DC.) Kaehler & L.G.Lohmann (Bignoniaceae), *Evolvulus frankenioides* Moric. (Convolvulaceae), *Argythamnia malpighiacea* Ule, *Croton adenocalyx* Baill. (Euphorbiaceae), *Rhynchosia minima* (L.) DC. (Fabaceae) and *Stachytarpheta coccinea* Schauer (Verbenaceae) were recorded exclusively in these three studies.

Lopes-Silva et al. (2019) and Lucena et al. (2015) are the most closely related studies ($J = 36.3$), which can be attributed to both surveys had been undertaken in inselbergs in the municipality of Patos, and thus sharing specialized species adapted to this type of environment. In this context, Porembski (2007) notes that inselbergs are prominent rocky environment that create specific climatic and edaphic conditions, such as high temperature, low air humidity, minimal soil accumulation and limited water retention capacity, factors that favor a highly adapted flora. These surveys exhibit greater similarity to the group which the present study belongs, probably due to the proximity to the areas where Fernando et al. (2022) and Lima and Barbosa (2014) carried out their research.

The geographical proximity and microenvironmental characteristics also account for the relationship between the studies of Lima and Melo (2014) and Machado-Filho et al. (2024) ($J = 31.4$), both studies conducted in rocky outcrops within the Environmental Protection Area (APA) of Cariri, which encompasses the municipalities of Boa Vista and Cabaceiras. This proximity explains the floristic connections between these studies and those undertaken in rocky outcrops in the Agreste mesoregion, specifically in the municipalities of Pocinhos (Costa et al. 2015) and Puxinanã (Tölke et al. 2011, Sales-Rodrigues et al. 2014, Melo et al. 2016), all of them located on the Borborema Plateau. The lower floristic similarity between Sales-Rodrigues et al. (2014) and the other studies located on Borborema Plateau is likely due to the absence

of certain species that are relatively common in rocky outcrops, such as *Dyckia spectabilis* (Mart. ex Schult. & Schult.f.) Baker (Bromeliaceae) and *Senna martiana* (Benth.) H.S. Irwin & Barneby. (Fabaceae), which are present in the other studies of this group but not record in the study carried out by Sales-Rodrigues et al. (2014). Additionally, the presence of exclusive species, such as *Mandevilla dardanoi* M.F. Sales, Kin.-Gouv. & A.O. Simões (Apocynaceae), may had contributed to this difference.

Another group formed on the dendrogram includes the surveys carried out in the pre-coastal Agreste region, on the eastern edge of Caatinga in the Paraíba State (Cordeiro et al. 2015, Cordeiro et al. 2018, Cordeiro and Souza 2024). In this region, the climate type is As', characterized as hot and humid, with precipitation ranging between 800-1000 mm/year (Francisco et al. 2015), and it is bordered by the Borborema Plateau to the west and the coastal plateaus to the east (Costa et al. 2020). These distinctive conditions probably influenced the selection of flora in this area, resulting in a flora that is notably distinct from those in others analyzed regions, thereby explaining the formation of this group.

The study carried out by Silva et al. (2015), conducted along the Piranhas River, Sertão mesoregion, is the second least similar of the analyzed studies. This lower similarity is probably due to it being the only floristic survey focused on a riparian forest and the unique peculiarities of the study area, such as its low altitude of 148 m (Silva et al. 2015), which contributes to a distinct flora. The area studied by Santos and Melo (2010), despite being in Cariri region, where the surveys of Lima and Melo (2015) and Machado-Filho et al. (2024) were conducted, exhibited the lowest floristic similarity with all other studies (Tölke et al. 2011, Lima and Barbosa 2014, Sales-Rodrigues et al. 2014, Cordeiro et al. 2015, Costa et al. 2015, Lima and Melo 2015, Lucena et al. 2015, Silva et al. 2015, Melo et al. 2016, Cordeiro et al. 2018, Lopes-Silva et al. 2019, Fernando et al. 2022, Cordeiro and Souza 2024, Machado-Filho et al. 2024 and this study). This disparity can be attributed primarily to the limited sampling effort, which encompassed only six months of fieldwork, and the presence of recently anthropized patches in the study area.

Pinto et al. (2020) carried out a scientometric analysis of the Caatinga, listing the species considered invasive in this domain. Among the species they cited, five were encountered during our fieldwork: *Ricinus communis* L. (Euphorbiaceae), *Leucaena leucocephala* (Lam.) de Wit, *Neltuma juliflora* (Sw.) Raf. (Fabaceae), *Cenchrus ciliaris* L. and *Megathyrsus maximus* (Jacq.) B.K.Simon & S.W.L.Jacobs (Poaceae). *Ricinus communis*, *L. leucocephala*, and *C. ciliaris* were found near the reserve headquarters, a highly anthropized environment due to recreational activities carried out there; *M. maximus* was found close to an area invaded by *N. juliflora*, a frequent invasive species in areas of Caatinga (Andrade et al. 2010) that reduces biodiversity when it becomes well established. The occurrence of these species is likely associated with former uses of the area (agriculture and livestock raising) before becoming established as a protected conservation reserve in 2005.

Conclusion

The number of angiosperm species found in the Reserva Ecológica Olho d'Água das Onças was found to be high when compared to other studies carried out in Caatinga conserved sites in Paraíba State, Brazil.

Thirty species (12%) were identified as endemic to this phytogeographic domain, highlighting the importance of proactive conservation measures for managing the study area. Moreover, similarity analysis demonstrates a stronger relationship between REODO and other protected areas in the Paraíba semiarid region, reinforcing its priority for conservation. Some species are naturalized but restricted to anthropized locations. Their presence, however, is concerning, as it reflects the anthropization that took place in some locations in the Ecological Reserve before it was declared a conservation area. More studies will be necessary to fully determine the biodiversity of the Reserva Ecológica Olho d'Água das Onças and implement proactive measures to effectively protect the area.

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Guilherme Araújo da Luz: contributed to field works, identification and aid in figures preparation.

Michel Martins Rodrigues: contributed to field works and identification.

Fernanda Kalina da Silva Monteiro: contributed to field works and identification.

Ana Paula da Silva Lima: contributed to field works and identification.

Dilma Maria de Brito Melo Trovão: contributed to conception, field works, supervision, revision and research funding.

José Iranildo Miranda de Melo: contributed to conception, field works, supervision, identification, data interpretation, revision, editing and research funding.

Conflicts of Interest

The authors declares that they have no conflict of interest related to the publication of this manuscript.

Data Availability

Supporting data are available at <<https://doi.org/10.5281/zenodo.11237488>>.

References

- AESA 2024. Agência Executiva de Gestão das Águas. Available from <http://www.acesa.pb.gov.br/acesa-website/>. Accessed May 06, 2024.
- ALVES, J.J.A., ARAÚJO, M.A. & NASCIMENTO, S.S. 2008. Degradação da Caatinga: Uma investigação ecogeográfica. *Caminhos de Geografia* 9(27), 143–155. <https://doi.org/10.14393/RCG92715740>.
- ALVES, J.J.A. 2007. Geocologia da caatinga no semiárido do Nordeste brasileiro. *CLIMEP: Climatologia e Estudos da Paisagem* 2(1), 58–71.
- AMORIM, I.L., SAMPAIO, E.V.S.B. & ARAÚJO, E.L. 2005. Flora e estrutura da vegetação arbustivo-arbórea de uma área de caatinga do Seridó, RN, Brasil. *Acta Botanica Brasilica* 19(3), 615–623. <https://doi.org/10.1590/S0102-33062005000300023>.
- ANDRADE, L.A., FABRICANTE, J.R. & OLIVEIRA, F.X. 2010. Impactos da invasão de *Prosopis juliflora* (Sw.) DC. (Fabaceae) sobre o estrato arbustivo-arbóreo em áreas de Caatinga no Estado da Paraíba, Brasil. *Acta Scientiarum Biological Sciences*, 32(3), 249–255. <https://doi.org/10.4025/actasciobiolsci.v32i3.4535>.
- ANDRADE, M.V.M., ANDRADE, A.P., SILVA, D.S., BRUNO, R.L.A. & GUEDES, D.S. 2009. Levantamento florístico e estrutura fitossociológica do estrato herbáceo e subarbustivo em áreas de caatinga no Cariri paraibano. *Revista Caatinga*, 22(1), 229–237.
- APG IV. 2016. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society* 181(1), 1–20. <https://doi.org/10.1111/boj.12385>.
- ARAÚJO, F.S., OLIVEIRA, R.F. & LIMA-VERDE, L.W. 2008. Composição, espectro biológico e síndromes de dispersão da vegetação de um inselbergue no domínio da Caatinga, Ceará. *Rodriguésia*, 59(4), 659–671. <https://doi.org/10.1590/2175-7860200859403>.
- ARAUJO, K.D., PARENTE, H.N., ÉDER-SILVA, É., RAMALHO, C.I., DANTAS, R.T., ANDRADE, A. P. & SILVA, D.S. 2010. Levantamento florístico do estrato arbustivo-arbóreo em áreas contíguas de Caatinga no Cariri Paraibano. *Revista Caatinga* 23(1), 63–70.
- BARBOSA, M.R.V., LIMA, I.B., LIMA, J.R., CUNHA, J.P., AGRA, M.F. & THOMAS, W.W. 2007. Vegetação e Flora no Cariri Paraibano. *Oecologia Brasiliensis*, 11(3), 313–322.
- CHAVES, A.D.C.G., SANTOS, R.M.S., SANTOS, J.O., FERNANDES, A.A. & MARACAJÁ, P.B. 2013. A importância dos levantamentos florístico e fitossociológico para a conservação e preservação das florestas. *ACSA – Agropecuária Científica no Semiárido*, 9(2), 42–48. <https://doi.org/10.30969/acsa.v9i2.449>.
- CORDEIRO, J.M.P., ALMEIDA, E.M., ARAÚJO, J.P., SOUZA, B.I. & FELIX, L.P. 2015. Levantamento florístico preliminar da Caatinga sublitorânea na Paraíba, Nordeste do Brasil. *Geografia*, 40(2), 241–257.
- CORDEIRO, J.M.P., SOUZA, B.I. & FELIX, L.P. 2018. Levantamento florístico em afloramento rochoso no piemonte da Borborema, Paraíba, Brasil. *Geosul*, 33(67), 214–228. <https://doi.org/10.5007/2177-5230.2018v33n67p214>.
- CORDEIRO, J.M.P. & SOUZA, B.I. 2024. Plantas vasculares em fragmento de floresta estacional decídua, limite leste da Caatinga, Paraíba, Brasil. *Revista Caminhos de Geografia*, 25(97), 338–363. <https://doi.org/10.14393/RCG259768990>.
- COSTA, E.S.C., LOPES, S.F. & MELO, J.I.M. 2015. Floristic similarity and dispersal syndromes in a rocky outcrop in semi-arid Northeastern Brazil. *Revista de Biología Tropical*, 63(3), 827–843.
- COSTA, K.C., LIMA, A.L.A., FERNANDES, C.H.M., SILVA, M.C.N.A., SILVA, A.C.B.L. & RODAL, M.J.N. 2009. Flora vascular e formas de vida em um hectare de caatinga no Nordeste brasileiro. *Revista Brasileira de Ciências Agrárias*, 4(1), 48–54. <https://doi.org/10.5039/agraria.v4i1a8>.
- COSTA, L. R. F., MAIA, R. P., BARRETO, L. L. & SALES, V. C. C. 2020. Geomorfologia do Nordeste setentrional brasileiro: Uma proposta de classificação. *Revista Brasileira de Geomorfologia*, 21(1), 185–208. <https://doi.org/10.20502/rbg.v21i1.1447>.
- CRIA - CENTRO DE REFERÊNCIA EM INFORMAÇÃO AMBIENTAL. 2024. SpeciesLink. Available from <https://specieslink.net/search/>. Accessed May 06, 2024.
- FARIAS, R.C., LACERDA, A.V., GOMES, A.C., BARBOSA, F.M. & DORNELAS, C.S.M. 2017. Riqueza florística em uma área ciliar de Caatinga no Cariri Ocidental da Paraíba, Brasil. *Revista Brasileira de Gestão Ambiental e Sustentabilidade*, 4(7), 109–118. <https://dx.doi.org/10.21438/rbgas.040711>.
- FERNANDES, M.F. & QUEIROZ, L.P. 2018. Vegetação e flora da Caatinga. *Ciência e Cultura*, 70(4), 51–56. <http://dx.doi.org/10.21800/2317-66602018000400014>.
- FERNANDO, E.M.P., CAMPOS, K.G., MAMEDE, M.L. & LUCENA, M.F.A. 2022. Floristic survey of a Caatinga area of high biological importance in the Mesoregion of Paraíba backlands, Northeast Brazil. *Hoehnea* 49. Article e642021. <https://doi.org/10.1590/2236-8906-64/2021>.
- FERREIRA, C.G.T., OLIVEIRA, R.C., VALLS, J.F.M. & LOIOLA, M.I.B. 2009. Poaceae da Estação Ecológica do Seridó, Rio Grande do Norte, Brasil. *Hoehnea*, 36(4), 679–707. <https://doi.org/10.1590/S2236-89062009000400008>.
- FLORA E FUNGA DO BRASIL. 2024. Flora e Funga do Brasil. Available from <http://floradobrasil.jbrj.gov.br/>. Accessed May 06, 2024.
- FRANCISCO, P.R.M., MEDEIROS, R.M., SANTOS, D. & MATOS, R.M. 2015. Classificação Climática de Köppen e Thornthwaite para o Estado da Paraíba. *Revista Brasileira de Geografia Física*, 8(4), 1006–1016. <https://doi.org/10.5935/1984-2295.20150049>.
- FRANCISCO, P.R.M., PEREIRA, F.C., MEDEIROS, R.M. & SÁ, T.F.F. 2011. Zoneamento de risco climático e aptidão de cultivo para o município de Picuí – PB. *Revista Brasileira de Geografia Física*, 4(5), 1043–1055. <https://doi.org/10.26848/rbgf.v4i5.232756>.
- FRANCISCO, P.R.M. & SANTOS, D. 2017. Climatologia do Estado da Paraíba. EDUFPG.
- GBIF - GLOBAL BIODIVERSITY INFORMATION FACILITY. 2024. GBIF - Global Biodiversity Information Facility. Available from <https://www.gbif.org/>. Accessed May 06, 2024.
- GIULIETTI, A.M., BOCAGE-NETA, A.L., CASTRO, A.A.J.F., GAMARRA-ROJAS, C.F.L., SAMPAIO, E.V.S.B., VIRGÍNIO, J.F., QUEIROZ, L.P., FIGUEIREDO, M.A., RODAL, M.J.N., BARBOSA, M.R.V. & HARLEY, R.M. 2004. Diagnóstico da vegetação nativa do bioma Caatinga. In J.M.C. SILVA et al. (Eds.), *Biodiversidade da Caatinga: áreas e ações prioritárias para a conservação*. (pp. 48–90). Universidade Estadual de Pernambuco.
- GOMES, A.P.S., RODAL, M.J.N. & MELO, A.L. 2006. Florística e fitogeografia da vegetação arbustiva subcaducifólia da Chapada de São José, Buíque, PE, Brasil. *Acta Botânica Brasilica*, 20(1), 37–48. <https://doi.org/10.1590/S0102-33062006000100005>.

- GUEDES, R.S., ZANELLA, F.C.V., COSTA-JÚNIOR, J.E.V., SANTANA, G.M. & SILVA, J.A. 2012. Caracterização florístico-fitosociológica do componente lenhoso de um trecho de Caatinga no semiárido paraibano. *Revista Caatinga*, 25(2), 99–108.
- HAMMER, Ø., HARPER, D. A. T. & RYAN, P. D. 2001. PAST: Paleontological Statistics Software Package for Education and Data Analysis. *Palaeontologia Electrónica*, 4(1), 1–9.
- HUBÁLEK, Z. 1984. Coefficients of association and similarity, based on binary (presence-absence) data: an evaluation. *Biological Reviews of Cambridge Philosophical Society*, 57, 669–689.
- IBGE – INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. 2017. Divisão Regional Brasileira. Governo Federal Brasileiro. Available from https://geftp.ibge.gov.br/organizacao_do_territorio/divisao_regional/divisao_regional_do_brasil/divisao_regional_do_brasil_em_regioes_geograficas_2017/mapas/25_regioes_geograficas_paraiba.pdf Accessed May 06, 2024.
- IBGE – INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. 2022. Cidades e Estados. Governo Federal Brasileiro. Available from <https://www.ibge.gov.br/cidades-e-estados/pb/picui.html> Accessed May 06, 2024.
- LACERDA, A.V., BARBOSA, F.M. & BARBOSA, M.R.V. 2007. Estudo do componente arbustivo-arbóreo de matas ciliares na bacia do Rio Taperoá, semiárido paraibano: uma perspectiva para a sustentabilidade dos recursos naturais. *Oecologia Brasiliensis*, 11(3), 331–340.
- LIMA, E.A. & MELO, J.I.M. 2015. Biological spectrum and dispersal syndromes in an area of the semiarid region of north-eastern Brazil. *Acta Scientiarum Biological Sciences*, 37(1), 91–100. 10.4025/actasciobiolsci.v37i1.23141.
- LIMA, H.C., QUEIROZ, L.P., MORIM, M.P., SOUZA, V.C., DUTRA, V.F., BORTOLUZZI, R.L.C., IGANCI, J.R.V., FORTUNATO, R.H., VAZ, A.M.S.F., SOUZA, E.R., FILARDI, F.L.R., VALLS, J.F.M., GARCIA, F.C.P., FERNANDES, J.M., MARTINS-DA-SILVA, R.C.V., PEREZ, A.P.F., MANSANO, V.F., MIOTTO, S.T.S., TOZZI, A.M.G.A., MEIRELES, J.E., LIMA, L.C.P., OLIVEIRA, M.L.A.A., FLORES, A.S., TORKE, B.M., PINTO, R.B., LEWIS, G.P., BARROS, M.J.F., SCHÜTZ, R., PENNINGTON, T., KLITGAARD, B.B., RANDO, J.G., SCALON, V.R., CARDOSO, D.B.O.S., COSTA, L.C., SILVA, M.J., MOURA, T.M., BARROS, L.A.V., SILVA, M.C.R., QUEIROZ, R.T., SARTORI, A.L.B., CAMARGO, R.A., LIMA, I.B., COSTA, J., SOARES, M.V.B., SNAK, C., SÃO-MATEUS, W., FALCÃO, M.J., MARTIUS, M.V., REIS, I.P. & CORDULA, E. 2015. Fabaceae. *Flora e Funga do Brasil*. Available from <https://floradobrasil.jbrj.gov.br/FB115> Accessed May 07, 2024.
- LIMA, I.B. & BARBOSA, M.R.V. 2014. Composição florística da RPPN Fazenda Almas, no Cariri paraibano, Paraíba, Brasil. *Revista Nordestina de Biologia*, 23(1), 49–67.
- LIMA, J.R., SAMPAIO, E.V.S.B., RODAL, M.J.N. & ARAÚJO, F.S. 2009. Composição florística da floresta estacional decídua montana de Serra das Almas, CE, Brasil. *Acta Botânica Brasilica*, 23(3), 756–763. <https://doi.org/10.1590/S0102-33062009000300015>.
- LOPES-SILVA, R. F., RODRIGUES, J. S., GOMES-SILVA, F., LUCENA, D. S. & LUCENA, M. F. A. 2019. Composição florística de um *inselberg* no semiárido paraibano, nordeste brasileiro. *Rodriguésia*, 70. Article: e02812017. <https://doi.org/10.1590/2175-7860201970079>.
- LUCENA, D.S., LUCENA, M.F.A., SOUSA, J.M., SILVA, R.F.L. & SOUZA, P.F. 2015. Flora vascular de um inselbergue na mesorregião do sertão paraibano, nordeste do Brasil. *Scientia Plena*, 11(1), 1–11.
- MACHADO-FILHO, H., GIRALDO-CAÑAS, D. & MELO, J.I.M. 2024. Flora and similarities of a rocky outcrop in the Caatinga, eastern region of South America. *Caldasia*. Advance online publication. <https://doi.org/10.15446/caldasia.v46n1.92476>.
- MARQUES, F.J., CABRAL, A.G.A., LIMA, C.R. & FRANÇA, P.R.C. 2020. Florística e estrutura do componente arbustivo-arbóreo da caatinga nas margens do rio Sucuru em Coxixola Paraíba: reflexos da antropização. *Brazilian Journal of Development*, 6(4), 20058–20072. <https://doi.org/10.34117/bjdv6n4-252>.
- MEDEIROS, N.C.G., SOUSA, S.M.S., MONTEIRO, M.M., AZEVEDO, L.K.S. & SALES, F.C.V. 2021. Levantamento florístico e fitossociológico em remanescente florestal em Patos-PB. *Revista Desafios*, 8(1), 120–129. <https://doi.org/10.20873/uftv8-9968>.
- MELO, J.I.M., ARAÚJO, H.C.S., QUEIROZ, W.A., COSTA, M.J.P., COSTA, F.C.P. & SILVA, T.S. 2016. Composição florística de um afloramento rochoso na mesorregião Agreste do Estado da Paraíba, Brasil. In M. J. G. Andrade, E. M. S. Nogueira, & C. A. B. Santos (Eds.), *Ecologia e Biodiversidade do Semiárido Nordeste* (pp. 13–33). SABEH.
- MORO, M.F., LUGHADHA, E.N., FILER, D.L., ARAÚJO, F.S. & MARTINS, F.R. 2014. A catalogue of the vascular plants of the Caatinga Phytogeographical Domain: a synthesis of floristic and phytosociological surveys. *Phytotaxa* 160(1), 1–118. <https://doi.org/10.11646/phytotaxa.160.1.1>
- PEIXOTO, A.L. & MAIA, L.C. 2013. Manual de Procedimento para Herbários. Editora Universitária UFPE.
- PEREIRA-JÚNIOR, L.R., ANDRADE, A.P. & ARAÚJO, K.D. 2012. Composição florística e fitossociologia de um fragmento de Caatinga em Monteiro, Paraíba. *Holos*, 6, 73–87. <https://doi.org/10.15628/holos.2012.1188>.
- PINTO, A.S., MONTEIRO, F.K.S., RAMOS, M.B., ARAÚJO, R.C.C. & LOPES, S.F. 2020. Invasive plants in the Brazilian Caatinga: a scientometric analysis with prospects for conservation. *Neotropical Biology and Conservation*, 15(4), 503–520. <https://doi.org/10.3897/neotropical.15.e57403>.
- POREMBSKI, S. 2007. Tropical inselbergs: habitat types, adaptive strategies and diversity patterns. *Brazilian Journal of Botany*, 30(4), 579–586. <https://doi.org/10.1590/S0100-84042007000400004>.
- PORTO, P.A.F., ALMEIDA, A., PESSOA, W.J., TROVÃO, D. & FELIX, L.P. 2008. Composição Florística de um Inselberg no Agreste Paraibano, Município de Esperança, Nordeste do Brasil. *Revista Caatinga*, 21(2), 214–222.
- REFLORA - HERBÁRIO VIRTUAL. 2024. Reflora - Herbário Virtual. Available from <https://floradobrasil.jbrj.gov.br/reflora/herbarioVirtual/> Accessed May 06, 2024.
- SABINO, F.G.S., CUNHA, M.C.L. & SANTANA, G.M. 2016. Estrutura da vegetação em dois fragmentos de caatinga antropizada na Paraíba. *Floresta e Ambiente*, 23(4), 487–497. <https://doi.org/10.1590/2179-8087.017315>.
- SALES-RODRIGUES, J., BRASILEIRO, J.C. & MELO, J.I.M. 2014. Flora de um inselberg na mesorregião agreste do estado da Paraíba-Brasil. *Polibotânica*, 37, 47–61.
- SALES, F.C.V., ALVES, J.B., SOUZA, M.P., JUSTINO, S.T.P. & RAMOS, G.G. 2021. Caracterização vegetacional do Monumento Natural Vale dos Dinossauros em Sousa, Paraíba, Brasil. *Research, Society and Development*, 10(17). Article e39101724134. <https://doi.org/10.33448/rsd-v10i17.24134>.
- SANTANA, J.A.S., PIMENTA, A.S., SOUTO, J.S., ALMEIDA, F.V. & PACHECO, M.V. 2009. Levantamento Florístico e Associação de Espécies na Caatinga da Estação Ecológica do Seridó, Serra Negra do Norte – RN – Brasil. *Revista Verde de Agroecologia e Desenvolvimento Sustentável*, 4(4), 83–89.
- SANTOS, A.C.J. & MELO, J.I.M. 2010. Flora vascular de uma área de caatinga no estado da Paraíba - Nordeste do Brasil. *Revista Caatinga*, 23(2), 32–40.
- SILVA, A.G., VILAR, L.O., VILAR, V.O., COELHO, F.P., ACIOLI, N.R.S., RAMOS, R.B.G.A., MOREIRA, J.G., DIARES, T.R., SILVA, D.F., CRUZ, M.S. & MOURA, R.G. 2021. O manejo florestal sustentável da caatinga. *Revista Ibero-Americana de Humanidades, Ciências e Educação*, 7(5), 872–884. <https://doi.org/10.51891/rease.v7i5.1299>.
- SILVA, B.L.R., TAVARES, F.M. & CORTEZ, J.S.A. 2012. Composição florística do componente herbáceo de uma área de caatinga - Fazenda Tamandua, Paraíba, Brasil. *Revista de Geografia*, 29(3), 54–64.
- SILVA, F.G., SILVA, R.H., ARAÚJO, R.M., LUCENA, M.F.A. & SOUSA, J.M. 2015. Levantamento florístico de um trecho de mata ciliar na mesorregião do Sertão Paraibano. *Revista Brasileira de Biociências*, 13(4), 250–258.
- SILVA, Í.G., ASSIS, T.M.F., SILVA, L.A., LOPES, D.V. & REIS, J.S. 2022. Geociências e educação ambiental no semiárido: estudo de caso na Reserva Ecológica Olho d'Água das Onças. *International Journal Semiarid*, 5, 465–476.
- SILVA, J.M.C., BARBOSA, L.C.F., LEAL, I.R. & TABARELLI, M. 2017. The Caatinga: Understanding the Challenges. In J.M.C. SILVA, I.R. & M. TABARELLI. (Eds.), *Caatinga: The Largest Tropical Dry Forest Region in South America* (pp. 03–19). Springer. <https://doi.org/10.1007/978-3-319-68339-3>.

- SILVA, J.S. 2021. Roteiro turístico geoeseducativo na Reserva Ecológica Olho d'Água das Onças [Monograph, Universidade Federal de Campina Grande]. Biblioteca Digital de Teses e Dissertações da UFCG.
- SOARES, G., SANTOS, C.A.G. & LOEUILLE, B. 2021. Asteraceae na microrregião do Curimataú Ocidental, Estado da Paraíba, Brasil. *Hoehnea*, 48. Article e662020. <https://doi.org/10.1590/2236-8906-66/2020>.
- SOUSA, J.F.O., OLIVEIRA, A.A., CAMPOS, N.B., ALMEIDA-BEZERRA, J.W., SILVA, V.B., NASCIMENTO, M.P., FERNANDES, P.A.S., SANTOS, A.F., VASCONCELOS, J.M.P.B.L., SOUSA, M.R.F., SILVA, M.A.P. & MENDONÇA, A.C.A.M. 2021. Composição florística de duas áreas de Caatinga da Chapada do Araripe. *Research, Society and Development*, 10(13). Article e506101321398. <http://dx.doi.org/10.33448/rsd-v10i13.21398>.
- SOUSA, V.F., SANTOS, C.A.G. & MELO, J.I.M. 2021. Boraginales Juss. na Microrregião do Curimataú, PB. *Hoehnea* 48. Article e022020. <https://doi.org/10.1590/2236-8906-02/2020>.
- TÖLKE, E.E.A.D., SILVA, J.B., PEREIRA, A.R.L. & MELO, J.I.M. 2011. Flora vascular de um inselbergue no estado da Paraíba, Nordeste do Brasil. *Biotemas*, 24(4), 39–48. <https://doi.org/10.5007/2175-7925.2011v24n4p39>.
- TROPICOS.ORG. 2024. Tropicos. Available from <https://tropicos.org>. Accessed May 06, 2024.
- TROVÃO, D.M.B.M., FREIRE, Á.M. & MELO, J.I.M. 2010. Florística e fitossociologia do componente lenhoso da mata ciliar do riacho de Bodocongó, semiárido paraibano. *Revista Caatinga*, 23(2), 78–86.
- WALTERS, M. 2011. Collecting succulent plants for deposition in a herbarium. In M. WALTERS, E. FIGUEIREDO, N.R. CROUCH, P.J.D. WINTER, G.F. SMITH, H.G. ZIMMERMANN & B.K. MASHOPE. (Eds.), *Naturalised and invasive succulents of Southern Africa* (pp. 28–33). ABC Taxa.
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