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Diversity Index and Richness of Tree Species in Mindoro State University (Minsu) Bongabong Campus, Oriental Mindoro, Philippines

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Abstract
The Mindoro State University Bongabong Campus serves as a crucial ecological and educational resource, particularly in terms of vascular tree species. A recent survey conducted in this area identified a remarkable total of 728 taxa of vascular trees, highlighting the rich diversity of flora present. The majority of these trees are classified as angiosperms, which are flowering plants that produce seeds encased within fruit. This classification encompasses not only trees but also extends to shrubs, herbs, vines, palms, grasses, and sedges, reflecting the ecological richness and biodiversity of the campus. As a living laboratory, the Bongabong Campus plays an essential role in fostering research and education regarding these vital ecosystems, contributing to the understanding and conservation of plant species in the region.

Keywords: angiosperm, diversity index, Mindoro State University, species richness, vascular tree

Introduction

Trees are among the most significant living organisms on Earth. They play vital functions in people's lives, including purifying the air, providing food and medicine, offering shelter, protecting against natural hazards, and enhancing the balance of processes in the environment. The richness and diversity of tree species are fundamental to the overall diversity of forests and other species that rely on these ecosystems, including both flora and fauna (Rennols & Laumonier, 2000) [4]. Understanding the diversity of tree species in forests is crucial for assessing the status of these ecosystems, and have regenerated organically over various environmental challenges.

Tree diversity also plays a critical role in conservation. By understanding the different species present in a forest, experts can identify which species are important for conservation efforts and prioritize management strategies accordingly. In ecology, diversity is often measured using diversity indices, which are statistics that summarize the diversity of a population by considering how many unique groups (or species) are present. Two key concepts in this field are species richness and species evenness. Species richness refers to the total number of species in a given area, while species evenness measures how evenly the individuals are distributed among these species. The more equal the proportions of each species, the more even the community is (Krebs, 1999) [2].

Vascular plants, including trees, are the primary producers in terrestrial ecosystems. They are excellent indicators of the abiotic conditions in which they thrive. Researchers investigate whether plant community composition and richness can be used to predict overall biodiversity. This analysis involves assessing the abiotic conditions, human impacts, and the biotic diversification of organic matter contribute to the health of these ecosystems (Brunbjerg *et al*., 2017) [1].

The conservation of biodiversity is crucial for the long-term sustainability of ecosystem services. This is the very reason, studying biodiversity is primarily motivated by the need for conservation. Conducting biological surveys to document the species present in an area is essential. This data allows government and non-governmental organizations to collaborate on environmental policies, management strategies, educational programs, and protection initiatives.

A study conducted at Mindoro State University- Bongabong Campus, focuses on gathering data about the diversity index and richness of tree species found within its boundaries.

The study aims to identify whether the tree species present on campus are vascular or non-vascular. Additionally, it seeks to analyze the tree species in terms of their diversity index and richness. Understanding the diversity of trees in this context is essential for informing conservation efforts and ensuring the health of the campus ecosystem.

Materials and Methods

This paper examines the tree species diversity found at Mindoro State University, located in the Municipality of Bongabong, Province of Oriental Mindoro, Philippines. The area of study is positioned at coordinates 12°46'19.6"N latitude and 121°28'31.6"E longitude, with an elevation of 8 meters (approximately 26 feet) above sea level.

Fig 1: The map of the study site (Labasan, Bongabong, Oriental Mindoro, Philippines

The research was conducted using a systematic approach where the researchers collected data using a field notebook, pen, and GPS. This combination of tools allowed for accurate recording of each tree species observed within the university's campus boundaries. The data collection process was meticulous; researchers counted each species individually to ensure precision.

During the study, the researchers identified and documented various tree species, including two species of mangroves. Mangroves are vital to coastal ecosystems, providing habitat for numerous marine and terrestrial species, preventing erosion, and acting as natural water filters. The inclusion of these mangrove species within the recorded data highlights the ecological significance of the university's location, which may serve as a micro-habitat for diverse flora and fauna.

The results of the study were compiled into a comprehensive list, enabling an analysis of the species richness and diversity present on campus. The researchers utilized the Shannon-Wiener Index, to quantify the diversity of tree species. This approach is a widely accepted tool in ecology, measuring the uncertainty in predicting the species of a randomly chosen individual from a data set. A higher value of the Shannon Index indicates greater diversity, suggesting a more complex and stable ecosystem.

The findings from this research offer valuable insights into the biodiversity at Mindoro State University. It is essential to recognize that maintaining such diversity is critical for sustaining ecological balance. Trees play a significant role in carbon sequestration, oxygen production, and providing habitat for various species. Therefore, understanding the tree species present in a particular area aids in environmental conservation efforts and promotes awareness of the ecological importance of preserving natural habitats.

The Shannon Diversity Index is calculated using the formula:

$$H = -\sum p_i * In(p_i)$$

Where:

- **Σ:** A Greek symbol that means “sum”
- ***ln*:** Natural log
- p_i**:** The proportion of the entire community made up of Species *i*

Species richness is the number of species present in the forest. For small datasets it can be calculated by counting the number of species in your forest manually.

Results and Discussion

The Mindoro State University Bongabong Campus serves as a vital ecological and educational resource, particularly in the understanding of vascular tree species. In a recent survey, a total of 728 taxa of vascular trees were identified in this area, showcasing an impressive variety of flora. These trees are classified primarily as Angiosperms, which are flowering plants that produce seeds within a fruit. The classification of these species extends beyond trees to include shrubs, herbs, vines, palms, grasses, and sedges, underscoring the ecological richness of the campus.

The diversity within the Angiosperm group is significant, with 29 different species recorded. This wealth of species contributes to the overall species richness of the Mindoro State University, indicating a healthy and thriving ecosystem. Such biodiversity is crucial not only for maintaining ecological balance but also for providing educational

opportunities for students and researchers alike.

The survey results highlight the importance of various plant families present in the campus area. Among the most notable families are *Fabaceae*, with six recorded species, and Moraceae, with three. Other families, including *Meliaceae, Lamiaceae, Rhizoporaceae, Rutaceae*, and *Sapotaceae*, each contributed two species, while families such as A*rraceae, Anacardiaceae, Lauraceae, Annonaceae, Cambretaceae, Lecythidaceae, Calophyllaceae,* and *Rubiaceae* each had one species represented. This distribution demonstrates a diverse array of plant life, with certain families thriving in this environment.

Understanding the composition of these families is essential for several reasons. First, it allows researchers and students to comprehend the ecological relationships between species and their environments. For instance, the Fabaceae family, commonly known as the legume family, plays a significant role in nitrogen fixation, which is essential for soil health and fertility. This, in turn, supports other plant life and contributes to the overall productivity of the ecosystem. (Wilsey, 2005) [5].

Furthermore, the presence of various families and species provides insight into the adaptability and resilience of the ecosystem. The ability of different species to thrive in specific conditions-such as soil type, moisture, and sunlight-provides valuable information regarding environmental changes over time. This is increasingly important as climate change poses threats to natural habitats and biodiversity. By studying these vascular trees, students and researchers can gain a deeper understanding of conservation efforts and the importance of preserving such ecosystems (Soininen, 2012) [6].

The species richness recorded at the Mindoro State University Bongabong Campus is not only a point of pride but also a call to action. With biodiversity declining globally, the preservation of such environments becomes crucial. The campus serves as a living laboratory, where students can engage in field studies, learn about plant identification, and participate in conservation initiatives. These experiences are invaluable in fostering a sense of responsibility towards the environment among future generations (Morris *et al*., 2014) [3]

Additionally, the educational value of the vascular trees extends beyond the academic realm. The campus can serve as a center for community engagement, where local residents and students collaborate on projects aimed at promoting environmental awareness and conservation. Workshops, guided tours, and research presentations can be organized to connect the university's resources with the broader community, emphasizing the significance of biodiversity in everyday life.

Table 1: Vascular Trees in Mindoro State University, Bongabong, Oriental Mindoro

Scientific Name	Local Name	Number (p)	p_i	Ln (p_i)	$p_i * Ln(p_i)$	$-p_i *$Ln (p_i)
Swietenia macrophylla	Mahogany	457	0.628	-0.47	-0.3	0.3
Cocos nucifera	Coconut	95	0.13	-2.04	-0.27	0.27
Mangifera indica	Mango	59	0.081	-2.51	-0.2	0.2
Gmelina arborea	Gmelina	42	0.058	-2.85	-0.17	0.17
Anacardium occidentale	Cashew	8	0.011	-4.51	-0.05	0.05
Rhizopora mucrunata	Red Mangrove	6	0.008	-4.83	-0.04	0.04
Rhizopora apiculata	Black Mangrove	6	0.008	-4.83	-0.04	0.04
Citrus maxima	Suha	6	0.008	-4.83	-0.04	0.04
Saraca asoca	Ashoka	6	0.008	-4.83	-0.04	0.04
Pterocarpus indicus	Narra	6	0.008	-4.83	-0.04	0.04
Ficus benjamina Linn.	Balete	4	0.005	-5.3	-0.03	0.03
Artocarpus heterophyllus	Jack fruit	4	0.005	-5.3	-0.03	0.03
Persea americana	Avocado	4	0.005	-5.3	-0.03	0.03
Leucaena leucocephala	Ipil-ipil	4	0.005	-5.3	-0.03	0.03
Cananga odorata	Ilang-ilang	3	0.004	-5.52	-0.02	0.02
Manilkara zapota	Chico	2	0.003	-5.81	-0.02	0.02
Tamarindus indica	Tamarind	2	0.003	-5.81	-0.02	0.02
Sandoricum koetjape	Santol	2	0.003	-5.81	-0.02	0.02
Terminalia catappa	Talisay	2	0.003	-5.81	-0.02	0.02
Premna odorata	Alagaw	1	0.001	-6.91	-0.01	0.01
Chrysophyllum cainito	Caimito	1	0.001	-6.91	-0.01	0.01
Acasia auriculiformis	Earleaf acacia	1	0.001	-6.91	-0.01	0.01
Barringtonia asiatica	Sea poison tree	1	0.001	-6.91	-0.01	0.01
Calophyllum inophyllum	Alexandrian laurel	1	0.001	-6.91	-0.01	0.01
Citrus nubilis	Dalanghita	1	0.001	-6.91	-0.01	0.01
Nauclea orientalis	Bangkal	1	0.001	-6.91	-0.01	0.01
Ficus carica	Fig	1	0.001	-6.91	-0.01	0.01
Moringa oleifera	Malungay	1	0.001	-6.91	-0.01	0.01
Parkia javanica	Kupang	1	0.001	-6.91	-0.	0.01
Total		728				1.51< x >2.5

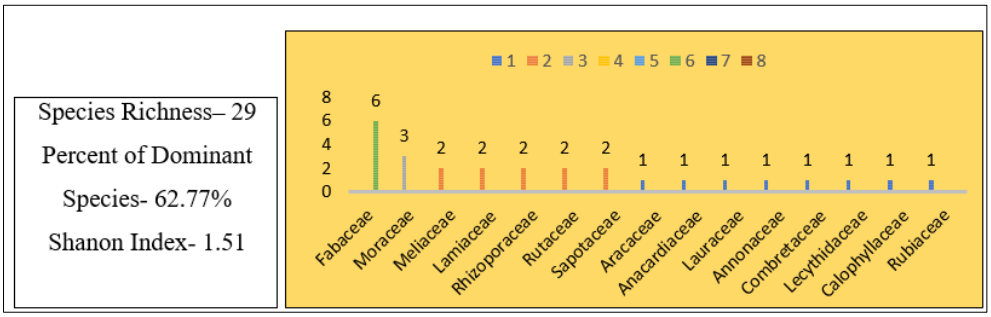

Fig 2: The most common tree families recorded at MinSU Bongabong Campus

Conclusion

In conclusion, the survey of vascular trees at Mindoro State University Bongabong Campus reveals a rich tapestry of Angiosperm species that contribute to the ecological integrity of the area. The identification of 728 taxa across 27 families underscores the importance of this ecosystem. As custodians of this environment, it is imperative for students, educators, and the community to engage in efforts that promote the conservation and study of these vital resources. The knowledge gained from understanding the biodiversity of vascular trees not only enriches academic pursuits but also fosters a culture of environmental stewardship that is essential for the future.

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