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Thesis/Practicum Reports
Forest Biological Science
2023

Title:	**Melliferous Plants Diversity in the Vicinity of Agroforestry and Residential Areas in Lucban, Quezon**
Author:	**Almazol, Lorenzo Escalanda**
Adviser:	**Tinio, Crusty E.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The pollen can be utilized to determine pollination mechanisms, foraging resources, migration routes, and source zones of insects and other pollinators. Studying the pollen sources used by stingless bees in the ecosystem can reveal the variety of melliferous plants, their pollen spectra, and their phenological cycles. This study aimed to determine the diversity of melliferous plants frequented by the stingless bee, Tetragonula biroi Friese, through pollen analysis and pollen frequency from the bee bread samples near the agroforestry and residential area of Lucban, Quezon. Fifteen colonies of stingless bees within five (5) sampling stations were installed; present flower species were collected for reference slides using a modified acetolysis procedure; and pollen sources of the bees were determined by collecting pollen samples from bee bread. The collection was done twice a month, from August 2022 to February 2023 and pollen identification was done by comparing with reference slides, using published literature on pollen, and through the aid of an expert. There were more than nine (9) plant species visited by stingless bees belonging to six families such as Arecaceae (Palmae), Asparagaceae, Asteraceae (Compositae), Euphorbiaceae, Fabaceae (Leguminosae), and Myrtaceae represented by different genera. Arecaceae, represented by

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	Palmera/Foxtail/Coconut, were the Predominant pollen, and Euphorbiaceae and Fabaceae, represented by Euphorbia sp and Makahiya, respectively, were secondary. The rest of the melliferous plants were minor pollen. Most melliferous plants flower continuously. The study recommends that further studies on the bees' food source be carried out in a broader, more extended period to understand this species and how they utilize their resources fully; and the creation of land regulation policies to regulate the conversion of agroforestry areas into subdivisions.
Title:	**Modeling Species Distribution of *Penelopides manillae and Penelopides panini* in the Philippines Under Changing Climate Using Maxent**
Author:	**David, Diether Añonuevo**
Adviser:	**Dans, Andres Tomas L.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Climate change is regarded as one of the biggest threats to biodiversity and ecosystems in the twenty-first century. Specifically, it has a huge impact on wildlife species that alters their natural habitat. The study aimed to model the potential two hornbill species Luzon Hornbill distribution and habitat suitability of (Penelopides manillae) and Visayan Hornbill (Penelopides panini) in the Philippines and assess the response to changing climate using Maxent by using bioclimatic and biophysical variables. The study utilized two global climate models (Model for Interdisciplinary Research on Climate, Earth System Model- MIROC- ESM and Hadley Centre Global Environmental Model, version 2, Earth System-HadGEM2-ES) and climate emission scenarios (SSP 126 and SSP 585) projector to 2030 and 2050. The MaxEnt models of the P. manillae and P. panini were evaluated

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	using Receiver Operating Characteristics Area Under Curve (AUC). Based on the generated Maxent models, the predicted suitable areas for species P. manillae will benefit from the future while for species P. panini will decline by 2030 and 2050 under SSP 126 and SSP 585. The findings of the study will contribute to understanding the habitat suitability distribution of the two hornbill species and it can be used in providing information and reference in the decision- making process in conserving the current and future habitat of the hornbill species.
Title:	**Ethnobotanical Survey of Medicinal Plants used by Residents of Barangay San Isidro and Barangay Mahabang Parang, Angono, Rizal, Philippines**
Author:	**Dela Rosa, Sofia Anne Montenegro**
Adviser:	**Quimado, Marilyn O.**
Stream:	**Production and Industrial Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Barangay San Isidro and Barangay Mahabang Parang in Angono, Rizal, Philippines is adjacent to a quarry site which poses risk of biodiversity loss in both barangays whose residents use medicinal plants as alternative source of medicine. The study aims to create a catalogue of medicinal plants and its uses available and grown in Angono, Rizal and may serve aid in future reforestation and conservation efforts in the municipality. The study documented the local knowledge of medicinal plants and its uses of the residents of Barangay San Isidro and Mahabang Parang in Angono, Rizal. A survey-questionnaire and interview were conducted to a total 50 respondents, 25 each from both barangays. Respondents range from 18-75 years old and with majority coming from the age group of 30 below or the young generation. Majority of the respondents were females (78%) than males (22%). Use value (UV) and informant consensus factor (FIC) were calculated from the documented data. The study cited a total of 32 plant species

	from 19 families. The most represented families were from Euphorbiaceae, Fabaceae, and Lamiaceae with four species each. Leaves were the most plant part used (67%). Collection and harvesting of plants were mostly from the wild (41%). Carica papaya obtained the highest UV (1.5), followed by both Moringa oleifera and Piper betle (1.48). Piper betle is the most mentioned species in treating symptoms, signs, and abnormal clinical findings not elsewhere classified. Moreover, Cymbopogan citratus, Pandanus amaryllifolius, Carica papaya, and Psidium guajava had the highest FIC value of 1.000 and were the most used medicinal plants by the residents of Angono in their respective use categories. This study serves as a baseline knowledge for future ethnobotanical screening of plants in Angono, Rizal and in other places in the Philippines.
Title:	**Modeling Future Spatial Distribution of White Lauan (*Shorea contorta S. Vidal*) in Mount Makiling Forest Reserve Using Maxent**
Author:	**Manalo, Sean Paul Bautista**
Adviser:	**Tinio, Crusty E.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Climate change poses a significant threat to tropical forests by altering species distribution, forest structure, composition, and phenology. This study aimed to determine the effects of climate change on the distribution of Shorea contorta S. Vidal in Mount Makiling Forest Reserve (MMFR) by modeling its current and future spatial distribution using Maximum Entropy Species Distribution Modeling (Maxent) under selected climate scenarios. This study made use of 26 environmental variables, classified as either bioclimatic or biophysical in modeling. The study utilized the bioclimatic variables based on current climatic

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	data and three future climate scenarios or Shared Socio-economic Pathways (SSPs), SSP126, SSP245, and SSP370 from the 20-year period of 2061-2080 under the Global Climate Model (GCM) Model for Interdisciplinary Research on Climate, Earth System version2 for Long-term simulations (MIROC-ES2L). Principal component analysis was employed in the reduction and selection of variables used in final modeling. Model performance was evaluated using Area Under Receiver Operating Characteristic Curve (AUC). Results showed that the distribution of S. contorta would increase under SSP126 and SSP245 and decrease under SSP370. Additionally, the bioclimatic variables, BIO 15 (Precipitation Seasonality) and BIO 2 (Mean Diurnal Range), and biophysical variables, distance from buildings and soil type, were the most significant in contributing to distribution modeling. The findings of this study can aid decision-makers in formulating strategies regarding the conservation of S. contorta and in contributing to the management plans of the MMFR in response to climate change.
Title:	**Avifaunal and Herpetofaunal Biodiversity Assessment of Mount Banahaw-San Cristobal Protected Landscape in Sitio Alitao, Tayabas Quezon**
Author:	**Manasan, Nino Paulo Faulve**
Adviser:	**Balatibat, Juancho B.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Practicum Report**
Abstract/Executive Summary:	With different factors that affect the decrease of forest cover, loss of biodiversity, threats to wildlife species and deteriorating ecosystem, there are different tools that are used for assessing these factors and for monitoring the natural resources. The practicum San Cristobal Protected

	study assessed the current biodiversity of Mt. Banahaw Landscape. The current avifauna and herpetofauna were identified and it provided a valuable data for establishing a biodiversity information database. Different methods were used such as Modified Transect Sampling, Line Transect Count, Purposive Sampling, Opportunistic Sampling and Photo Documentation for the data gathering. Different species have been observed and identified. The most abundant bird species recorded is the Hypsipetes philippinus commonly known as Philippine bulbul from the Family Pycnonotidae which was persistent all throughout the transect. Two Spilornis holospilus, the endemic Philippine serpent eagle, were sighted roaming around the area. Aside from them, the amphibian species, Rhinella marina and commonly known as Cane toad was recorded in the area. Presence of this invasive species in the protected area is a threat to endemic species in the area. In addition, one of the recorded reptiles in the area is the Philippine pit viper, Trimeresurus flavomaculatus For the biodiversity indices, Shannon-Weiner Diversity Index (H'), which measures the level of species diversity had a value of 2.358, indicating a relatively low diversity. On the other hand, Simpson's Diversity Index (D) had a value of 0.8617, indicating the dominance of a particular species in the area. These indices show a high relative value despite of limited data gathered all throughout the practicum. In order to characterize the area in greater detail, additional research must be conducted based on the findings of the biodiversity assessment. To be able to account for differences in environmental conditions between sites, various biodiversity assessments should be conducted in the different areas of Mt. Banahaw - San Cristobal Protected Landscape.
Title:	**Preliminary Assessment of the Leaf Architectural Characteristics of Selected Metallophytes in two Ultramafic Formations in Palawan Island, Philippines**

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Author:	**Montes, Julian Valentin Mataro**
Adviser:	**De Castro, Ma. Ellenita G.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The leaf architecture of selected metallophytes thriving in two types of ultramafic forests in Palawan Island were assessed. In both sites, laminar size was found to be dominated by microphyll size class, indicating that small leaves typify this kind of forest formation. Morphological character states were also found to be very similar within and between two sites, which shows that these traits are environmentally-selected for and maybe useful for typifying ultramafic vegetation. On the other hand, laminar L W ratio was found to be significantly different across sites which may indicate the direct response of the current land-use as Rio Tuba site is inside an active mining activity while Magarwak site is part of undisturbed secondary forest. Venation characters were also found to be highly variable within and between the two sites, thus a more detailed work will be needed to fully understand the intricacies of this laminar feature. In particular, unrelated species exhibit similarities in venation characters based on the results of Paleontological Statistics (PAST) analysis. Given these preliminary findings, venation characters may be considered unreliable characters for the assessment of the phylogenetic relationships among the metallophytes present. It may also be due to the availability of limited. representatives per plant groups during the conduct of the site, indicating that leaf architecture is more useful for delineating closely related taxa, and that heavy metal tolerance had been developed by unrelated taxa via convergent evolution.

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Title:	**Sustainability Index of Biodiversity and Carbon Resources From Selected Rehabilitation Areas in Quezon Province, Philippines**
Author:	**Tabaco, Erwin Lapitan**
Adviser:	**Pampolina, Nelson M.**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	The forest landscape of the Philippines is undergoing intensive rehabilitation through the national greening program and carbon sink initiatives due to years of deforestation that have contributed to biodiversity loss, climate change, and sustainable development goals. This study focused on the evaluation of the sustainability index (SI) regarding biodiversity and carbon resources in monitored and assessed rehabilitation areas in Pagbilao and Padre Burgos, Quezon Province. Mangrove rehabilitation sites (Ilayang Polo, Marao, Ibabang Kinagunan) and upland areas (Binahaan, Ilayang Palsabangon, Ilayang Bagumbungan) were selected. Bioindicators (species composition, diversity, conservation, biodiversity, growth, regeneration, biomass, and carbon) were described and indexed using Likert scale to assess correlations with natural ecosystems. All bioindicators of biodiversity and carbon resources defined the progress of rehabilitation. Regeneration SI was very high in mangroves (525-5,850 seedlings ha-1) than in upland (1,150-11,425 seedlings ha-1) and positively correlated (r<1) with natural forest, indicating succession. Aboveground carbon was higher in upland than in mangroves, and positively correlated with diversity, conservation, and biometrics indicating a more functional upland ecosystem that mimics a natural forest. Overall, the success of mangrove and upland rehabilitation can significantly contribute to biodiversity conservation and climate change mitigation. Monitoring biodiversity and carbon can ensure the sustainability of ecosystems for generations but should further explore other factors to improve the index.
Title:	**Associated Arbuscular Mycorrhizal Fungi (AMF) in Selected Nickel Hyperaccmulators from two Ultramafic Formations in Palawan Island, Philippines**
Author:	**Tayson, Gabriel Joshua Delfin**

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Adviser:	**De Castro, Ma. Ellenita G.**
Stream:	**Production and Industrial Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Arbuscular mycorrhizal fungi (AMF) establishes a symbiotic relationship with almost 80% of vascular plants by forming arbuscule or tree-like structures of fungal hyphae that penetrate the root cortex and vesicles or small and round structures function as storage for nutrients. Vesicular-arbuscular mycorrhizal or VAM structure are the main indicators of AMF **root** colonization. It extends further from the root cortex *via* long filaments of extraradical hyphae into the surrounding soil increasing the uptake of low mobility nutrients. The native vegetation of ultramafic formation primarily consists of hyperaccumulators or plant groups of metallophytes that can thrive on Ni-rich ultramafic soils. It is reported that AMF association reduces the translocation of potential toxic metals such as nickel (Ni), manganese (Mn), cobalt (Co) on the aerial plant tissue. AMF association of two selected nickel hyperaccumulators namely *Phyllantus balgooyi* Petra Hoffm. & A.JM Baker *and Brackenridgea foxworthyi* (Elmer) Furtado in two ultramafic formations in Palawan Island, Philippines, namely Mt. Bulanjao in Rio Tuba, Bataraza and Magarwak Highlands in Sitio Magarwak, Puerto Princesa City was assessed by isolation of spores through wet sieving sucrose centrifugation and root clearing and staining procedure. The morphospecies of AMF identified belongs to families of *Glomeraceae* and *Acaulosporaceae*. The soil physico-chemical properties and elevation was correlated with AMF spore density with positive correlation in organic carbon, organic matter, and nitrogen (p=0.92) in Mt. Bulanjao, Rio Tuba, Bataraza. AMF association is greatly affected by climatic factors and edaphic factors. AMF can establish a symbiotic association with most vascular plants even in highly polluted and unusable soils such as heavy metal- contaminated sites through increasing uptake of low mobility nutrients in plants and process of amelioration or the detoxification by

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	storing heavy metal on their mycorrhizal structures. However, this is warranted for further investigation and requires further identification in species level for its biotechnological application.
Title:	**Plant Diversity, Endomycorrhizas, and Carbon Sequestration and Secondary Forest of La Mesa, Calamba City, Philippines**
Author:	**Timanil, Allyssa Allyson V.**
Adviser:	**Pampolina, Nelson M,**
Stream:	**Environmental Forestry**
Access:	**General Public**
Type:	**Thesis**
Abstract/Executive Summary:	Secondary-growth forest is among the remaining dense green space on hills within Barangay La Mesa in Calamba City. It has the potential to regulate local climate, however, urbanization and land conversions are threat to the ecology, biodiversity, and carbon resources in the area. This study investigated plant diversity, endomycorrhizas, and carbon sequestration potential of the forest ecosystem. A modified quadrat sampling technique was employed to assess these resources across two kilometer transects containing 10 plots (10x10m2 each). Plants were morphologically identified while examined endomycorrhizas and determined Shannon diversity, importance and conservation values. Carbon in tree biomass was estimated through allometric equation while dry weight of ground biomass, and soil organic matter were computed for carbon values. Plant composition in canopy, intermediate, and undergrowth comprised of 14, 20, and 16 species, respectively but diversity was generally low indicating level of disturbance. Species with high importance values were Ficus nota (Blanco) Merr., Dysoxylum gaudichaudianum (A.Juss). Miq., Dendrocnide meyeniana (Walp.) Chew, and Aglaia rimosa (Blanco) Merr. at canopy

	and intermediate layers while A. rimosa and F. ulmifolia Lam. were identified as threatened. Fine roots of these noteworthy species were found associated with species of Glomus, Acaulospora, and Sclerocystis, showing arbuscules, hyphae, and vesicles, suggesting possible role in nutrient dynamics. Endomycorrhizal plants and other pioneer species are indicators of successional phases in the development of a secondary growth forest that support ecologically the ecosystem. The overall potential carbon stock of the secondary growth forest was 292.41tons ha1, which are closely comparable with other forest elsewhere. In depth biodiversity study can be conducted in the area while protecting the remaining secondary growth forest and conserving biodiversity and carbon resources.