

Mosses of Maranhão, Brazil: Occurrence and Distribution of Species

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Abstract: The objective of the research was to record the moss species for the Cerrado phytogeographic domain of the State of Maranhão/Brazil. were identified 80 mosses species, distributed in 41 genera and 20 families. The recorded taxa, occur in almost all Brazilian phytogeographic regions. Of the analyzed families, Calymperaceae, Fissidentaceae, Sematophyllaceae and Pottiaceae were the most representative in number of specimens and species. The studied mosses have the capacity to be fixed in the most varied substrates, which facilitated the collection of a large number of bryological material. The substrate most colonized was the corticolous, which proved to be the preferred for many species, followed by the terrestrial and epixylic substrates. The Cerrado of Maranhão presents 25.15% of the number of species estimated for the Brazilian Cerrado. The work presents graphs with the number of specimens of mosses by colonized substrates; list of moss families with their respective genera and species numbers, as well as geographical distribution in Brazil and in the Brazilian phytogeographical domains.

Keywords: Bryological Collection, Bryology, Maranhão Plants, Mosses from Brazil.

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I. Introduction

Bryophytes are plants avascular and cryptogams that are represented by three distinct groups, the hornworts, the mosses and the liverworts, that belong respectively to the divisions or phylum Anthocerotophyta¹, Bryophyta² and Marchantiophyta³.

The group has many ecological functions, because they are important bioindicators of the quality of air and water^{4,5} are still considered ideal species for impact studies of global climate change⁶ and although its ecological role has not yet been sufficiently studied, it is known that several animal species, such as tardigrades, they live exclusively on moss throughout their lifetime⁷.

According to⁵, bryophytes have anti-carcinogenic activity, inflammatory and alelopathic and are also producing antibiotics and antivirals. They have been used also as model organisms in cellular development studies in molecular biology⁸.

Brazil has a rich bryoflora, with about 1524 species⁹. The wide geographical distribution of the moss rate is justified by possessing characteristics that enable its ability to adapt to the conditions of the medium¹⁰, and may inhabit the most diverse substrates, highlighting: dead or alive trunks, rocks, decaying materials, soils, among others¹¹.

After the enactment of the Convention on Biological Diversity (CBD), the herbariums headquartered in different institutions, mainly museums, universities and botanical gardens, became more evident to society and to governments, among other reasons, because they are responsible for the custody of the botanical species, which document the biodiversity. The specimens deposited in these institutions, hereinafter called biological collections, are records of the past and recent morphological and genetic variation of the geographical distribution, as well as other valuable information¹².

Thus, biological collections are commonly organized from exemplary witnesses of the research, or teaching, performed by professionals, or institutions with these missions, inserted in the most diverse areas of knowledge. All the biological material collected follows a flow of ranking, identification, deposit, or tipping,

which allows its availability to the scientific community, promoting loans, donations, permutations and the establishment of new research projects, which end up repercussions on new deposits and exchanges¹³.

As for the Bryological Collections, these are extremely important for providing the custody of the bryophytes species and information about the abiotic data observed in the field. These collections record the geographical distribution, phytogeographic domains and the various colonized substrates. According to¹⁴, the study of bryophytes is still scarce for some regions and states of Brazil, some present very low numbers of occurrences due to lack of local studies.

However, for the Cerrado from Maranhão, several works of floristic and taxonomic of bryophytes have been carried out to fill gaps of knowledge about the group, with emphasis the works:^{15, 16, 17, 18, 19, 20, 21, 22, 23}.

This work was aimed to know the species of mosses in the Bryological collection of the Herbarium Prof. Aylthon Brandão Joly from CESC/UEMA, as well as provide grants to assist in future research on the species of bryophytes occurring in the Cerrado from Maranhão.

II. Material and Methods

The samples of bryophytes analyzed belong to the Bryological Collection of the Herbarium Prof. Aylthon Brandão Joly, located in the Center of Superior Studies of Caxias/CESEC, the State University of Maranhão/UEMA. The herbarium was founded in 2006, with the objective of storing information about the phytodiversity of the flora of Maranhão. The collection has in its collections specimens of Cryptogams, being these ferns, licophytes and bryophytes, as well as Phanerogams species, and copies donated by Herbariums from other Brazilian states.

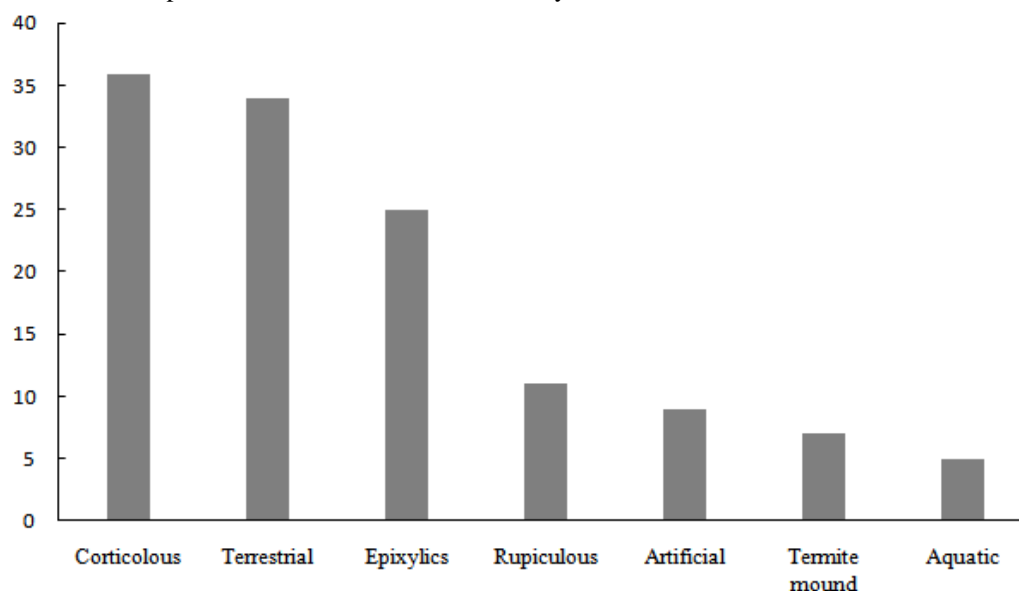
For the study were reviewed taxonomically the species of moss in the Bryological Collection, using the works of^{24, 11, 25} and²⁶. The classification system used was that of⁹.

III. Result and Discussion

Were identified a total of 80 species belonging to the phylum Bryophyta, distributed in 20 families: Archidiaceae, Bartramiaceae, Bryaceae, Calymperaceae, Dicranaceae, Ditrichaceae, Entodontaceae, Fabroniaceae, Fissidentaceae, Helicophyllaceae, Hypnaceae, Pilotriachaceae, Pottiaceae, Pterobryaceae, Rhachithecaceae, Sematophyllaceae, Sphagnaceae, Splachnobryaceae, Stereophyllaceae and Thuidiaceae (Table 2). These families present occurrences in almost all Brazilian regions, according to the data of the Flora do Brazil 2020, list of species of bryophytes for Maranhão prepared by:^{18, 16, 17, 15, 20, 21, 22, 23} and⁹, to Brazil which included bryophytes of the state of Maranhão.

Of the twenty families present in the collection, four presented higher percentages in number of species: Calymperaceae (17%), Fissidentaceae (17%), Sematophyllaceae (11%) and Pottiaceae (8%). These families demonstrate the capacity, which they have to fixate on the most varied substrates, which facilitates a large number of collected material (Figure 1). The most colonized substrate was living trunk, demonstrating to be preferential for some species such as *Octoblepharum albidum* Hedw, followed by soil and dead trunk.

Figure 1. Number of specimens and substrates colonized by the moss from Cerrado of Maranhão/Brazil



It was found that the Cerrado Maranhão has about 25% of the total species cited for the Cerrado from Brazil (Table 1), where the most representative families are Calymperaceae and Fissidentaceae, followed by Bryaceae, Sematophyllaceae and Pottiaceae. According to ²⁷ The data reflects the current knowledge of this group of plants in Brazil and the states with fewer taxa, possibly, have a greater diversity of what is known today, since in recent years the numbers come Increasing, mainly in the Northeast and Midwest regions, depending on the studies carried out by new specialists and their student groups.

The species sampled in this work demonstrated a wide geographic distribution in Brazil (Table 2), among them are the species that were distributed in about 78% of the Brazilian states: *Philonotis uncinata* (Schwägr.) Brid. /Bartramiaceae; *Octoblepharum pulvinatum* (Dozy & Molk.) Mitt.; *Syrrophodon prolifer* Broth. /Calymperaceae; *Dicranella hilariana* (Mont.) Mitt. /Dicranaceae; *Fissidens elegans* Brid.; *Fissidens submarginatus* Bruch.; *Fissidens zollingeri* Mont. /Fissidentaceae; *Fabroniaciliares*(Brid.) Brid. /Fabroniaceae; *Chryso-hypnum subdiminutivum* (Hampe); *Isopterygium tenerum* Mitt.; *Vesicularia vesicularis* (Schwägr.) Broth. /Hypnaceae; *Calliscostella pallida* (Hornsch.) Angstrom. /Pilotrichaceae; *Hyophilla involuta* (Hook.) Jaeg. /Pottiaceae; *Brittonodoxa subpinnata* (Brid.) W.R. Buck, P.E.A.S. Câmara & Carv.-Silva; *Microcalpe subsimplex* (Hedw.) W.R. Buck; *Taxithelium portoricense* R. S. Williams /Sematophyllaceae; *Entodontopsis leucostega* (Brid.) Mitt. /Stereophyllaceae. Among the species, *Octoblepharum albidum* Hedw., was distributed in 100% of Brazilian states being considered a kind of great adaptation to the varied types of environments, and in all regions of the tropics, being characterized as Pantropical.

As for the distribution of species in the Brazilian phytogeographic areas, it was characterized as widely distributed (Table 3). The most diversified, to those registered in all phytogeographic domains, are the species: *Philonotis uncinata* (Schwägr.) Brid. (Bartramiaceae); *Octoblepharum albidum* Hedw. (Calymperaceae); *Fissidens angustifolius* Sull.; *Fissidens angustelimbatus* Mitt.; *Fissidens crispus* Mont.; *Fissidens falccidus* Mitt.; *Fissidens submarginatus* Bruch. (Fissidentaceae); *Helicophyllum torquatum* (Hook.) Brid. (Helicophyllaceae); *Calliscostella pallida* (Hornsch.) Angstrom. (Pilotricaceae); *Hyophilla involuta* (Hook.) Jaeg. (Pottiaceae); *Microcalpe subsimplex* (Hedw.) W.R. Buck. (Sematophyllaceae), With the Fissidentaceae family presenting greater distribution among the domains.

Table 1. Listing of the families of mosses, with their respective numbers of genera and species, found in the Cerrado fragment State of Maranhão/Brazil compared with total already registered for the Phytogeographic domain Cerrado, according to Flora of Brazil 2020.

| Families | Genera | Species |
|-------------------|-----------|---------------|
| Archidiaceae | 01 | 1 |
| Bartramiaceae | 01 | 3 |
| Bryaceae | 05 | 9 |
| Calymperaceae | 03 | 14 |
| Dicranaceae | 02 | 05 |
| Ditrichaceae | 01 | 01 |
| Entodontaceae | 02 | 02 |
| Erpodiaceae | 01 | 01 |
| Fabroniaceae | 01 | 02 |
| Fissidentaceae | 01 | 14 |
| Helicophyllaceae | 01 | 01 |
| Hypnaceae | 04 | 05 |
| Pilotrichaceae | 01 | 01 |
| Pottiaceae | 06 | 07 |
| Pterobryaceae | 02 | 02 |
| Rhachithecaceae | 01 | 01 |
| Semathophyllaceae | 03 | 09 |
| Sphagnaceae | 01 | 01 |
| Splanchnobryaceae | 02 | 02 |
| Thuidiaceae | 03 | 03 |
| Total | 41 | 80/318 |

Table2. Geographical distribution of the registered moss species of the Bryological Collection, Maranhão/Brazil.

| FAMILIES SPECIES US | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|--|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Archidiaceae | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Archidium ohioense</i> Schimp. Ex Müll. Hal. | | • | | | • | • | | | • | | • | • | • | | • | | • | • | | | • | • | | | | | |
| Bartramiaceae | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Philonotis cermua</i> (Wilson) Griffin & W.R. Buck | | | | | | • | • | | • | • | • | | | | • | | | | • | | • | | | • | • | • | |
| <i>Philonotis elongata</i> (Dumort.) H. A. Crum & Steere | | | | • | • | • | | | | | • | | | | • | • | | | | | | | | | • | | |
| <i>Philonotis sphaerocarpa</i> Dism. | | | | • | • | • | | | | | • | | | | | | | | • | | | | | • | | | |
| <i>Philonotis uncinata</i> (Schwägr.) Brid. | • | | • | • | • | • | • | • | • | | | • | • | • | • | • | • | • | • | • | • | • | | | • | • | • |
| Bryaceae | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Brachymerium exile</i> (Dozy & Molke.) J. R. Spence & h. Ramsay | | | | | • | | | | | | | • | | | | | • | | • | | | | | | • | | |
| <i>Brachymerium fabronioides</i> (Müll. Hal.) Paris | | | | | • | | | • | | • | | | | | | | | | | | | | | | | | |
| <i>Brachymerium patulum</i> (Müll. Hal.) Schimp. | | | | | | | | | | • | | | | | | • | | | | | | | | | | | |
| <i>Bryum apiculatum</i> Schwägr | • | | | | | • | • | | • | • | | • | • | • | | • | | | | • | | | | | • | • | |
| <i>Bryum caespiticium</i> Hedw. | | | | | | | | | | • | | | | | | | | | | | | | | | | | |
| <i>Bryum coronatum</i> Schwägr. | | • | | | | | • | • | • | | • | • | • | | • | | • | | • | | | • | | • | • | | • |
| <i>Bryum limbatum</i> Müll. Hal. | | | | | | | • | • | | | | • | • | | | • | | | • | | • | | | • | • | | |
| <i>Rosulabryum billardieri</i> (Schwägr.) J.R. Spence | • | | | | | • | • | | • | | | • | • | • | | • | | | • | | • | | | • | • | | |
| Calymperaceae | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| <i>Calymperes afzelii</i> Sw. | . | | | . | . | | . | | . | . | | . | | . | | . | . | . | . | | . | |
| <i>Calymperes erosum</i> Müll. C. | . | | . | . | . | | . | | . | . | | . | | . | | . | . | | | | | |
| <i>Calymperes tenerum</i> Müll. C. | | | | | | | . | | . | | | | | . | | | | | . | | | |
| <i>Calymperes palisotii</i> Schwagr. | | . | . | . | . | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Octoblepharum albidum</i> Hedw | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Octoblepharum cocuiense</i> Mitt. | . | | | . | . | . | . | | . | . | . | . | | . | | . | . | | . | | | |
| <i>Octoblepharum pulvinatum</i> (Dozy & Molk.) Mitt. | . | . | . | . | . | . | . | | . | . | . | . | | . | | . | . | . | . | . | . | |
| <i>Syrrhopodon gardneri</i> (Hook.) Schwägr. | | | . | . | | . | . | | . | | | | | . | | | | | | | | |
| <i>Syrrhopodon gaudichaudii</i> Mont. | | | . | . | . | . | . | . | . | . | . | . | | . | . | . | . | . | . | . | . | |
| <i>Syrrhopodon incompletum</i> Mont. | . | . | . | . | . | . | . | | . | . | . | . | | . | | . | . | . | . | . | . | |
| <i>Syrrhopodon ligulatus</i> Mont. | . | . | . | . | . | . | . | | . | . | . | . | | . | | . | . | | . | | | |
| <i>Syrrhopodon prolifer</i> Broth. | . | . | . | . | . | . | . | | . | . | . | . | | . | . | . | . | . | . | . | . | |
| Dicranaceae | | | | | | | | | | | | | | | | | | | | | | |
| <i>Campylopus coralinae</i> Grout. | | | | . | . | | | | . | . | . | | | | | | . | | | | | |
| <i>Campylopus heterostachys</i> (Hampe) A. Jaeger | | | | . | . | . | . | . | . | . | . | | . | . | . | . | . | . | . | . | . | |
| <i>Campylopus savannarum</i> (Müll. Hal.) Mitt. | | | | . | . | . | . | . | . | . | . | | . | . | . | . | . | . | . | . | . | |
| <i>Campylopus surinamensis</i> Müll. Hal. | | | | . | . | . | . | . | . | . | . | | . | . | . | . | . | . | . | . | . | |
| <i>Dicranella hilariana</i> (Mont.) Mitt. | . | . | . | . | . | . | . | . | . | . | . | . | | . | . | . | . | . | . | . | . | |
| Ditrichaceae | | | | | | | | | | | | | | | | | | | | | | |
| <i>Garkea flexuosa</i> (Griff) (Griffith) Marg. | | | | | | | . | | | | | | | | | | | | | | . | |

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| Entodontaceae | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Entodon jamesanii</i> (Taylor) Mitt. | | | | | . | | | | . | | . | | | . | | | | | . | | . | | | | | | |
| Erpodiaceae | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Erpodium coronatum</i> (Hook. & Wilson) Mitt. | | | | . | . | . | | . | . | . | . | . | . | | . | | | | | | | | | | . | | |
| Fissidentaceae | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Fissidens angustifolius</i> Sull. | . | | . | . | . | | . | . | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens angustelimbatus</i> Mitt. | . | | . | . | . | . | . | . | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens arnatus</i> Herzog. | . | | . | . | . | . | . | . | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens crispus</i> Mont. | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens elegans</i> Brid. | . | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens falccidus</i> Mitt. | . | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens goyanensis</i> Broth. | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens intromarginatus</i> (Hampe) Mitt. | . | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens lindbergii</i> Mitt. | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens palmatus</i> Hedw. | . | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens perfalcatus</i> Broth. | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens submarginatus</i> Bruch. | . | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens wallisii</i> Mull. Hal. | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fissidens zollingeri</i> Mont. | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| Fabroniaceae | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Fabronia ciliarens</i> (Brid.) Brid. | . | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| <i>Fabronia pusilla</i> Raddi | | | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| Helicophyllaceae | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| <i>Jaegerina scariosa</i> (Lorentz) Meteroriu m. S. L. | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| <i>Orthostic hopsis praetermissa</i> Buck. W. R. | | | • | • | | | | • | | | | | | | | | | | | | | | |
| Rhachitheciaceae | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Zandera octoblepharis</i> (A. Jaeger) Goffinet, B. | | | • | • | | | | • | | | | | | | | | | | • | | | | |
| Sematophyllaceae | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Brittonodoxa subpinnata</i> (Brid.) W.R. Buck, P.E.A.S. Câmara & Carv. – Silva | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| <i>Microcalpex</i> (Hedw.) W.R. Buck | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| <i>Taxithelium planum</i> (Brid.) Mitt. | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| <i>Taxithelium portoricense</i> R. S. Williams | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| <i>Trichosteleum fluviatile</i> (Mitt.) A. Jaeger | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| <i>Trichosteleum subdemissum</i> (Besch.) A. Jaeger | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| <i>Vitalia galipensis</i> (Müll. Hal.) P.E.A.S. Câmara, Carv. – Silva & W.R. Buck (Mull. Hal.) Mitt. | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Sphagnaceae | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Sphagnum palustre</i> L. | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Splachnobryaceae | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Pterogonium pulchellum</i> (Hook.) Müll. Hal. | | | • | • | | | | | | | • | • | | | • | • | | | | • | | | |

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| <i>Sphachno bryum obtusum</i> (Brid.) Müll. Hal. | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| Stereophyllaceae | | | | | | | | | | | | | | | | | | | | | |
| <i>Entodontopsis leucostega</i> (Brid.) Mitt. | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| <i>Entodontopsis nitens</i> (Mitt.) Buck & Ireland | | | | • | | | | • | | | | | | | | | | | | | |
| Thuidiaceae | | | | | | | | | | | | | | | | | | | | | |
| <i>Thuidium tomentosum</i> Schimp. Ex Besch. | | • | | • | | • | • | | • | • | | • | • | | • | | • | | • | • | |
| <i>Pelekium involvens</i> (Hedw.) W. R. Buck & H. A. Crum | • | | • | • | • | • | • | • | • | • | | • | | • | | • | • | | • | | |

Subtitle. 1. Acre-AC; 2. Alagoas-AL; 3. Amapá-AP; 4. Amazonas-AM; 5. Bahia-BA; 6. Ceará-CE; 7. Distrito Federal-DF; 8. Espírito Santo-ES; 9. Goiás-GO; 10. Maranhão-MA; 11. Mato Grosso-MT; 12. Mato Grosso do Sul-MS; 13. Minas Gerais-MG; 14. Pará PA; 15. Paraíba-PB; 16. Paraná-PR; 17. Pernambuco-PE; 18. Piauí-PI; 19. Rio de Janeiro-RJ; 20. Rio Grande do Norte-RN; 21. Rio Grande do Sul-RS; 22. Rondônia-RO; 23. Roraima-RR; 24. Santa Catarina-SC; 25. São Paulo-SP; 26. Sergipe-SE; 27. Tocantins-TO.

Table 3. Phytogeographic domains of the moss catalogued for the Cerrado from Maranhão/Brazil.

| Families and Species | PD | 1 | 2 | 3 | 4 | 5 | 6 |
|---|----|---|---|---|---|---|---|
| ARCHIDIACEAE | | | | | | | |
| <i>Archidium ohioense</i> Schimp. Ex Müll. Hal. | | • | • | | • | • | • |
| BARTRAMIACEAE | | | | | | | |
| <i>Philonotis cernua</i> (Wilson) Griffin & W.R. Buck | | | • | • | • | | |
| <i>Philonotis elongata</i> (Dumort.) H. A. Crum & Steere | | | • | • | • | | |
| <i>Philonotis sphaerocarpa</i> Dism. | | • | • | • | • | | |
| <i>Philonotis uncinata</i> (Schwägr.) Brid. | | • | • | • | • | • | • |
| BRYACEAE | | | | | | | |
| <i>Brachymenium exile</i> (Dozy & Molk.) J. R. Spence & H. Ramsay | | • | • | | • | | |
| <i>Brachymenium fabronioides</i> (Müll. Hal.) Paris | | | • | | • | | |
| <i>Brachymenium patulum</i> (Müll. Hal.) Schimp. | | | • | | • | | |
| <i>Bryum apiculatum</i> Schwägr. | | • | • | | • | | |
| BRYACEAE | | | | | | | |
| <i>Bryum caespiticium</i> Hedw. | | | • | | | | |
| <i>Bryum coronatum</i> Schwägr. | | | • | • | • | | |
| <i>Bryum limbatum</i> Müll. Hal. | | | • | • | • | | |
| <i>Rosulabryum billardieri</i> (Schwägr.) J.R. Spence | | | • | • | • | • | • |
| CALYMPERACEAE | | | | | | | |
| <i>Calymperes afzelii</i> Sw. | | | • | • | • | | |
| <i>Calymperes erosum</i> Müll. C. | | | • | • | • | | |
| <i>Calymperes tenerum</i> Müll. C. | | | • | • | • | | |
| <i>Calymperes palisotii</i> Schwagr. | | • | • | • | • | | |
| <i>Octoblepharum albidum</i> Hedw. | | • | • | • | • | • | • |
| <i>Octoblepharum cocuiense</i> Mitt. | | | • | • | • | | |
| <i>Octoblepharum pulvinatum</i> (Dozy & Molk.) Mitt. | | • | • | • | • | | • |
| <i>Syrrophodon gardneri</i> (Hook.) Schwägr. | | | • | • | • | | |
| <i>Syrrophodon gaudichaudii</i> Mont. | | • | • | • | • | | • |
| <i>Syrrophodon incompletus</i> Mont. | | | • | • | • | | |
| <i>Syrrophodon ligulatus</i> Mont. | | | • | • | • | | |
| CALYMPERACEAE | | | | | | | |

Mosses Of Maranhão, Brazil: Occurrence And Distribution Of Species

| | | | | | | | |
|--|--|---|---|---|---|---|---|
| <i>Syrrhopodon prolifer</i> Broth. | | • | • | • | • | | |
| DICRANACEAE | | | | | | | |
| <i>Campylopus coralinae</i> Grout. | | | • | • | • | | • |
| <i>Campylopus heterostachys</i> (Hampe) A. Jaeger | | • | • | • | • | | |
| <i>Campylopus savannarum</i> (Müll. Hal.) Mitt. | | • | • | • | • | | • |
| <i>Campylopus surinamensis</i> Mull. Hal. | | | • | • | • | | • |
| <i>Dicranella hilariana</i> (Mont.) Mitt. | | • | • | • | • | | • |
| DITRICHACEAE | | | | | | | |
| <i>Garkea flexuosa</i> (Griff.) (Griffith.) Marg. | | | • | | | | |
| <i>Entodon jamesanii</i> (Taylor) Mitt. | | | • | | • | | |
| ERPHODIACEAE | | | | | | | |
| <i>Erpodium coronatum</i> (Hook. & Wilson) Mitt. | | • | • | • | | | |
| FISSIDENTACEAE | | | | | | | |
| <i>Fissidens angustifolius</i> Sull. | | • | • | • | • | • | • |
| <i>Fissidens anguste-limbatus</i> Mitt. | | • | • | • | • | • | • |
| <i>Fissidens crispus</i> Mont. | | • | • | • | • | • | • |
| <i>Fissidens elegans</i> Brid. | | • | • | • | | | |
| <i>Fissidens falcidus</i> Mitt. | | • | • | • | • | • | • |
| <i>Fissidens goyanensis</i> Broth. | | • | • | • | • | | |
| <i>Fissidens intromarginatus</i> (Hampe) Mitt. | | • | • | • | • | | • |
| <i>Fissidens lindbergii</i> Mitt. | | • | • | | • | | |
| <i>Fissidens ornatus</i> Herzog | | | • | • | • | | |
| <i>Fissidens palmatus</i> Hedw. | | | • | • | • | | |
| <i>Fissidens perfalcatus</i> Broth. | | | • | | • | | |
| <i>Fissidens submarginatus</i> Bruch. | | • | • | • | • | • | • |
| <i>Fissidens wallisii</i> Mull. Hal. | | | • | | • | | |
| <i>Fissidens zollingeri</i> Mont. | | • | • | • | • | | • |
| FABRONIACEAE | | | | | | | |
| <i>Fabroniaciliares</i> (Brid.) Brid. | | • | • | • | • | | • |
| <i>Fabronia pusilla</i> Raddi | | • | • | | • | | |
| HELICOPHYLLACEAE | | | | | | | |
| <i>Helicophyllum torquatum</i> (Hook.) Brid. | | • | • | • | • | • | • |
| HYPNACEAE | | | | | | | |
| <i>Chryso-hypnum subdiminutivum</i> (Hampe) W. R. Buck | | | • | • | • | • | • |
| <i>Isopterygium tenerifolium</i> Mitt. | | | • | • | • | | |

| | | | | | | | |
|--|--|---|---|---|---|---|---|
| <i>Isopterygium tenerum</i> Mitt. | | | • | • | • | | |
| <i>Mittenothamnium subdiminutivum</i> (Geh. & Hampe) Cardot J. | | | • | | • | | |
| <i>Vesicularia vesicularis</i> (Schwägr.) Broth. | | | • | • | • | | • |
| PILOTRIACHACEAE | | | | | | | |
| <i>Calliscostella pallida</i> (Hornsch.) Angstrom. | | • | • | • | • | • | • |
| POTTIACEAE | | | | | | | |
| <i>Barbula indica</i> (Hook.) Spreng. | | • | • | • | • | | • |
| <i>Hyophiladelphus agrarius</i> (Hedw.) R. H. Zander | | • | • | • | • | | |
| <i>Hyophilla involuta</i> (Hook.) Jaeg. | | • | • | • | • | • | • |
| <i>Plaubelia prengelii</i> (Schwägr.) R. H. Zander | | • | • | • | • | | |
| <i>Molendoa sendtneriana</i> (Bruch & Schimp.) Limpr. | | | • | | • | | • |
| <i>Trichostomum brachydontium</i> Bruch. | | • | • | • | • | | |
| <i>Trichostomum molariforme</i> R. H. Zander | | | • | | | | |
| PTEROBRYACEAE | | | | | | | |
| <i>Jaegerina scariosa</i> (Lorentz) Meteorium, S. L. | | | • | • | • | | • |
| <i>Orthostichopsis praetermissa</i> Buck. W. R. | | | • | • | • | | |
| RHACHITHECIAACEAE | | | | | | | |
| <i>Zandera octoblepharis</i> (A. Jaeger) Goffinet, B. | | • | • | • | • | | |
| SEMATOPHYLLACEAE | | | | | | | |
| <i>Brittonodoxa subpinnata</i> (Brid.) W.R. Buck, P.E.A.S. Câmara & Carv. -Silva | | • | • | • | • | | • |
| <i>Microcalpe subsimplex</i> (Hedw.) W.R. Buck | | • | • | • | • | • | • |
| <i>Taxithelium planum</i> (Brid.) Mitt. | | | • | • | • | | • |
| <i>Taxithelium portoricense</i> R. S. Williams | | • | • | • | • | | • |
| <i>Trichosteleum fluviale</i> (Mitt.) A. Jaeger | | | • | • | • | | • |
| <i>Trichosteleum subdemissum</i> (Besch.) A. Jaeger | | | • | • | • | | |
| <i>Vitalia galipensis</i> (Müll. Hal.) P.E.A.S. Câmara, Carv. Silva & W.R. Buck (mull. Hal.) Mitt. | | | • | • | • | | |
| SPHAGNACEAE | | | | | | | |
| <i>Sphagnum palustre</i> L. | | | • | • | • | • | • |
| SPLACHNOBRYACEAE | | | | | | | |
| <i>Pterogonidium pulchellum</i> (Hook.) Müll. Hal. | | | • | • | • | | |
| <i>Sphachnobryum obtusum</i> (Brid.) Mull. Hal. | | | • | • | • | | • |
| STEREOPHYLLACEAE | | | | | | | |
| <i>Entodontopsis leucostega</i> (Brid.) Mitt. | | | • | • | • | | • |
| <i>Entodontopsis nitens</i> (Mitt) Buck & Ireland | | | • | | • | | |

| THUIDIACEAE | | | | | | | |
|--|--|--|---|---|---|--|---|
| <i>Pelekium involvens</i> (Hedw.) W. R. Buck & H.A. Crum | | | • | • | • | | • |
| <i>Thuidium tomentosum</i> Schimp. Ex Besch. | | | • | • | • | | • |

Subtitle: 1 – Caatinga; 2 – Cerrado; 3 – Amazon forest; 4 – Atlantic Forest; 5 – Pampa; 6 – Pantanal. (PD: Phytogeographic domains).

IV. Conclusion

The moss flora of the state of Maranhão represented in the Bryological Collection, to date has 80 species, 41 genera, 20 families, which colonized the most diverse substrates, with species widely distributed by Brazil and in the phytogeographic domains. This collection is gradually gaining expressiveness and notoriety by the number of increased species as new collection efforts are made. The collection presents above all, didactic and scientific characteristics with its use in classes in undergraduate and post-graduation, as well as in training for the formation of future bryophytes specialists for the Maranhão and Brazil.

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