

Floristic Survey of a Portion of the Vegetation Complex of the Coastal Zone in Piauí State, Brazil

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To cite this article:

Mateus Cardoso do Amaral, Jesus Rodrigues Lemos. Floristic Survey of a Portion of the Vegetation Complex of the Coastal Zone in Piauí State, Brazil. *American Journal of Life Sciences*. Vol. 3, No. 3, 2015, pp. 213-218. doi: 10.11648/j.ajls.20150303.22

Abstract: The coast of Piauí state, unexplored regarding its phytodiversity, instigates conducting research that contributes to the knowledge of its flora. This study aims to better understand the floristic diversity of a patch of vegetation in the village of Curral Velho (02° 52' 45" S and 41° 40' 01" W), in the municipality of Luis Correia, Piauí state. Random monthly samples were collected in the study area over eight months; 105 specimens were collected and 93 species belonging to 76 genera and 33 families were identified. Local flora includes floristic elements of *Caatinga*, *Cerrado* and *Restinga*, suggesting that the plant community in the coastal area of Piauí has a transitional nature. This study brings unpublished data on the floristic diversity of the studied area, contributing, ultimately, to the knowledge of the flora in the state as a whole. This is a pioneer and partial inventory in this portion of the state and does not portray its full phytodiversity, thus subsequent surveys are required to add data for a better knowledge on the flora in the studied stretch.

Keywords: Flora, Phytogeography, Piauí State

1. Introduction

The classification of the Brazilian territory in broad geographic areas [1] inevitably leads to a certain level of generality and vagueness. Maps and vegetation classifications of continental scale have trend to underestimate regional differences in physiognomy, structure and composition of plant communities. This is the case of Brazilian maps and systems of vegetation classification [2], that often ignore Restingas and coastal formations which, despite being relatively narrow bands of vegetation, can reach tens of kilometers into the continent [3].

Refs. [4,5] has individualized the stretch of the Brazilian Northeast coast that lies between Maranhão and the “curve of the South American continent”, in Rio Grande do Norte, as a unit called “*Litoral Setentrional do Nordeste*” (The Northern Coast of Brazilian Northeast) – LSN. Due to the geographical proximity of LSN with the area of *Caatinga*, *Cerrado* and Atlantic Forest, LSN allows the formation of a very peculiar ecotone: a floristic complex which includes species from *Caatinga*, *Cerrado*, Atlantic Forest and Amazon besides typical species from *Restingas* [6, 3, 7, 8, 9]. According to Ref. [10], studies in areas of transition between two or more

distinct ecosystems are still not common in Brazil, though to Ref. [11], ecotones in general show great floristic richness that brings together species from different plant communities, and areas with abrupt changes of vegetation may, however, occur.

Ref. [12] emphasize that Piauí state has its coastline under two recent geological formations: areas composed by quartz sands, and areas settled on the *Barreiras* Formation. Besides mangrove, the vegetation that occurs in this coast is the one known as *Tabuleiro* and *Restinga*, which shows variations in its features and these vegetation formations are most likely related to a combination of abiotic factors occurring in the area. Ref. [13] point out that this area is well characterized for having a mosaic of diverse ecosystems.

Ref. [14] highlights that coastal ecosystems are geologically recent environments, and plant species that inhabit there are typical from adjacent ecosystems, such as the Atlantic Forest, the *Tabuleiro* Forest and *Caatinga*. Ref. [15] emphasize that they are fragile complex and are highly affected by deforestation, besides depending on the hydric dynamics in the areas where they occur.

Early studies in the Northeastern Region were presented

through the pioneer Dárdano de Andrade Lima still in the 1950s [16]. Although great floristic diversity is observed in plant communities of the Northeastern Region [17], there is a great scarcity of research papers published, with only isolated floristic surveys [18, 19, 8]. Anyway, it is noticed that the northeastern coastal vegetation is quite diverse in terms of floristic richness. Fabaceae, Myrtaceae, Cyperaceae, Poaceae, and Euphorbiaceae are the families with the highest number of species [14, 20, 21, 22, 16], and they are often reported as being of great economic importance.

The northern coast of Piauí state, still little explored as to its phytodiversity, instigates conducting research that contributes to the knowledge of its flora, bringing positive results for both the scientific and local communities. Given this context, it thus becomes necessary and useful to know, disseminate and subsequently apply biological data derived from this knowledge in the everyday life of residents in this area, and awaken them to the extreme importance of the existence of ecosystems that hold a large plant diversity, which will be better observed and understood by the local population.

2. Materials and Methods

2.1. Study Area

The study was conducted in Curral Velho (02° 52' 45" S and 41° 40' 01" W), a village that belongs to the rural area of the municipality of Luís Correia (northern Piauí), which has approximately 46 km of coastline.

According to data obtained from the CPRM [23], the climatic conditions in the municipality of Luís Correia (whose center altitude is 10m above sea level) have minimum and maximum temperatures of 25°C to 32°C with warm tropical weather. The average annual rainfall (with a record of 1,200 mm.year⁻¹ in the center of the municipality) is defined in Equatorial Maritime Regime, with annual isohyets between 800-1600 mm.year⁻¹, about 5 to 6 months are the rainiest months and the remainder period is a dry season. The wettest quarter is formed by the months of February, March and April.

According to data contained in the works of Ref. [24] and Project RADAM [25], the soils in the county are represented by various types: Indiscriminate grouping of Eutrophic, Solodic and Non-Solodic Planosols, weak to moderate, with

medium texture, and stony and non-stony phase.

According to data from IBGE [26], the sampled area is characterized by a sandy barrier, with partially anthropized vegetation, corresponding to a semideciduous non-floodable open shrubby plant community, organized both as thickets and as areas of dense vegetation. Due to anthropic pressure in the region, by the presence of several farms near the area collected, is likely to be the elimination of populations of some species in the study area mainly through the use of natural areas for plantations.

2.2. Data Sampling and Analysis

Specimens collection was made by random walks by four people in an area from about 5 km², following the methodology adopted by Ref. [27], giving priority to fertile branches. In this study, the presence of invasive and/or introduced species in the area is also taken into account. Each sample consisted of five to seven specimens that were processed following the methodology described by Ref. [28] and identified in the Botany Laboratory of the Federal University of Piauí/Campus Ministro Reis Velloso, in the city of Parnaíba, using specialized literature and also by comparisons made in the Herbarium Graziela Barroso (TEPB). The botanical families followed the Angiosperm Phylogeny Group III System [29]. The botanical synonymies have been updated using the database available in the list of species of the Botanical Garden of Rio de Janeiro [30] as well as the name of authors of the species. The botanical collection is found deposited at the collection of the Herbarium HDelta and TEPB [31].

3. Results and Discussion

For the floristic survey in the area 105 specimens in reproductive stage were collected. Out of them, the botanical identification of 93 species belonging to 76 genera and 33 families was performed, and five were identified up to the genus level (Table 1). Families with higher species richness were Fabaceae (26 species) and Bignoniaceae and Euphorbiaceae (with six species each). Those data indicate that these families form a group of high floristic representation for the studied stretch.

Table 1. List of families and species recorded in a patch of vegetation on the coast of the Piauí state with its vernacular names, habit and collector number (CN) of Mateus Cardoso do Amaral.

Families/Species	Vernacular Name	Habit	CN
1 ACANTHACEAE			
1 <i>Dicliptera</i> sp.	-	Herb	29
2 AMARANTHACEAE			
2 <i>Alternanthera brasiliensis</i> (L.) Kuntze	-	Herb	16
3 <i>Alternanthera tenella</i> Colla	Apaga fogo	Herb	21
4 <i>Amaranthus deflexus</i> L.	-	Herb	86
5 <i>Froelichia interrupta</i> (L.) Moq.	-	Herb	20
3 ANACARDIACEAE			
6 <i>Myracrodruon urundeuva</i> Allemão	Aroeira	Tree	42
4 APOCYNACEAE			
7 <i>Allamanda blanchetti</i> A.DC.	Poliana-roxa	Shrub	13
8 <i>Aspidosperma pyrifolium</i> Mart.	Pereira	Tree	17

Families/Species	Vernacular Name	Habit	CN
9 <i>Calotropis procera</i> (Aiton) W.T. Aiton	Ciumeira	Shrub	52
10 <i>Cryptostegia grandiflora</i> R. Br.	Alamanda-roxa	Climber	84
5 ARISTOLOCHIACEAE			
11 <i>Aristolochia labiata</i> Willd.	Orelha-de-cavalo	Climber	23
6 ASTERACEAE			
12 <i>Acanthospermum hispidum</i> DC.	Carrapicho	Herb	83
13 <i>Bidens bipinnata</i> L.	-	Herb	27
7 BIGNONIACEAE			
14 <i>Anemopaegma chamberlaynii</i> (Sims) Bureau & K. Schum.	-	Climber	105
15 <i>Anemopaegma chrysoleucum</i> (Kunth.) Sandwith.	-	Climber	65
16 <i>Cuspidaria argentea</i> (Wawra) Sandwith	-	Shrub	12
17 <i>Fridericia platyphylla</i> (Cham.) L.G.Lohman	Cipó-uma	Shrub	06
18 <i>Lundia helicocalyx</i> A.H. Gentry	-	Shrub	61
19 <i>Handroanthus impetiginosus</i> (Mart. ex. DC.) Mattos	Ipê-roxo	Tree	35
8 BORAGINACEAE			
20 <i>Cordia affinis</i> Fresen.	-	Shrub	18
21 <i>Cordia rufescens</i> A.DC.	Grão-de-galo	Tree	19
22 <i>Heliotropium indicum</i> L.	Crista-de-galo	Climber	47
9 CHRYSOBALANACEAE			
23 <i>Chrysobalanus icaco</i> L.	Guajirú	Shrub	70
10 CYPERACEAE			
24 <i>Cyperus articulatus</i> L.	Junco	Herb	91
11 COMBRETACEAE			
25 <i>Combretum leprosum</i> Mart.	Mufumbo	Shrub	15
12 CONVOLVULACEAE			
26 <i>Ipomoea asarifolia</i> (Desr.) Roem. & Schult.	Salsa	Climber	89
27 <i>Ipomoea carnea</i> Jacq.	-	Shrub	72
28 <i>Ipomoea purpurea</i> (L.) Roth.	-	Climber	50
29 <i>Merremia aegyptia</i> (L.) Urb.	-	Climber	88
13 CUCURBITACEAE			
30 <i>Momordica charantia</i> L.	Melão-são-caetano	Climber	97
14 ERYTHROXYLACEAE			
31 <i>Erythroxylum</i> sp.	Cafê bravo	Shrub	03
15 EUPHORBIACEAE			
32 <i>Croton urucurana</i> Baill.	-	Shrub	11
33 <i>Cnidoscolus urens</i> (L.) Arthur	Cansanção	Herb	75
34 <i>Dalechampia pernambucensis</i> Baill.	-	Climber	54
35 <i>Jatropha gossypifolia</i> L.	Piã Roxo	Shrub	82
36 <i>Jatropha mollissima</i> (Pohl) Baill.	Piã manso	Shrub	92
37 <i>Ricinus communis</i> L.	Mamona	Shrub	71
16 FABACEAE			
38 <i>Bauhinia brevipes</i> Vogel	Pata-de-vaca	Shrub	01
39 <i>Bauhinia unguolata</i> L.	Mororó	Shrub	39
40 <i>Canavalia brasiliensis</i> Mart. ex Benth.	-	Shrub	10
41 <i>Cassia alata</i> L.	Fedegoso	Shrub	73
42 <i>Centrosema brasilianum</i> (L.) Benth	-	Climber	04
43 <i>Chamaecrista</i> sp.	-	Shrub	81
44 <i>Chamaecrista nictitans</i> (L.) Moench.	-	Shrub	26
45 <i>Chamaecrista rotundifolia</i> (Pers.) Greene	-	Shrub	104
46 <i>Copaifera langsdorffii</i> Desf.	Podói	Tree	58
47 <i>Crotalaria incana</i> L.	-	Shrub	93
48 <i>Dioclea grandiflora</i> Mart. ex. Benth.	Mucunã	Shrub	46
49 <i>Hymenaea courbaril</i> L.	Jatobá	Tree	31
50 <i>Libidibia ferrea</i> (Mart. Ex Tul.) L.P.Queiroz	Jucá	Tree	37
51 <i>Luetzelburgia</i> sp.	-	Shrub	41
52 <i>Macroptilium atropurpureum</i> (Sessé & Moc. ex DC.) Urb.	-	Shrub	33
53 <i>Macroptilium lathyroides</i> (L.) Urb.	-	Shrub	98
54 <i>Mimosa caesalpiniiifolia</i> Benth.	Sabiá	Tree	30
55 <i>Mimosa pudica</i> L.	Malícia	Herb	77
56 <i>Poincianella gardneriana</i> (Benth.) L.P.Queiroz	Catingueira	Shrub	02
57 <i>Pityrocarpa moniliformis</i> (Benth.) Luckow & R.W.Jobson	Catanduva	Shrub	40
58 <i>Senegalia langsdorffii</i> (Benth.) Seigler & Ebinger.	Acácia	Tree	07
59 <i>Senna cearensis</i> Afr. Fern.	-	Shrub	60
60 <i>Senna obtusifolia</i> (L.) Irwin & Barneby	-	Shrub	78
61 <i>Senna occidentalis</i> (L.) H.S. Irwin & R.C. Barneby	Manjerioba	Shrub	79
62 <i>Vachellia farnesiana</i> (L.) Wight & Arn.	Coronha	Shrub	49
63 <i>Leucaena leucocephala</i> (Lam.) de Wit.	-	Shrub	87

Families/Species	Vernacular Name	Habit	CN
17 MALPIGHIACEAE			
64 <i>Byrsonima gardneriana</i> A. Juss.	Murici	Shrub	14
18 MALVACEAE			
65 <i>Gossypium barbadense</i> L.	Algodão	Shrub	74
66 <i>Pavonia cancellata</i> (L.) Cav.	-	Climber	102
67 <i>Sida glomerata</i> Cav.	-	Herb	80
68 <i>Sidastrum micranthum</i> (A.St.-Hil.) Fruxell	-	Herb	100
19 LAMIACEAE			
69 <i>Amasonia campestris</i> (Aubl.) Moldenke	-	Herb	51
70 <i>Hyptis</i> sp.	-	Herb	63
71 <i>Marsypianthes montana</i> Benth.	-	Herb	95
72 <i>Mesosphaerum suaveolens</i> (L.) Kuntze	Carrapicho	Herb	36
20 LOGANIACEAE			
73 <i>Spigelia anthelmia</i> L.	Pimenta-da-água	Herb	101
21 LORANTACEAE			
74 <i>Struthanthus oerstedii</i> (Oliv.) Standl.	Erva-de-passarinho	Herb	53
22 MYRTACEAE			
75 <i>Campomanesia aromatica</i> (Aubl.) Griseb.	Guabiraba	Shrub	67
23 OLACACEAE			
76 <i>Ximenia americana</i> L.	Ameixa brava	Shrub	09
24 PASSIFLORACEAE			
77 <i>Passiflora foetida</i> L.	Maracujá-de-estrada	Climber	85
78 <i>Passiflora sub-rotunda</i> Mast.	Maracujá bravo	Climber	28
25 PLANTAGINACEAE			
79 <i>Scoparia dulcis</i> L.	Vassourinha	Herb	94
80 <i>Stemodia maritima</i> L.	-	Herb	43
26 POACEAE			
81 <i>Urochloa brizantha</i> (Hochst. ex A. Rich.) R.D.Webster	-	Herb	90
27 POLYGALACEAE			
82 <i>Bredemeyera floribunda</i> Willd.	-	Tree	62
28 RUBIACEAE			
83 <i>Genipa americana</i> L.	Jenipapo	Tree	59
84 <i>Guettarda angelica</i> Mart. ex Müll.Arg.	Angélica	Tree	32
85 <i>Mitracarpus hirtus</i> (L.) DC.	-	Herb	22,38
29 SAPINDACEAE			
86 <i>Cardiospermum halicacabum</i> L.	Balãozinho	Climber	55
30 SOLANACEAE			
87 <i>Solanum paludosum</i> Moric.	-	Shrub	56
88 <i>Solanum aculeatissimum</i> Jacq.	-	Herb	44
31 TURNERACEAE			
89 <i>Turnera chamaedrifolia</i> Cambess.	-	Herb	24
90 <i>Turnera ulmifolia</i> L.	Chanana	Herb	96
32 URTICACEAE			
91 <i>Urtica dioica</i> L.	Urtiga	Herb	76
33 VERBENACEAE			
92 <i>Lantana camara</i> L.	-	Herb	05
93 <i>Lippia alba</i> (Mill) N.E.Br.	Cidreirinha	Herb	99

The most representative families found in the study area were also mentioned earlier in the study by Ref. [16], which also found that the physiognomy of *Restinga* in Piauí is similar to the ones in the North, South and Southeast Regions of Brazil (fields, fruitful and forestry) and still showed through a dendrogram of floristic similarity that the vegetation of the municipalities of Luís Correia, Parnaíba and Ilha Grande has similarities to other *Restingas* in northeastern Brazil.

In the sampled area we observed the predominance of species of shrub habit (40.86%), with representatives in 17 out of the 36 families identified in the area. The herbaceous habit corresponded to 31.18% of species and climber (vines) and tree habits are represented by 15.05% and 12.90%, respectively (Table 1). These data reveal that the floristic composition of the area consists mainly of specimens of shrub layer interspersed with open areas consisting of herbaceous plants.

Analyzing the distribution of the species recorded in the study area and comparing them to main surveys in Piauí in *Caatinga* [32, 33, 34], *Cerrado* [35, 13, 36] and *Carrasco* areas [37, 38], it was possible to identify characteristic species of these plant formations composing the flora of the studied vegetation. It was found that 29.03% of the species identified in the area were found in surveys of *Cerrado*, 25.80% in areas of *Caatinga* and 16.12% in studies conducted in *Carrasco*.

According to data from CEPRO [39], plant formations in Piauí state are influenced by different other vegetation formations, such as the ones in the Amazon, the Central Plateau (*Cerrado*) and the xeric vegetation present in the Brazilian Northeast, and it is characterized by presenting great diversity of ecosystems, such as the semideciduous broadleaf forest, the mixed semideciduous forest, the non-thorny deciduous broadleaf forest, and the transition

areas between *Babaçu Forest/Cerrado*, *Mata Seca/Cerrado* and *Cerrado/Caatinga*. According to Ref. [13], transition areas of the state correspond to 19% of its territory.

After the comparative results between the subject area of this study and other surveys in various vegetational formations of the semi-arid northeast [35, 32, 33, 13, 34, 36, 37, 38, 40, 41, 42], it becomes apparent that the study area has the highest floristic similarity to the surveys on *Cerrado* and *Caatinga*, which points to the fact that the study area is an area of *Caatinga-Cerrado* transition, coinciding with that described by Ref. [16] in his study area.

Species of widely occurrence in areas of *Cerrado* in Piauí [35, 13, 36, 40, 41] such as *Byrsonima gardneriana*, *Hymenaea courbaril*, *Fridericia platyphylla*, *Bauhinia unguolata* and *Copaifera langsdorffii*, for example, were recorded in the study area, as well as in the *Caatinga* in this state [32, 33, 34], for example *Aspidosperma pyrifolium*, *Combretum leprosum*, *Pityrocarpa moniliformis* and *Acacia langsdorffii*. Moreover, it is possible to cite the typical species of the *Restinga* along the coast of Piauí [16] such as *Ipomoea asarifolia* and *Chrysobalanus icaco* and also species occurring in *Carrasco*, such as *Mimosa caesalpinifolia* and *Mitracarpus hirtus* [37, 38]. On the other hand, some species recorded in the study area are reported as being widely distributed, such as *Ximenia americana* and *Handroanthus impetiginosus* [42].

According to Ref. [43], considering that some species of *Cerrado* and also *Caatinga* have certain success in installing coastal environments and when one realizes that the local flora tends to be a mixture of species of different phytogeographical areas, they used the intermediary local climatic conditions to settle. The same authors also claim that from this condition it is noticed that the northern coast of Northeastern Brazil appears to serve, in greater or lesser degree, as an ecological corridor between *Cerrado* in the west and the Atlantic Forest in the east, surrounded by *Caatinga*. This mosaic of environmental conditions, in this ground, allows the coexistence of species in *Caatinga*, *Cerrado*, *Psamófilas* species and even forest species.

4. Conclusion

It was found that the flora present in the studied area has typical species from *Caatinga*, *Cerrado* and *Restinga*, suggesting that the plant community located in the studied coastal area of Piauí state has a transitional nature, as already mentioned by some authors.

In a general context, this survey provides unpublished data of the floristic diversity of the study area, contributing, ultimately, to the knowledge of the phytodiversity in Piauí state as a whole, still lacking in studies of such nature.

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