EFFECT OF BABASSU PALM TREE DOMINANCE ON MACROFUNGAL COMMUNITIES IN EASTERN AMAZONIA

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ABSTRACT: Anthropogenic disturbances are the main factors that threaten biodiversity and modify forest composition. Among the effects of these actions, the dominance of the babassu palm (*Atallea speciosa* Mart. ex Spreng.) stands out, which proliferates in areas of slash-and-burn agriculture and are in the process of being abandoned. Babassu has great socioeconomic importance, however, its proliferation can lead to a reduction in plant biodiversity and ecological changes. This work investigated the effects of babassu dominance on macrofungi communities in an area of humid tropical forest, located in the municipality of Marabá-PA. Five transects with different babassu dominance levels (7.14% to 78.77%) were established and inventoried. In total, 952 specimens of macrofungi distributed in two phyla were collected: Ascomycota and Basidiomycota, identified in 46 morphospecies, 25 genera and 17 families of 7 orders. Babassu dominance had no effect on biodiversity parameters (abundance, richness, Simpson dominance, Shannon-Weaver diversity and Pielou evenness) of macrofungi. Furthermore, we observed that there are four different macrofungal compositions occurring for the five transects (areas). In general, babassu dominance had no effect on biodiversity, only on species composition due to the occurrence of rare and dominant species. Probably due to changes in the diversity of organic matter (areas with different dominance of babassu) they lead to changes in fungal species, generating different compositions. The results of this study help to understand the diversity and distribution of macrofungi in areas of the Amazon rainforest in southeastern Pará, in addition to subsidizing studies of conservation and environmental management of anthropic areas through the interrelationship of macrofungi communities with dominance of babassu.

Keywords: Amazon rainforest, Brazil, community ecology, diversity, fungi, human disturbances

EFEITO DA DOMINÂNCIA DE BABAÇU NAS COMUNIDADES DE MACROFUNGOS DA AMAZÔNIA ORIENTAL

RESUMO: As perturbações antrópicas são os principais fatores que ameaçam a biodiversidade e modificam a composição florestal. Entre os efeitos dessas ações, destaca-se o domínio da palmeira babaçu (*Atallea speciosa* Mart. ex Spreng.), que prolifera em áreas de agricultura de corte e queima e que estão em processo de abandono. O babaçu tem grande importância socioeconômica, porém, sua proliferação pode levar à redução da biodiversidade vegetal e a mudanças ecológicas. Este trabalho investigou os efeitos do domínio do babaçu nas comunidades de macrofungos em uma área de floresta tropical úmida, localizada no município de Marabá-PA. Cinco transectos com diferentes níveis de domínio do babaçu (7,14% a 78,77%) foram estabelecidos e inventariados. No total, foram coletados 952 espécimes de macrofungos distribuídos em dois filos: Ascomycota e Basidiomycota, identificados em 46 morfoespécies, 25 gêneros e 17 famílias de 7 ordens. A dominância do babaçu não teve efeito sobre os parâmetros de biodiversidade (abundância, riqueza, dominância de Simpson, diversidade de Shannon-Weaver e uniformidade de Pielou) dos macrofungos. Além disso, observamos que existem quatro composições diferentes de macrofungos ocorrendo nos cinco transectos (áreas). Em geral, a dominância de babaçu não teve efeito sobre a biodiversidade, apenas sobre a composição das espécies devido à ocorrência de espécies raras e dominantes. Provavelmente devido a mudanças na diversidade da matéria orgânica (áreas com diferentes dominâncias do babaçu), elas levam a mudanças nas espécies de fungos, gerando composições diferentes. Os resultados deste estudo ajudam a compreender a diversidade e a distribuição de macrofungos em áreas da floresta amazônica no sudeste do Pará, além de subsidiar estudos de conservação e manejo ambiental de áreas antrópicas por meio da inter-relação das comunidades de macrofungos com predominância de babaçu.

Palavras-chave: Floresta Amazônica, Brasil, ecologia de comunidades, diversidade, fungos, pertubações antrópicas.

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INTRODUCTION

Human activities are one of the main factors in changes in forest structure and composition through processes such as habitat fragmentation, exploitation of natural resources and disordered land use (WESTERN, 2001; LAURANCE et al., 2002). Given this, human disturbances have acted as the main modulating agent of biological communities, interfering with the integrity of the environment, causing changes in the functioning of ecosystems and a reduction in biodiversity (TABARELLI et al., 2010; BRANCALION, 2013). In particular, the variations in intensity and spatio-temporal amplitude that characterize human disturbances, can cause adaptive behaviors and responses in different organisms, and consequently the difficulty of survival, in the medium and long term, and the capacity of populations, communities and ecosystems are maintained (BATISTTI et al., 2016). The effects of human disturbances on natural ecosystems have attracted attention due to: negative effects on the ecological balance of flora and fauna communities, as in addition to altering climate regulation globally, they cause reductions in the richness and abundance of plants and animals, loss of functional and phylogenetic diversity, change in the frequency of tree species, proliferation of pathogenic and generalist species, and homogenization of biota (RIBEIRO, 2013; GIRÃO et al., 2007). Allied to this, the exploitation of natural resources that meet the food and housing needs of human populations that are increasingly growing in areas of natural vegetation, especially in tropical rain forests, intensify the effects of anthropogenic disturbances (LAURANCE et al., 2014).

The babassu palm (*Atallea speciosa* Mart. ex. Spreng) is a pioneer species from the Arecaceae family with high abundance in the Eastern Amazon, with a high density in areas degraded by slash-and-burn agriculture. Its morphological characteristics such as a high number of seeds (e.g. up to 500 fruits) and physiological characteristics such as energy resources present in the seeds (KAHN, GRANVILLE, 1992), can favor their proliferation after the removal of vegetation (GUIX, 2006). The babassu apical meristem presents positive geotropism at the beginning of germination (KERBAUY, 2004), which allows it to remain after the felling of the forest and cleaning of the area (cutting and/or fire) (KAHN; GRANVILLE, 1992; KERBAUY, 2004). On the one hand, the permanence of babassu in pastures is important, as it guarantees raw material for the extraction of babassu oil (SHIRAISHI NETO, 2017), an important product for the local economy. However, as the pasture ages and the area is abandoned, there may be an increase in the population of this palm tree (SANTOS et al., 2017), causing hyperdominance of babaçus (i.e. homogenization of the biota) and preventing the colonization of this area by new plant species, consequently slowing down ecological succession, thus characterizing babassu as an invasive native species (PIVELLO et al., 2018).

Forest ecosystems are important habitats for different groups of organisms, and establish complex interactions between them (PEREIRA, 2015). Population dynamics can be influenced by biotic factors, such as dispersal, competition, environmental heterogeneity and/or homogeneity, and abiotic factors, such as soil, climate and topography (PITMAN et al., 2001; HUBBEL, 2013; TER STEEGE et al., 2013; DEMACHI et al., 2018). For example, macrofungi, defined as fungi that produce ascomas or basidiomas (e.g. fruiting bodies) visible to the naked eye, and have as representatives the phyla Ascomycota and Basidiomycota, popularly known as mushrooms and wood ears (SILVEIRA, 1995; LODGE et. al., 2004), depend on factors such as light, humidity and temperature to determine their population dynamics (JENNINGS; LYSEK, 1996).

Approximately 120,000 species of fungi are described in the literature worldwide (HAWKSWORTH; LUCKING, 2017) and only 5,719 have been cited in Brazil (Maia et al., 2015). Having the phyla Ascomycota (approximately 32,300 species) and Basidiomycota (approximately 31,515 species) (KIRK et al., 2008), which present species responsible for: the decomposition of organic matter found in forests and pathogens for native and/or cultivated plants (GUERRA, 2011). In general, fungi are macroscopic, varying in size, color and shape. The occurrence of fungi is more frequent in forest areas, where they play an important role in the balance and regulation of ecosystems (SOUZA et al., 2006). The maintenance of these ecosystems is generally influenced by the occurrence of macrofungi (FILIPPOVA; BULYONKOVA, 2017). These organisms are necessary components in the forest trophic chain, because they constitute a food base for many animals (PEREIRA, 2015), and due to the decomposition of organic matter, which contributes to the recycling of forest biomass (ARNOLDS, 1992).

In relation to problems related to human disturbances, referring to the homogenization of biota due to the dominance of babaçus with changes in light, temperature, humidity and ecological interactions. The objective of this work was to verify the effect of babassu dominance on macrofungal communities in a humid tropical forest area. Our hypothesis is that areas with high babassu dominance will cause a reduction in biodiversity (e.g. abundance, richness, dominance, diversity and equitability) of macrofungi. This will lead to changes in the composition of species in areas with high and low dominance. Since, the composition of plant species in a forest directly affects the composition of macrofungal species, due: diversity and quality of resources and substrates. In view of the above, studies on the population dynamics of macrofungi and how they are influenced by human disturbances can assist in the development of strategies for environmental conservation of the Amazon forest. Because fungi are fundamental for their role in the decomposition of organic matter and for their endophytic and mycorrhizal parasitic interactions in the maintenance and balance of the ecosystem. Therefore, it is necessary to strengthen the knowledge of society, decision makers and the scientific community about the effect of babassu dominance in the Eastern Amazon.

METHODS

Study area

The study was carried out in an area of tropical rain forest located at the Fundação Zoobotânica de Marabá (FZM) with approximately 1 539 ha. The FZM is located at km 8 of the PA-150 highway in the municipality of Marabá, in the southeast of the state of Pará in Brazil (Eastern Amazon), on the coordinates 05º 21' 54" South Latitude and 04º 07' 24" Longitude WGr. The climate classification of the region is Aw (tropical and humid) according to Köppen and Geiger (1948), with average monthly temperatures between 22.9°C and 32°C, with an annual average of 26°C and an average annual rainfall of 1837 mm, according to data from the National Institute of Meteorology (INMET), obtained at the station located in Marabá at an altitude of 95.00 m. The municipality of Marabá is characterized by a less rainy period between the months of June and November and a rainier period between the months of December to May. The region is part of Brazil's deforestation arc due to the advance of agriculture in the Amazon region.

Characterization of babassu dominance

The characterization of babassu (*A. speciosa*) dominance was carried out through the work of Silva (in press). Babassu dominance was measured in plots measuring 5 m x 10 m, 50 m from the edge and at least 200 m apart. Babassu dominance was calculated by dividing the palm abundance value by the sum of all trees (diameter at breast height > 15 cm) in the plot and multiplying the division result by 100. Babassu dominance values were obtained in percentage.

Data collect

The collections were carried out in March 2023, (250 mm of rainfall) during the period from 10 am to 3:30 pm with the possibility of finding more macroscopic fungi due to the high light rate close to noon, to facilitate the visualization of the macrofungi. Sampling took place in 5 (five) pre-established transects (100 m from the edge to the interior of the forest), each transect being at least 200 meters apart (from now on, the transects will be called by area).

Data collection was carried out through photographic records, according to the Macrofungal Image Capture Protocol by Bittencourt et al. (2022), to observe details such as color, substrate and other characteristics that photography allows us to identify. The photos were taken from various angles to observe the details of the macrofungi, and at least one measuring reference such as a ruler and pen was used. Morphological details of the species were also observed to assist in identification. For each of the recorded specimens, information such as: identification number; collection date; local; area; weather conditions; individuals number; collectors; habitat or type of substrate (tree trunk, leaf litter or soil); hat color, stipe color, hymenium color, presence of laminae (lamellae), odor and general observations (BITTENCOURT 2022; FORZZA 2010). Regarding the identification of fungi, the macroscopic characteristics observed in the field and in photographs were taken into account, through field guides, such as Braga-Neto (2008), Bon (2004), Ferreira (2013) and the Field Guide of Federation of Forest Producers of Portugal (2008), identification occurred down to the lowest possible taxonomic level. Research platforms were used to assist in identification, such as: Google Lens, BioDiversity4All, Flora do Brasil and GBif. Information on the diversity and phylogeny of fungi, for identification was based on Singer (1975, 1986) and Pedroso (2020).

Data analysis

To evaluate the diversity of macrofungi in different areas, the Species Diversity Profile (Hill numbers) was used, assigning different weights according to the abundance of the morphospecies, where 0 (q0, species richness), 1 (q1, exponential Shannon entropy) and 2 (q2, inverse Simpson concentration) were used to evaluate changes in macrofungal populations on the babassu dominance index (JOST, 2007). The weight q0 is not sensitive to the abundance of individuals and, therefore, greater weight for rare species, while q1 weights each morphospecies according to their abundance in the community, without favoring rare morphospecies or abundant morphospecies (JOST, 2007). Finally, q2 can be interpreted as the number of “very abundant” or “dominant” morphospecies in the community (JOST, 2006).

To verify whether babassu dominance interferes with abundance (number of morphospecies in a community), evenness (Pielou), richness (q0) and diversity of rare and dominant morphospecies (q1, Shannon index; and q2, Simpson index) were used General Linear Mixed Models (GLMM), where transects as a random factor and Poisson error distribution. To consider an individual macrofungus, we will consider the basidioma or ascoma, the sexual reproduction structure of some fungi from the phyla Basidiomycota and Ascomycota. For each basidiome found, we will standardize a distance of 5 m to determine whether it is another individual. To understand the dissimilarity between community compositions in the sample areas, non-Metric Multidimensional Scaling (nMDS) was performed using the Jaccard index. All analyzes were performed with the aid of the R 4.2.3 program using the nlme, stats, mlmRev, lme4, gplost, psych and Rcmdr packages.

RESULTS

A total of 952 specimens belonging to the phyla Ascomycota and Basidiomycota were recorded. In the five areas, 7 orders of macrofungi, 25 genera and 17 families were identified, of which Marasmiaceae (14 species), Mycenaceae (6) and Polyporaceae (5) were the most abundant. The morphospecies *Cookeina speciosa* (Fr.) Dennis, from the Sarcoscyphaceae family, was the only species found in the phylum Ascomycota, the others belong to the phylum Basidiomycota. (Table 1).

Table 1: List of morphospecies of macrofungi registered at the Zoobotanical Foundation of Marabá – PA.

Taxon: PHYLUM, Order, **Family** and *Morphospecies*	NUMBER OF INDIVIDUALS FOUND IN EACH AREA				
	Area 1 (25%)*	Area 2 (78.77%)	Area3 (15.38%)	Area 4 (7.14%)	Area 5 (20%)
PHYLUM ASCOMYCOTA					
Order Pezizales					
Family Sarcoscyphaceae					
Cookeina speciosa (Fr.) Dennis	0	3	3	6	16
PHYLUM BASIDIOMYCOTA					
Order Agaricales					
Family Bolbitiaceae					
Bolbitius sp. 1	0	0	2	0	0
Bolbitius titubans (Bull.) Fr.	0	1	0	0	0
Family Clavariaceae					
Ramariopsis kunzei (Fr.) Corner	0	0	0	30	0
Ramariopsis crocea (Pers.) Corner	0	0	0	3	0
Family Hygrophorineae					
Hygrocybe miniata (Fr.) P.Kumm	0	0	0	2	0
Hygrocybe sp. 1	0	0	0	1	0
Lichenomphalia sp. 1	2	0	0	0	0
Lichenomphalia sp. 2	0	0	1	0	0
Family Hymenogastraceae					
Psilocybe cubensis (Earle) Singer	0	0	1	0	0
Family Lycoperdaceae					
Calvatia rugosa (Berk. & M.A.Curtis) D.A.Reid	0	0	0	0	1
Lycoperdon sp. 1	0	0	0	0	30
Family Marasmiaceae					
Marasmius calhouniae Singer	23	4	3	0	49
Marasmius capillaris Morgan	34	0	10	0	0

Marasmius elegans (Cleland) Grgur	0	2	0	0	0
Marasmius rotula (Scop.) Fr	0	0	6	0	0
Marasmius siccus (Schwein.) Fr.	0	0	38	0	2
Marasmiellus volvatus Singer	0	0	0	0	1
Tetrapyrgos nigripes (Schwein.) E. Horak	4	0	0	0	0
Xeromphalina sp. 1	0	0	0	0	300
Crinipellis sp. 1	0	0	26	0	0
Crinipellis sp. 2	0	0	6	0	0
Marasmius sp. 1	7	0	0	0	0
Marasmius sp. 2	2	0	0	0	0
Marasmius sp. 3	0	0	4	0	2
Marasmius sp. 4	0	0	0	0	1
Family Mycenaceae					
Mycena chlorophos (Berk. & M. A. Curtis) Sacc., 1887	0	0	0	0	1
Mycena leaiana (Berk.) Sacc.	0	0	8	0	0
Mycena leptocephala (Pers.) Gillet	0	5	0	0	0
Mycena rósea Gramberg	0	0	4	0	0
Mycena sanguinolenta (Alb. & Schwein.) P.Kumm.	0	0	0	0	39
Mycena sp. 1	6	0	0	0	1
Family Verrucosporaceae					
Lepiota sp. 1	0	0	1	0	0
Ordem Boletales					
Family Sclerodermataceae					
Scleroderma sp. 1	0	0	2	0	0
Order Dacrymycetales					
Family Dacrymycetaceae					
Dacryopiax spathularia (Schwein.) G.W.Martin	24	0	0	0	0
Order Cantharellales					
Family Cantharellaceae					
Cantharellus sp. 1	0	0	0	31	0
Order Polyporales					
Family Phaeolaceae					
Phaeolus sp. 1	0	0	0	1	0
Family Physalacriaceae					
Oudemansiella canarii (Jjungh.) Höhn	91	2	0	0	0
Family Polyporaceae					
Trametes coccínea (Fr.) Hai J.Li & S.H.He	0	2	1	0	0
Trametes ochraceae (Pers.) Gilb. & Ryvarden	3	0	0	1	0

Polyporus sp. 1	0	0	0	0	1
Polyporaceae sp. 1	16	0	7	0	1
Polyporaceae sp. 2	0	0	58	0	0
Family Ischnodermataceae					
Ischnoderma resinosum (Schrad.) P.Karst.	0	0	0	14	0
Order Tremellales					
Family Tremellaceae					
Berk.	0	0	3	0	0
Tremella sp. 1	0	0	0	1	0

***means the percentage of babassu dominance in each area.**

Among the 46 morphospecies identified, *Xeromphalina* sp. 1 was the most abundant with 300 individuals found, followed by the morphospecies *Oudemansiella canarii* (93), *Marasmius calhouniae* (79), *Polyporaceae* sp. 2 (58), *Marasmius capillaries* (44) (Figure 1).

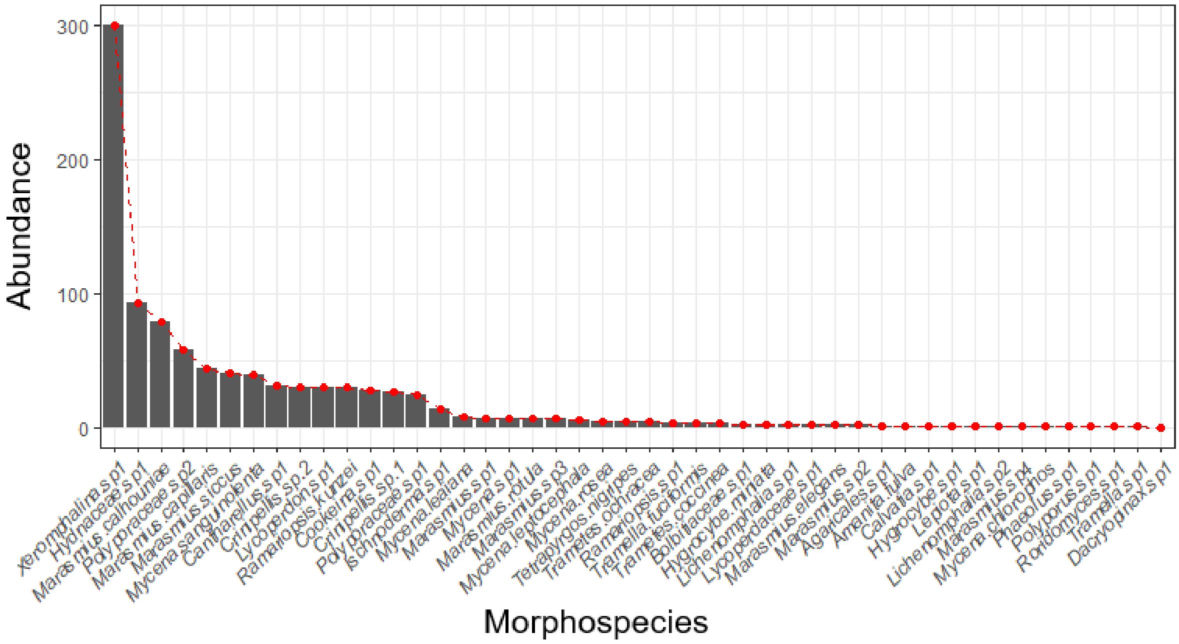

Figure 1: Abundance of macrofungi morphospecies found at the Zoobotanical Foundation of Marabá (FZM) - PA.

The diversity profile showed that all areas have great variability in macrofungi (Figure 2). The richness of morphospecies (q0) in the area with 15.38% dominance proved to be higher than in other areas, which highlights the greater occurrence of rare species. When we assign the weight to the abundances found in the communities (q1) we observe that the area with 78.77% dominance and the area with 25% dominance have similar species richness, and the area with 15.38% dominance remains with greater species richness. However, when we assign weight to dominant or very abundant species (q2), the area with 78.77% dominance resembles the location with 15.38% dominance and presents similar q2 values, as do the areas with 25% and 7.14% dominance. While the area with 20% dominance, when assigned to numbers q1 and q2, presented a lower diversity of morphospecies in relation to the other areas. While the area with 78.77% dominance, despite having a lower richness of morphospecies, demonstrated greater diversity when attributed to numbers q1 and q2.

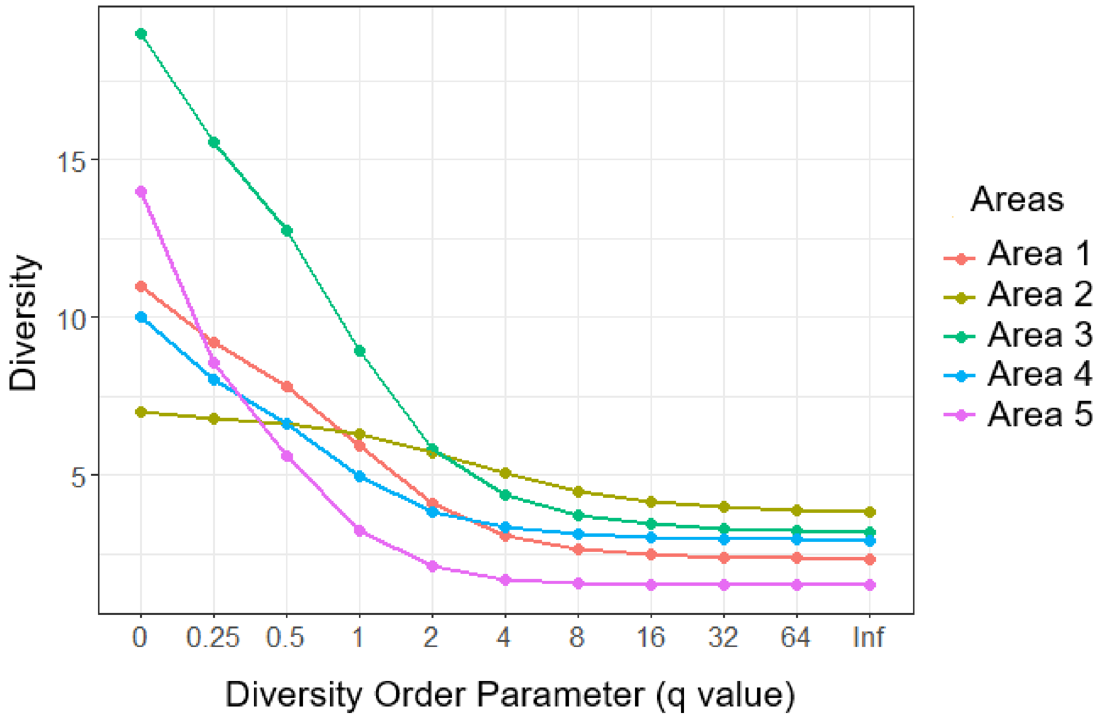

Figure 2: Macrofungal diversity profiles for five sites with different babassu dominance (area 1=25%; area 2=78.77%; area 3=15.38%; area 4= 7.14%; area 5= 20%) using the Series of numbers by Hills at the Zoobotanical Foundation of Marabá - PA. Thus: when q=0, all abundances are raised to 0 and return to a value of 1 (rare species diversity); when q=1, the values correspond to the abundances found in each community (typical species diversity); when q=2, all abundances are squared, giving more 'weight' to the dominant species (diversity of dominant species). The higher the value of q, the greater the weight for the dominant species.

No effects of babassu dominance were found for the biodiversity parameters: abundance, richness, dominance, diversity and equitability (Table 2).

Table 2: Result of the Mixed General Linear Models (GLMM) considering the indices of evenness (Pielou), species richness (q0), species diversity (q1) and species dominance (q2) of macrofungal communities at the Zoobotânica Foundation of Marabá – PA. For significant models, the p-value is < 0.05.

	GL	F	p
Abundance	3	0.842	0.425
Dominance	3	0.405	0.569
Pielou	3	2.538	0.209
q0	3	1.757	0.276
q1	3	0.027	0.879
q2	3	0.832	0.428

Among the five areas, it was observed through the similarity diagram based on the Jaccard index, the occurrence of four macrofungal communities referring to areas with: 7.14%, 15.38%, 20% and 25% dominance, or In other words, there are four species compositions that present morphospecies characteristic of each community according to the dominance of babassu present in the area (Figure 3). In the area with 78.77% (area 2) of dominance there was no difference in morphospecies composition in relation to the other areas.

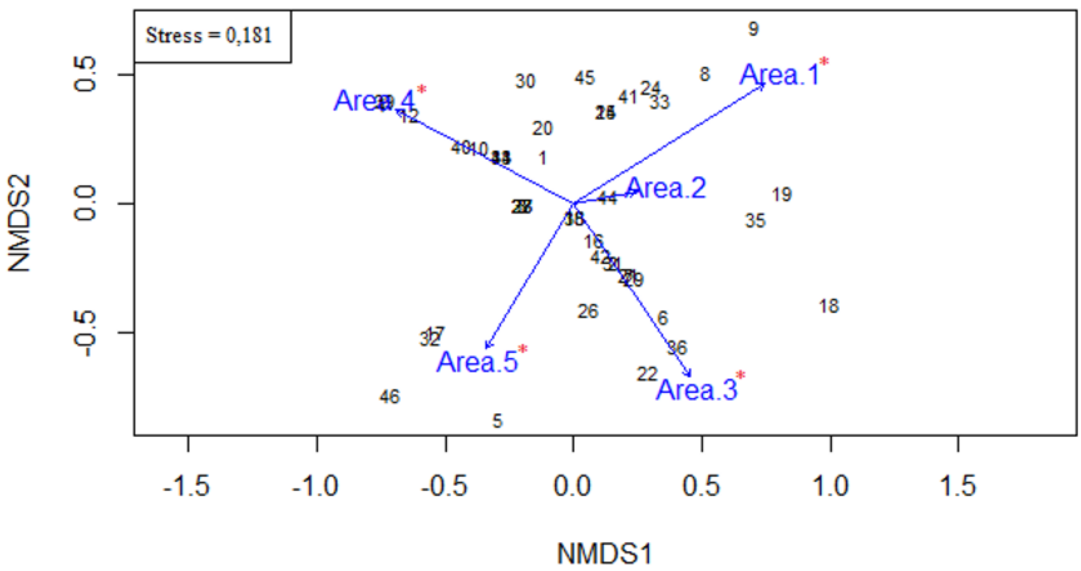

Figure 3: Result of the similarity analysis of the morphospecies in different sites of babassu dominance (area 1=25% babassu dominance; area 2=78.77%; area 3=15.38%; area 4=7.14 %; area 5= 20%), using Non-Metric Multidimensional Scaling (n-MDS) at Fundação Zoobotânica de Marabá - PA. Locations with an asterisk (*) in red represent the locations that showed the greatest dissimilarity to each other. Numbers from 1 to 46 represent macrofungi species.

The morphospecies *Oudemansiella conarii* (point 9 in the dissimilarity matrix. Fig. 3), *Dacryopinax spathularia* (8) and *Mycena* sp. 1 (33) that occur in area 1, where there is 25% babassu dominance, are characteristics of this location. In area 3, with 15.38% babassu dominance, we have *Marasmius siccus* (22), *Polyporaceae* sp. 2 (36) and *Crinipellis* sp. 1 (6) representing the most abundant morphospecies. In area 5, the morphospecies *Xeromphalina* sp. 1 (46) *Cookeina speciosa* (5) and *Mycena sanguinolenta* (32) represent a community with a different composition, with 20% babassu dominance. And in area 4, where the lowest level of babassu dominance occurs, with 7.14%, the representative morphospecies are *Ramariopsis kunzei* (39), *Cantharellus* sp. 1 (4), and *Ischnoderma resinosum* (12).

Table 3: Result of the analysis of non-metric multidimensional scaling (n-MDS) applied to five locations with different babassu dominance at Fundação Zoobotânica de Marabá – PA.

	N-MDS1	N-MDS2	r^2	Pr (>r)	
Área 1	0.84637	0.53260	0.3801	0.001	***
Área 2	0.98106	0.19371	0.0313	0.497	
Área 3	0.55957	-0.82878	0.3252	0.001	***
Área 4	-0.88379	0.46806	0.3017	0.001	***
Área 5	-0.51903	-0.85476	0.2150	0.001	***

*Code values: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1.

DISCUSSION

In this work, we analyzed the effects of babassu dominance on macrofungal communities in the Eastern Amazon. We found that palm population dynamics do not directly interfere with macrofungal biodiversity in general. It only has an effect when we analyze rare and dominant species, which causes distinct communities at different levels of babassu dominance. This occurs because: a) areas with babassu dominance produce a high amount of organic matter that serves as a substrate for fungi and maintains populations; and b) a high amount of organic matter helps maintain the richness and abundance of species, but changes in the diversity and quality of organic matter result in changes in the species of fungi that use these resources, causing different compositions.

The diversity of macrofungal species found in the present work is explained by the positive environmental conditions in the study area, which corresponds to one of the well-preserved fragments of tropical rain forest in the Southeast region of Pará. Since humid habitats constitute areas with high richness of macrofungi due to the availability of organic matter and the existence of water (soil and air), important factors in the substrate decomposition process (KUTSZEGI et al., 2015). The peak of macrofungal diversity in tropical regions occurs during the wet season (ZANIEWSKI et al., 2002), therefore, we can consider that the great diversity of species found was due to the high rainfall and environmental quality. However, to verify the effects of seasonality it is necessary to carry out a study lasting at least one year. Among the 46 morphospecies collected, only 16 were identified to the species level. The difficulty in identifying morphospecies at different taxonomic levels is because there is little information on the occurrence of macrofungi in the Amazon region (HAWKSWORTH, 2001).

The greater representation of species from the phylum Basidiomycota in relation to the phylum Acomycota can be explained by the fact that this group includes the greatest diversity of macrofungal species (KIRK et al., 2001). In addition, they have different habits: saprobic grasses/forest litter, wood decomposers, ectomycorrhiza, phytopathogens, the edible genus *Cantharellus* and yeasts of the genera *Sporobolomyces* and *Cryptococcus* (pathogenic in humans) (HE et al., 2022).

Of the seven orders of macrofungi found, the order Agaricales was the one with the greatest representation, with 65.7% of the specimens. This order represents a structurally complex group, with a wide variety in its macro and microscopic characteristics (BONONI et al., 2017). Among the species of this order, the morphospecies *Xeromphalina* sp. 1 of the Mycenaceae family, was the most abundant. This is due this species occurs in very dense clusters forming large population patches, generally on tree trunks, where it was recorded in this study. The species *Marasmius calhouniae* and *Marasmius capillaris*, from the Marasmiaceae family, were also common. According to Lodge et al. (1995) species of this genus occur preferentially in tropical areas, due to the diversity of plants. Furthermore, *Marasmius* species are, for the most part, decomposers of residual organic matter (SINGER, 1976). Some species have a geographical limitation due to the development of the basidioma (reproductive system) depending on species-specific environmental conditions. Temperature and precipitation are important factors for the growth, seasonal distribution and ecology of macrofungi, influencing their phenology (AGREDA et al., 2015).

In relation to diversity profiles, we noticed that the occurrence of rare and abundant species alters the dynamics of diversity in different areas. The area with the second lowest babassu dominance (15.38%) had the highest number of rare species. This indicates that areas with high plant diversity (less dominance of babassu) have macrofungal species with low population size and are dependent on plant diversity for their occurrence. Thus, greater plant diversity is related to greater variability of substrates, such as tree trunks and litter, which enhances the diversity of species of saprophytic fungi (LODGE et al., 2004). On the other hand, when we add the weight for dominant species (q2), the area with the greatest babassu dominance (78.77%) equals the species diversity of the area with 15.38% dominance. Due to species such as: *Bolbitius titubans*, *Marasmius elegans* and *Mycena leptocephala* were found only in this area and with high abundance, and therefore considered dominant. These species occur in large populations in different types of habitats, including ruderal locations, such as the species *B. titubans* (WATLING 1987; ARNOLDS 2005; KIRK, 2001).

Babassu dominance had no effect on macrofungal biodiversity in relation to diversity parameters. On the other hand, most studies report that fungal diversity is related to the richness of plant species (BORBA-SILVA et al., 2015; LODGE et al., 2004). In our case, we point out that factors related to seasonality such as precipitation, air humidity and light are probably responsible in part for the biodiversity of fungi in the Eastern Amazon (ANDREW, 2013). However, babassu dominance influenced the composition of macrofungal communities. Species of saprophytic macrofungi, mycorrhizae and parasites occur only in association with specific plant families or genera (GÓMEZ-HERNANDEZ et al., 2012). The low plant diversity, possibly due to the high dominance of babassu in the area with 78.77%, combined with the occurrence of more generalist and abundant species of macrofungi. It was the determining factor for the species from this location to be common in other areas. Therefore, babassu dominance interferes with the composition of macrofungal species in humid tropical forest areas in the Eastern Amazon.

CONCLUSIONS

Babassu palm trees are important in terms of biomass, carbon and nutrient stocks (GEHRING, 2011), which indirectly contributes to the biodiversity of several species, especially macrofungi. It is worth mentioning that its products are a source of income for local communities, for example: the sale of almond oil for edible purposes or for the hygiene, cleaning and cosmetics segments (PORRO, 2019). Based on the study carried out, it was observed that the dominance of the babassu palm does not directly interfere with biodiversity. However, with effects on the composition of macrofungal communities, since fungal species are sensitive to factors related to the environment such as temperature and humidity, in addition to the association with the substrate in which they occur. On the other hand, the occurrence of rare species was higher in areas of low dominance (15.38%) and of dominant species in the area of greater dominance (78.77%). In view of the above, the results of the present study are important, because even in areas with high babassu dominance they have a high diversity of fungi, which can, in the long term, help in the ecological succession of these environments due to the ecological functions performed by the fungi. However, given the scarcity of information about the macrobiota of fungi, especially in the Amazon, it is suggested in future studies: verify the effect of seasonality on fungal communities; the biotechnological and food potential of macrofungi, as an initiative to understand not only diversity, but also a conservation strategy for Amazon forest areas.

ACKNOWLEDGEMENTS

We thank the Federal University of the South and Southeast of Pará (Unifesspa); Botany and Ecology Laboratory (BotEco); Ecology and Conservation in the Amazon (ECoA) research group for the space to develop data analysis and help with collection and work itself.

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