FLORA AND FAUNA ASSESSMENT IN THE STRICT PROTECTED ZONE OF THE MUNICIPALITY OF BANTAYAN, CEBU, PHILIPPINES

TECHNICAL REPORT

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February 01, 2023

Report Outline

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EXECUTIVE SUMMARY

The assessment of the existing biodiversity (flora and fauna) status within the urban areas, formulation and implementation of urban biodiversity management plan, and the development of CBI will be the bases for formulation of policies, possible integration in the Comprehensive Land Use Plan (CLUP), Zoning Ordinance (ZO) and other plans in the management of the city's/municipal biodiversity and updated actions for the succeeding plans. This is in accordance with Republic Act 7160, also known as the Local Government Code of 1991, as well as the DENR Administrative Order 2016-12 titled Adopting the Philippine Biodiversity Strategy and Action Plan 2015–2028 (DENR-BMB Technical Bulletin, 2018- 02).

In order to determine the overall value of the flora and fauna of the study area, data was collected during a field survey to assess two different botanical attributes using Biodiversity Assessment and Monitoring System (BAMS): (1) The Flora occurring within the area were determined that focused on sampling technique. The assessment of species indicated the distribution and relative abundance of each vegetation unit, which helped to define units of particular conservation value; and (2) the overall fauna species occurring in the study area. This survey provided a measure of the overall flora and fauna richness of the area, and identified the individual species present. The result of the biodiversity monitoring was compared to the previous assessment.

The Natural Forest of the Municipality of Bantayan in general was characterized as forest over limestone habitat types with an elevation, ranges from 40–100m, having a mountainous topography. The site has a geological composition of mostly raised sedimentary and metamorphic rocks, a considerable part of it being limestone. The forest was dominated by less dense vegetation, small size trees, and few large trees. Lesser vegetation and smaller size trees were observed in the whole part of the mountain. The forest was also covered by large size of outcrop bedrocks with shallow soil and undecomposed organic matters. The smaller size trees ranging from 5–10 cm, with a vegetation cover to almost 30%, canopy cover of 20%, and understory of 50%.

A total of 123 flora species were recorded in the study sites. The species were classified into 51 families and 114 genera. Among the 123 species, 72 were trees, 7 vines, 35 shrubs, 4 herbs, 3 palms, 1 pandan, and 2 ferns **(Table 2; Figure 3)**. Among the 123 plant species, 120 species were categorized as Angiosperm, 1 species as Gymnosperm, and 2 species as Pteridophyte. The most represented families were Fabaceae, Lamiaceae, Annonaceae, Sapindaceae, Moraceae, Anacardiaceae, and Euphorbiaceae. The most recorded genus was Ficus.

Out of the 123 species, 92 species (75%) were recorded in Barangay Atop-atop, 42 (34%) in Barangay Kabangbang, 89 (72%) in Barangay Kampingganon, and 75 (61%) in Barangay Tamiao. Based on the result, based from Shannon diversity index signifies for high species diversities.

In this study a total of 7 herpetofauna species were recorded, with 48 individuals. Out of the 7 species, 5 species were reptiles, and 2 amphibians. For reptiles, majority of the species were Gecko. While for amphibians the dominant species was American Toad (*Anaxyrus*

americanus) with 78 individuals, recorded mostly along the rocks and on intermittent stream. The Reptiles were collected on trees and rocks. Both species were not yet threatened based from IUCN. The lower species diversity of herpetofauna species was attributed by rampant disturbance in the area due to quarrying activity, Kaingin, and charcoal making.

For Mammals, a total of 5 species recorded in the sampling site, with 271 individuals. Out of 5 mammal species, 4 were categorized as fruit bats, and 1 species of rodent (*Rattus tanezume*). The most abundant species were represented by *Rousettus ampliicaudatus,* and *Cynopterus brachyotis.* For Birds, a total of 28 species recorded in the study sites, classified into 22 families, and 29 genera, with 747 individuals, indicating for a high species diversity.

All the flora and fauna species were important components of an ecosystem and play vital roles in facilitating ecological functions and processes. Therefore, the continued disturbance and further degradation of their habitats may cause extreme impacts on their lives. So to ensure of their continued growth, survival and reproduction, conservation measures should be prioritized and urgent actions should be undertaken.

INTRODUCTION

Rationale

The assessment of the existing biodiversity (flora and fauna) status within the urban areas, formulation and implementation of urban biodiversity management plan, and the development of CBI will be the bases for formulation of policies, possible integration in the Comprehensive Land Use Plan (CLUP), Zoning Ordinance (ZO) and other plans in the management of the city's/municipal biodiversity and updated actions for the succeeding plans. This is in accordance with Republic Act 7160, also known as the Local Government Code of 1991, as well as the DENR Administrative Order 2016-12 titled Adopting the Philippine Biodiversity Strategy and Action Plan 2015–2028 (DENR-BMB Technical Bulletin, 2018- 02).

Biodiversity in urban/rural areas is important because in some cases, there are areas within the cities/rural which harbor or affect critical ecosystems such as wetlands or may even provide links to centers of endemism. Biodiversity is an important constituent of sustainable landscape development thus an important ecological, economic, and social/cultural resource that gives the basis for the sustainability of any region.

In general, diverse communities are believed to have increased stability, increased productivity, and resistance to invasion and other disturbances (University of Idaho. 2009). The protection of a wide span of environmental variation may also ensure the long – term persistence of species by allowing adaptive response to future change (Channell and lomolino 2000; Smith et al. 2001).

Conservation of the 600 hectares of the Municipality of Bantayan is about ensuring biological diversity, and the natural processes that sustain it is protected over short and long-time scales. Conservation of biodiversity in nature became acute during the last decades, attempting to alleviate the pending extinction of the biosphere by humans (Soule', 1986, 1987; Wilson & Petter, 1988; Wilson, 1989, 1992; Ehrlich & Wilson, 1991; Fiedler & Jain, 1992). Maximizing environmental diversity within conservation networks, that is maximizing the range of suitable living conditions for different species, guarantee the representation of a diversity of species (Faith and Walker, 1996).

Integrating biodiversity conservation in the Municipal of Bantayan environmental management, and undertaking actions for the sustainable use of resources as well as the protection of nature will promote biodiversity conservation. It is imperative that sustainable resource utilization and as well as conservation serve as a strong tool in the Municipal economic strategic plan, as well as an avoidance of environmental degradation.

Objectives of the Study

The study aims of assessing the flora and fauna species in the 600 hectares strict protected zone of the Municipality of Bantayan as basis for conservation and management strategy.

METHODOLOGY

Physical Profile

The perimeter boundary of the declared Strict Protected Zone (SPZ) of the Municipality (**Figure 1**) were surveyed and layout in the map. The different development, cultivation and vegetation in the area were also indicated in the map. The area in every cultivation and vegetation coverage were computed. Vegetation cover were characterized based on % vegetation cover, elevation and topography. Determination of the vegetation cover was done through estimation based on its occupancy on the ground. The elevation of the site was determined by using GPS. The topography of the site was determined through estimation whether it is flat, rolling or mountainous.

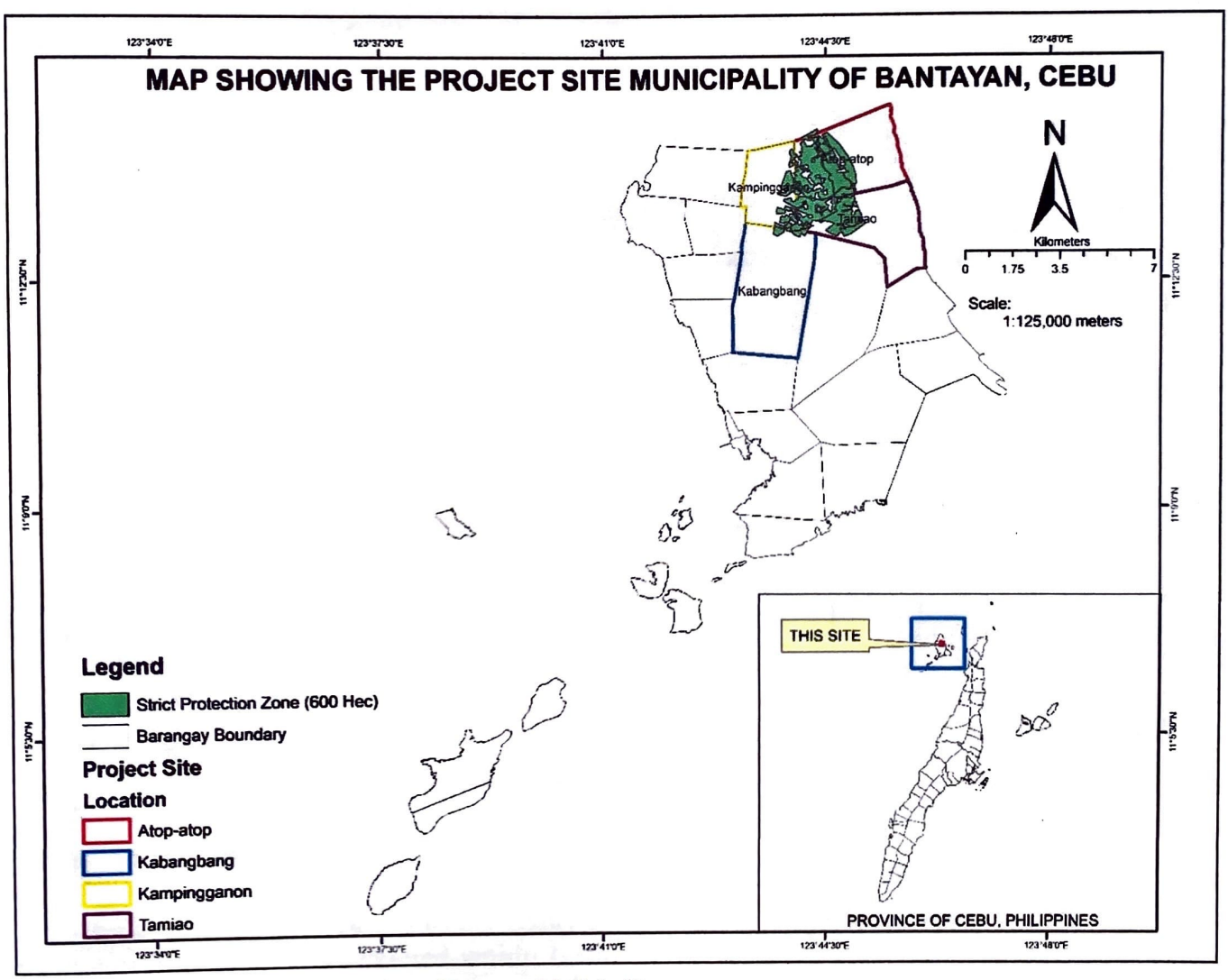

Figure 1. Showing the different study sites of Bantayan Municipality

Biological Profile

The study was conducted in the 600 hectares Strict Protected Area (SPA) of the Municipality of Bantayan (**Figure 1**). A Field Assessment Techniques was employed during the gathering of data from December 2022 to January 2023. The main goal of the activity was to assess the fauna and flora diversity, richness, and habitat characterization.

A Belt-in transect line method were used in the study, 9 quadrats at 20m x 20m were laid out along a 2-km transect line at every 250m interval (**Figure 2**). Nested quadrat sampling technique was used to assess and characterize the structure and species composition of the different plant communities (BMS, 2001; **Figure 2**). For large woody plants whose diameter is equal or greater than 10 centimeters, measurements of diameter at breast-height (DBH), merchantable height (MH), and total height (TH) were done inside the 20m x 20m quadrat. Frequency of shrubs, poles and saplings inside the 5m x 5m quadrat was counted to account for the intermediate species, while percentage cover of understorey species such as grasses and other plants below 1m in height inside the 1m x 1m quadrat was determined.

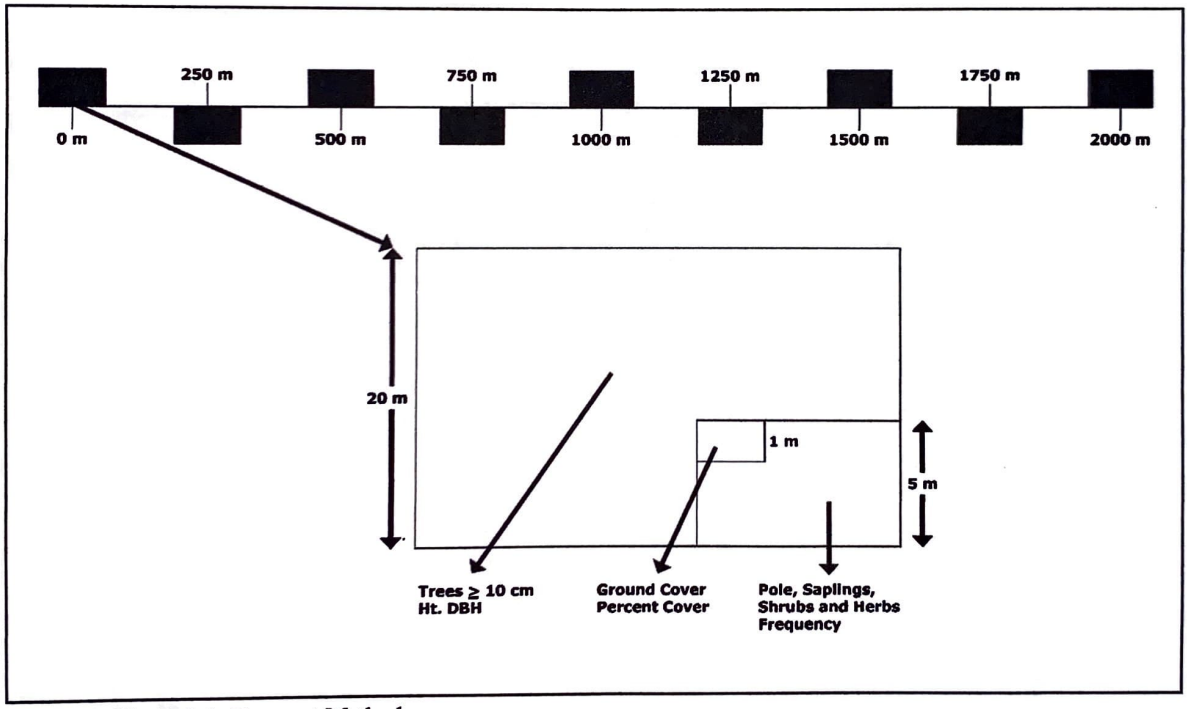

Figure 2. The Belt-in Transect Method.

Flora assessment

The opportunistic flora survey, involving listing and photo documentation of the different plant and tree species encountered within 1-km radius in the study area, was also carried out to fully document the floral resources along the transect plots (**Figure 3**). Tree and other plant species were also surveyed by enumeration of species inside the opportunistic survey radius. All specimens collected during the survey period are photographed and systematically processed on-site. Relevant literature (Leonard L. Co Digital Flora Compilations, Flora Malesiana, Flora of

Manila, Enumeration of Philippine Flowering Plants, Lexicon of Philippine Plants, Blumea, Leaflets of Botany among others) were consulted for the initial identification of the plant materials/photographs. Specimens were then compared with the image database on type materials of the Philippines for final identification.

Figure 3. Flora Assessment. (A) Tree measurement using Haga-altimeter to calculate tree height and tree markings; (B) Tagging of identified tree species.

Bats assessment

Bats were trapped in mist nets for 75 net- nights for the covered sampling sites within the area of jurisdiction; Mist nets were also set (**Figure 4a**) at varying combinations such as V or L formations depending on the orientation of the trail and heights ranging from 0-3 m above the ground (ground mist- netting). A sub-canopy mist-netting was also employed with heights ranged 5-10 m depending on the terrain. A long series of nets connected with each other by a pole or tree branch were set to maximize capture efficiency of bats. Edge mist nets were placed either perpendicular or parallel to the forest edge or in vegetation gaps within the surrounding agricultural land. The nets were checked approximately every 10-20 min and captured bats were immediately retrieved. After extraction, bats were placed in cloth bags and brought to the camp site for identification following Heany and Ingle (1992). All bats that were captured were subsequently released once identified (**Figure 4b**).

Figure 4a. Established and Gathered Data. (A, B) Establishment of mist nets for flying

Figure 4b. Fauna Identification. (A, B) Identification and measuring of volant mammals with BIHIYA WARRIORS trainees from GOOD LAND Community Organization.

Avifauna assessment

Survey of birds were done through a combination of transect line and point count method. The point count method was advisable particularly that bird species per plot was required. The recording of birds was done along the transect line and also at point station at an interval of 250m along the transect line (**Figure 5**). Recording of bird species in the area was done early in the morning from 6:00 am to 9:00 am, and late in the afternoon from 3:00pm to 5:00 pm. Birds captured by mist nets were also considered and recorded. Abundance or richness of birds recorded in the area was computed by summing all the species. Documentation of the specimens were also done through high resolution camera for proper identification.

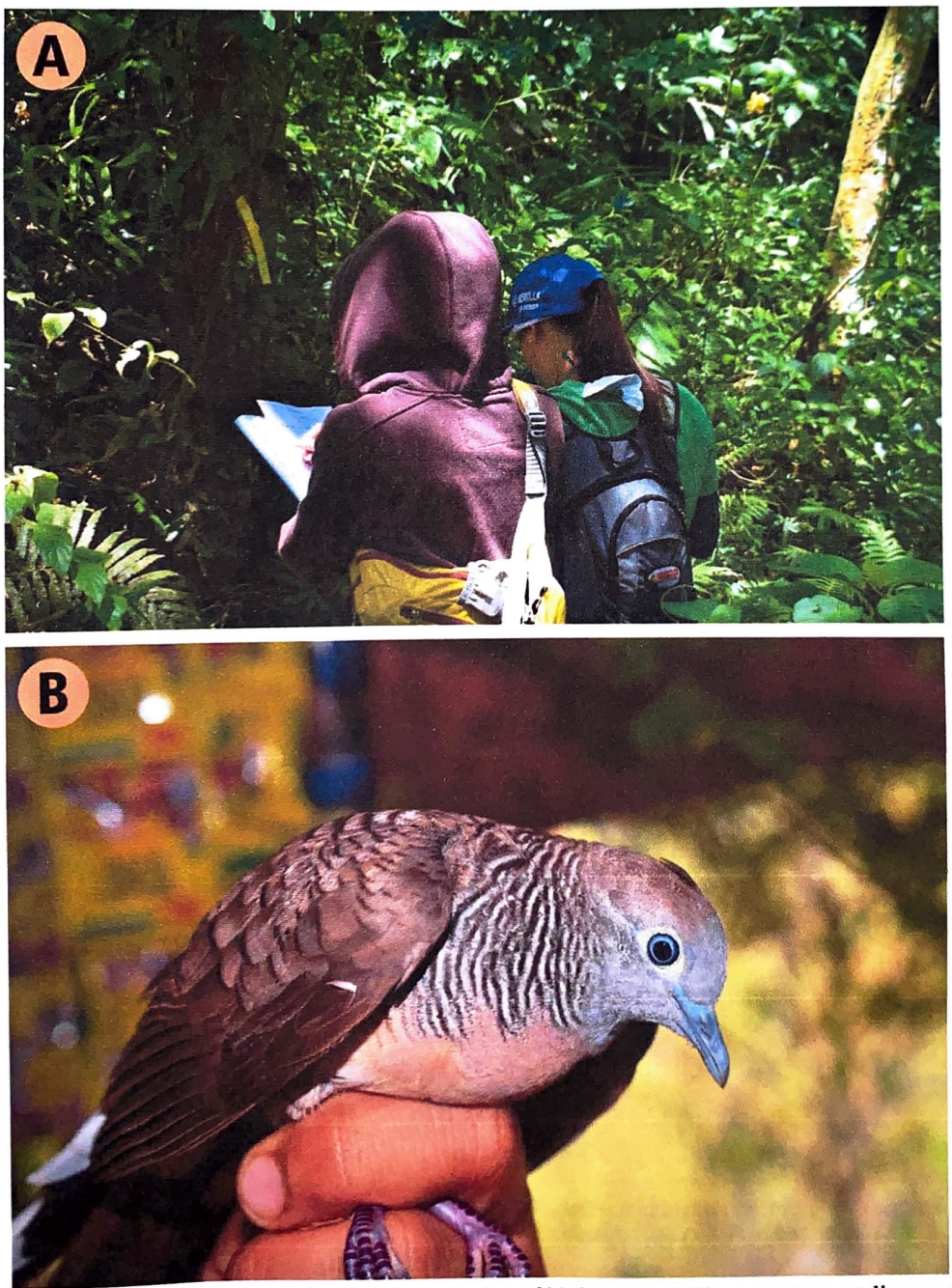

Figure 5. Birds Assessment. (A, B) Data gathering of birds within 2 kilometers transect lines and some beautiful picture of birds.

Herpetofauna assessment

The survey of herpetofauna species employed a modified version of Alcala, E. *et al.* (2004) cruising transect walk technique. The technique involved observation and collection of organisms (herpetofauna) along the transect lines and also used opportunistic sampling on areas believed to be habitats of the organisms under study (**Figure 6**). The study used taxonomic references applicable to particular taxa. For gekkonids, they were identified following the taxonomic keys developed by Brown and Alcala (1978) while amphibians were identified using the taxonomic keys of Alcala and Brown (1998) and Siler et al. (2009).

Figure 6. Herpetoauna Identification. (A, B) Identification and measuring of volant mammals with BIHIYA WARRIORS trainees from GOOD LAND Community Organization.

RESULT OF THE BIODIVERSITY ASSESSMENT

Physical Resources

The Natural Forest of the Municipality of Bantayan in general was characterized as forest over limestone habitat types with an elevation, ranges from 40–100m, having a mountainous topography. The site has a geological composition of mostly raised sedimentary and metamorphic rocks, a considerable part of it being limestone (Audley-Charles *et al.* 1979). The habitat type was comparable to the forest over limestone of the Philippine Forest formation of Fernando *et al.* (2008), and similar to the so-called 'Molave' *(Vitex parviflora)* forest.

The declared Strict Protected Zone (SPZ) of the Municipality has a total area of 600 hectares. The larger area coverage of the SPZ with an intact forest was found in Barangay Kampingganon with 183.91 hectares, Atop-atop with 80.52 hectares, Tamiao with 51.62 hectares, and Kabangbang with 11.62 hectares (**Figure 7a, 7b, 7c, and 7d**).

The forest was dominated by less dense vegetation, small size trees, and few large trees. The larger trees prohibit the penetration of solar radiation into the forest floor, this can be observed in the upper elevation in three study sites (Atop-atop, Kampingganon, and Tamiao). Lesser vegetation and smaller size trees were observed in the whole part of the mountain. The forest was also covered by large size of outcrop bedrocks with shallow soil and undecomposed organic matters.

The smaller size trees ranging from 5–10 cm, with a vegetation cover to almost 30%, canopy cover of 20%, and understory of 50%. The forest was also covered by native trees with almost uniform in height and non-stratified layering. The high number of small size trees in the study area signified for more penetration of solar energy on the forest floor.

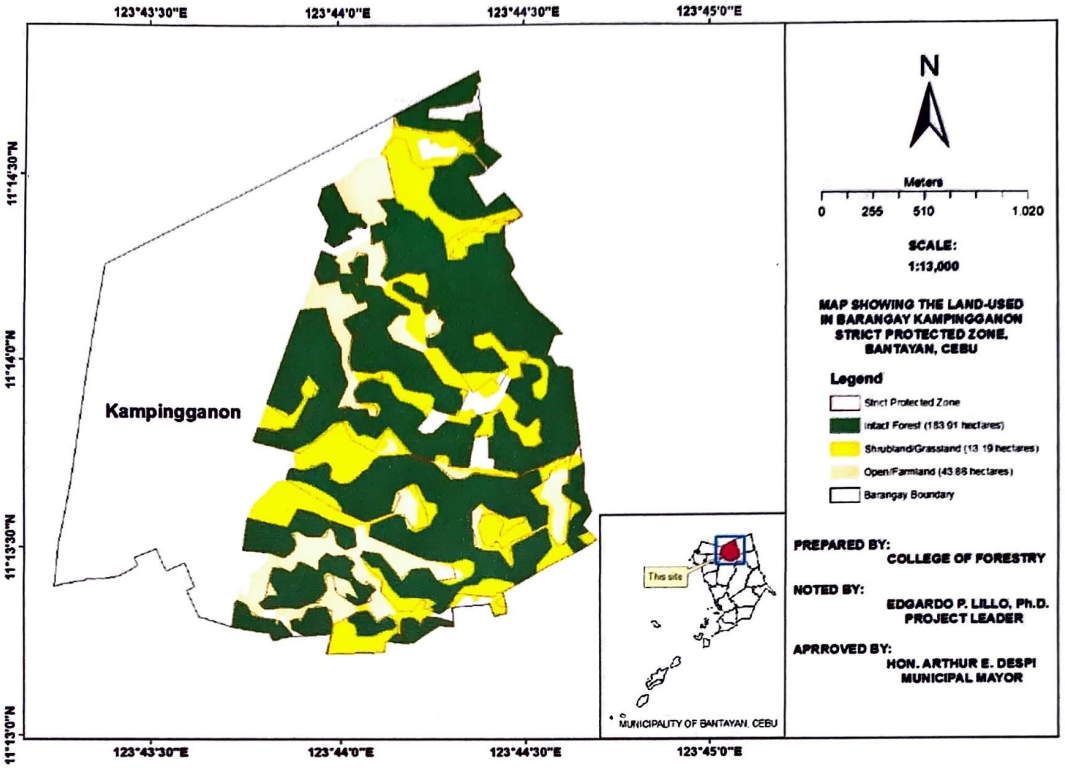

Figure 7a. Land use map of Barangay Kampingganon.

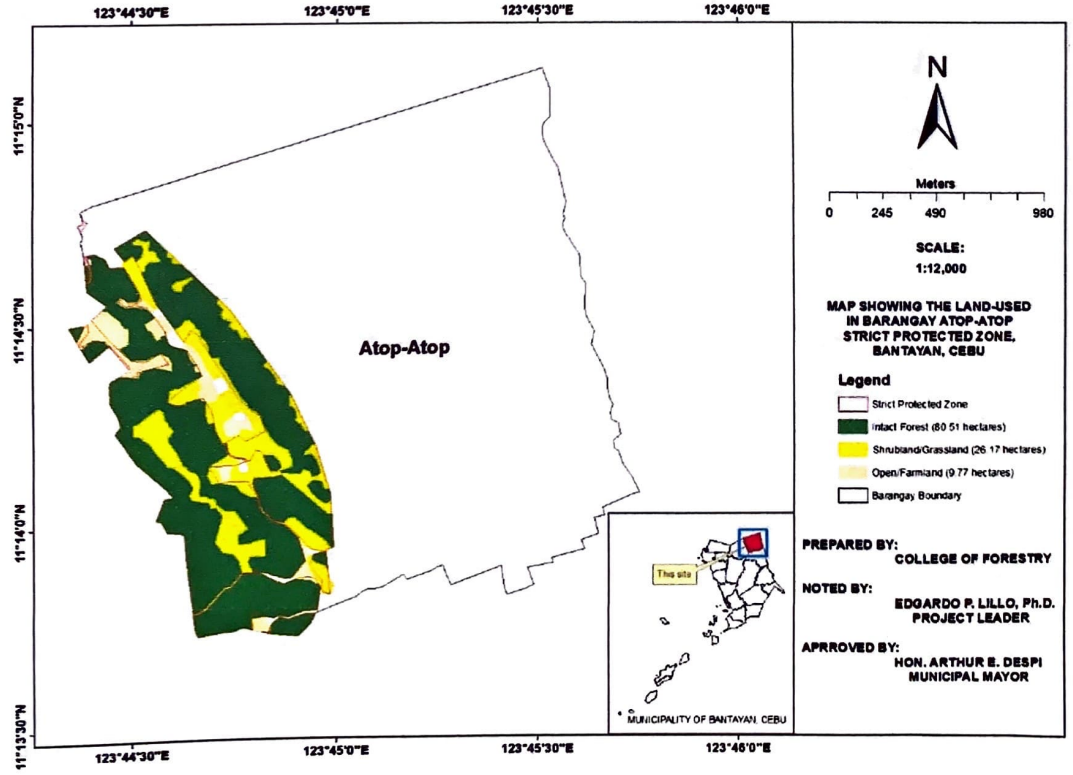

Figure 7b. Land use map of Barangay Atop-Atop.

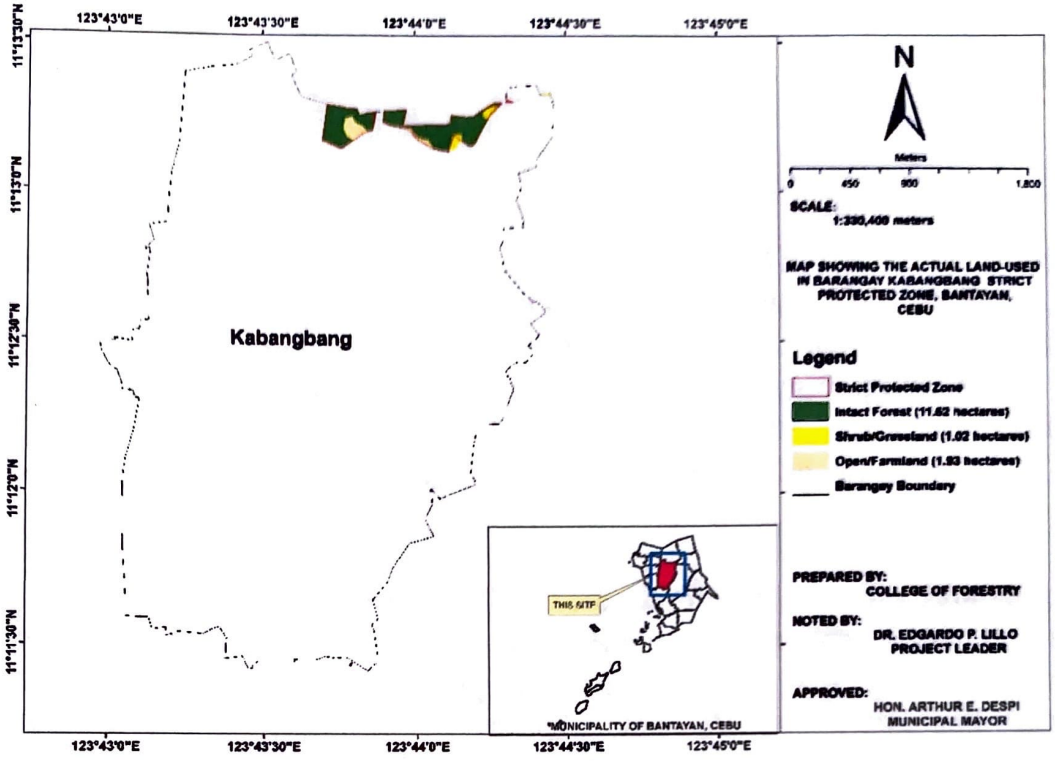

Figure 7c. Land use map of Barangay Kabangbang.

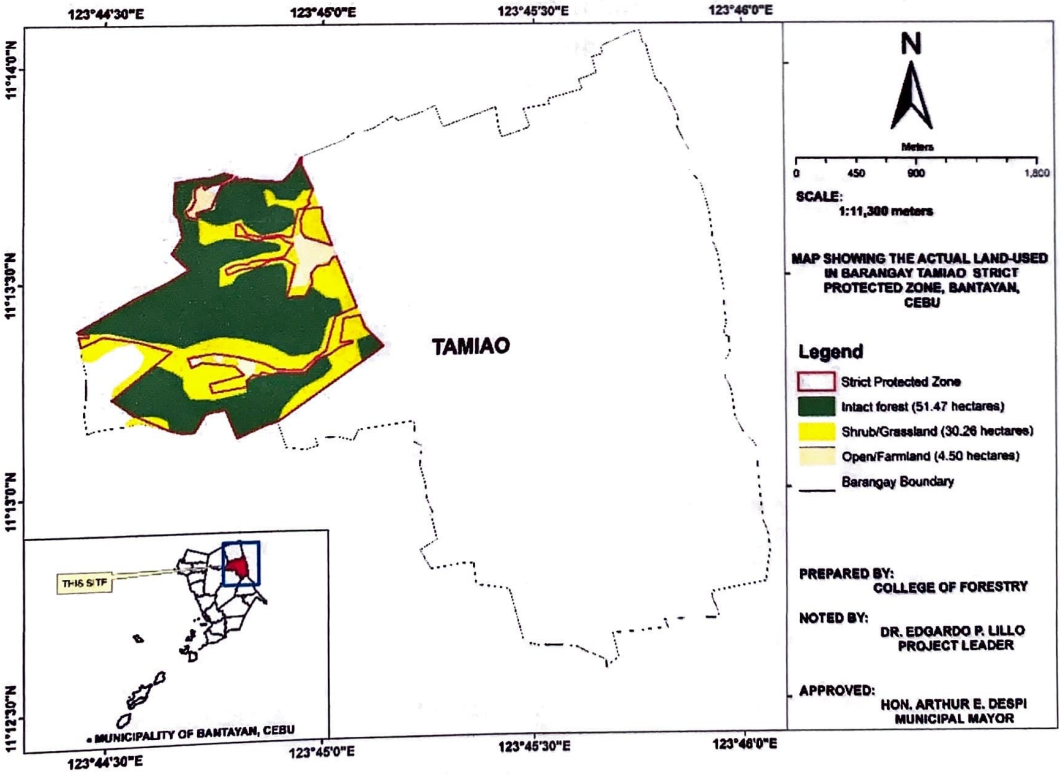

Figure 7d. Land use map of Barangay Tamiao.

Biological Resources

Flora

Species composition

A total of 123 species were recorded in the study sites. The species were classified into 51 families and 114 genera. Among the 123 species, 72 were trees, 7 vines, 35 shrubs, 4 herbs, 3 palms, 1 pandan, and 2 ferns (**Table 2; Figure 8A, 8B, and 8C**). Among the 123 plant species, 120 species were categorized as Angiosperm, 1 species as Gymnosperm, and 2 species as Pteridophyte. The most represented families were Fabaceae, Lamiaceae, Annonaceae, Sapindaceae, Moraceae, Anacardiaceae, and Euphorbiaceae. The most recorded genus was Ficus.

Out of the 123 species, 92 species (75%) were recorded in Barangay Atop-atop, 42 (34%) in Barangay Kabangbang, 89 (72%) in Barangay Kampingganon, and 75 (61%) in Barangay Tamiao. Barangay Atop-atop and Kampingganon found out to have a greater number of species as compared to other study sites due to area of coverage. Both Atop-atop and Kampingganon study sites have covered more than hundred hectares, and densely vegetated as compared to other sites.

The most dominant species were *Buchanania arborescens* (Blume) Blume, *Vitex parviflora* A.Juss., *Acacia auriculiformis* A.Cunn. ex Benth, *Mallotus philippensis* (Lam.) Müll.Arg., and *Allophylus cobbe* (L.) (Figure 3).

Of the 123 species, 4 species were categorized as Threatened under DENR-DAO (2017-11) National Red List. Out of the 4 threatened species, 1 species was categorized as Endangered (*Vitex parviflora* Juss), 1 species was categorized as Vulnerable (*Cycas edentata* de Laub), and 2 categorized as Other Threatened species (*Meiogyne mindorensis* (Merr.) Heusden and *Canarium luzonicum* (Blume) A.Gray) (**Table 1**).

Table 1. Conservation Status of Plant Species.

Species	Family	Conservation Status (DAO-DENR 2017-11)	Endemism
Cycas edentata de Laub	Cycadaceae	Vulnerable	Endemic to Philippines
Meiogyne mindorensis (Merr.) Heusden	Annonaceae	Other Threatened Species	Endemic to Philippines
Canarium luzonicum (Blume) A.Gray	Burseraceae	Other Threatened Species	Endemic to Philippines
Vitex parviflora Juss.	Lamiaceae	Endangered	Java

Table 2. Species Composition and Relative Abundance in Four (4) Study Sites.

Family Name/ Scientific Name	Common Name	Endemicity	Conservation Status (DENR-DAO, 2017-11)	Frequency			
				Atop-Atop	Kabang bang	Kamping ganon	Tamiao
Acanthaceae							
Ruellia tuberosa L	Piti2x	NN	LC	11	3	21	19
Anacardiaceae							
Buchanania arborescens (Blume)	An2x	NE	LC	4	2	3	2
Buchanania microphylla Engl.	Malacopa	NE	LC	1	0	3	1
Mangifera indica L.	Mangga	NN	LC	1	1	1	1
Parishia malabog Merr.	Malabog	PE	LC	1	0	0	2
Semecarpus cuneiformis Blanco	Ligas	NE	LC	8	1	14	5
Spondias purpurea L.	Siniguelas	NN	LC	5	1	7	7
Annonaceae							
Annona muricata	Guyabano	NN	LC	22	6	37	18
Annona squamosa L	Atis	NN	LC	4	5	9	8
Meiogyne mindorensis (Merr.)	Pugan	PE	VU	1	0	0	0
Uvaria rufa (Dunal) Blume	Uvaria	NE	LC	0	0	0	2
Apocynaceae							
Alstonia macrophylla Wall. ex G.Don	Batino	NE	LC	8	0	2	4
Alstonia scholaris (L.) R. Br.	Dita	NE	LC	9	5	0	4
Hoya madulidii Kloppenb.	Hoya	PE	LC	1	0	1	0
Tabernaemontana pandacaqui Poir.	Buta2x	NE	LC	18	8	25	17
Voacanga globosa (Blanco) Merr.	Bayag-usa	PE	LC	4	4	7	2
Araliaceae							
Amorphophallus merrillii K.Krause	Pongapong	PE	LC	3	0	0	0
Arecaceae							
Cocos nucifera L.	Lubi	NN	LC	0	0	2	1
Corypha utan Lamk	Buli	NE	LC	1	1	2	1
Heterospathe elata	Sagisi	NE	LC	0	0	1	0
Asparagaceae							
Agave sisalana Perrine ex Engelm.	Magay	NN	LC	8	0	14	5
Aspleniaceae							
Asplenium sp.	Manalo	NE	LC	0	0	1	0

Asteraceae							
Chromolaena odorata (L.)	Hagonoy	NN	LC	2	1	2	2
Bombacaceae							
Ceiba pentandra (L.) Gaertn	Duldol	NN	LC	1	0	1	1
Boraginaceae							
Carmona retusa (Vahl) Masam.	Tsaang gubat	NE	LC	0	0	0	1
Burseraceae							
Canarium luzonicum (Blume) A.Gray,	Pagsahingin bolog	PE	OTS	1	0	1	0
Burseraceae							
Garuga floribunda Decne	Bogo	NE	LC	0	0	1	0
Caricaceae							
Carica papaya L.	Papaya	NN	LC	0	0	1	0
Celastraceae							
Celastrus paniculatus Willd	Celastrus	NE	LC	0	0	1	0
Salacia chinensis L.	Salacia	NE	LC	1	0	1	0
Combretaceae							
Terminalia foetidissima Griff	Talisay gubat	NE	LC	8	7	12	6
Convolvulaceae							
Ipomoea boholensis (Merr.)	Ipomoea	PE	LC	5	0	0	3
Crassulaceae							
Bryophyllum pinnatum (Lam.)	Katakataka	NE	LC	0	0	1	0
Cucurbitaceae							
Trichosanthes tricuspidata L.	Trichosanthes	NE	LC	1	1	0	0
Cycadaceae							
Cycas edentata de Laub.	Pitogo	NE	VU	1	0	0	0
Ebenaceae							
Diospyros maritima Blume	Malatinta	NE	LC	2	1	0	1
Euphorbiaceae							
Acalypha amentacea Roxb	Bogus	NE	LC	0	0	0	37
Jatropha gossypiifolia L	Tuba2x pula	NN	LC	4	0	6	3
Macaranga tanarius (L.) Muell.-Arg.	Binunga	NE	LC	2	1	3	1
Mallotus mollissimus (Geiseler) Airy Shaw	Hinlaumo	NE	LC	1	0	0	0
Mallotus philippensis (Lam.) Müll.Arg.	Banato	NE	LC	9	5	10	4

Melanolepis multiglandulosa (Reinw. ex Blume)	Alim	NE	LC	2	1	2	1
Suregada glomerulata (Blume) Baill.	Malasuha	NE	LC	15	12	21	13
Fabaceae							
Abrus precatorius L.	Oyang-ya	NE	LC	11	0	12	9
Acacia auriculiformis A.Cunn. ex Benth	Ayangile	NN	LC	120	45	89	27
Albizia saponaria (Lour.) Miq.	Salingkugi	NE	LC	4	0	2	2
Centrosema angustifolium Benth.	Centrosema	NE	LC	1	0	0	0
Delonix regia (Bojer) Raf.	Acacia	NN	LC	0	0	1	0
Derris elliptica Benth	Tubli	NE	LC	1	1	0	0
Eucalyptus globulus Labill	White bagras	NN	LC	0	0	1	0
Flemingia macrophylla (Willd.) Merr.	Flemingia	NE	LC	0	0	1	0
Gliricidia sepium (Jacq.)	Madre de cacao	NN	LC	0	0	1	0
Leucaena leucocephala (Lam.)	Ipil2x	NN	LC	8	1	1	1
Pithecellobium dulce	Kamachile	NE	LC	0	0	1	0
Senna spectabilis (DC.) H. S. Irwin & Barneby	Robles	NE	LC	0	0	3	0
Sophora tomentosa L.	Sophora	NE	LC	0	0	2	0
Tamarindus indica L.	Sambag	NN	LC	1	0	2	0
Hypericaceae							
Cratoxylum sumatranum (Jack) Blume	Kinay	NE	LC	1	0	0	0
Lamiaceae							
Callicarpa bicolor Juss	Alagau	NE	LC	2	0	0	0
Clerodendrum minahassae Teijsm. & Binn.	Bagawak	NE	LC	1	0	1	1
Gmelina arborea Roxb.	Gmelina	NN	LC	2	1	2	1
Ocimum tenuiflorum L.	Mala-sangig	NE	LC	20	1	6	12
Premna serratifolia L.	Sali-argao	NE	LC	1	0	1	6
Vitex parviflora A.Juss.	Tugas	NE	Endangered	46	12	35	15
Lauraceae							
Cassytha filiformis L.	Pobreng vines	NE	LC	1	0	1	0

Neolitsea cassia (L.) Kosterm	Law-at	NE	LC	2	0	1	1
Loganiaceae							
Geniostoma rupestre J.R.Forst. & G.Forst.	Gagadang	NE	LC	0	0	0	3
Magnoliaceae							
Magnolia liliifera (L.) Baill.	Magnolia	NE	LC	1	0	0	0
Malvaceae							
Corchorus olitorius L.	Saluyot	NE	LC	1	0	0	0
Meliaceae							
Aglaia luzoniensis (Vidal) Merr. & Rolfe	Kuling-manuk	NE	LC	0	0	5	3
Aglaia sp.	Meliaceae sp.	NE	LC	0	0	2	1
Azadirachta indica A.Juss.	Neem tree	NN	LC	2	1	1	0
Dysoxylum pauciflorum Merr.	Dysoxylum	PE	LC	0	0	0	1
Melia azedarach L.	Bagalunga	NE	LC	27	15	12	6
Sandoricum koetjape	Santol	NE	LC	0	0	1	0
Swietenia mahagoni (L.) Jacq.	Mahogay	NN	LC	12	9	28	9
Menispermaceae							
Tinospora crispa (L.) Hook.f. & Thomson	Panyawan	NE	LC	3	0	0	0
Moraceae							
Artocarpus altilis (Parkinson) Fosberg,	Kolo	NE	LC	1	1	2	1
Artocarpus heterophyllus Lamk	Nangka	NN	LC	3	0	1	2
Broussonetia luzonica (Blanco) Bureau	Bulbulan	NE	LC	2	3	1	0
Ficus odorata (Blanco) Merr.	Pakiling	PE	LC	1	0	0	0
Ficus pseudopalma Blanco,	Niyog-niyogan	PE	LC	1	0	2	0
Ficus septica Burm.f.	Lagnub	NE	LC	2	1	2	1
Ficus ulmifolia Lam.	Is2x	PE	LC	3	2	1	6
Morus alba L.	Mulberry	NE	LC	0	0	1	0
Muntingiaceae							
Muntingia calabura L.	Mansanitas	NN	LC	2	0	1	2
Myrtaceae							
Psidium guajava L	Bayabas	NN	LC	12	5	15	8
Syzygium cumini (L.) Skeels	Lomboy	NN	LC	3	0	2	1
Orchidaceae							
Geodorum densiflorum (Lam.)	Wild orchids	NE	LC	0	0	0	2

Schltr							
Oxalidaceae							
Biophytum sensitivum (L.) DC	Biophytum	NE	LC	1	1	2	13
Pandanaceae							
Pandanus luzonensis	Pandan	PE	LC	1	0	0	0
Phyllanthaceae							
Antidesma tomentosum Blume	Bignai-kalau	NN	LC	4	0	0	0
Breynia vitis-idaea (Burm.f.)	Matang-hipon	NE	LC	10	0	19	2
Bridelia stipularis (L.) Blume	Subiang	NE	LC	2	0	1	0
Flueggea virosa (Roxb. ex Willd.)	Tahod2x	NE	LC	11	0	2	6
Glochidion rubrum Blume	Bunot2x	NE	LC	3	0	3	1
Pittosporaceae							
Pittosporum pentandrum (Blanco) Merr.	Tikala	NE	LC	2	1	2	1
Poaceae							
Bambusa spinosa Roxb.	Kawayan tinik	NE	LC	4	2	4	0
Polypodiaceae							
Drynaria sparsisora (Desv.)	Cab2x	NE	LC	0	0	1	0
Primulaceae							
Maesa indica (Roxb.) A.DC	Maysa	NE	LC	1	0	1	1
Proteaceae							
Helicia paucinervia Merr	Lakot	PE	LC	1	0	0	0
Rubiaceae							
Ixora philippinensis Merr.	Wild santan	NE	LC	3	1	3	1
Kanapia wenzelii (Merr.) Arriola, Parag. & Alejandro	Malacape	PE	LC	1	0	0	0
Morinda citrifolia L.	Bangkoro	NE	LC	9	5	13	5
Nauclea orientalis (L.)	Bangkal	NE	LC	0	0	1	7
Rutaceae							
Citrus maxima	Buongon	NN	LC	0	0	1	0
Micromelon minutum Wight & Arn.	Tulibastilos	NE	LC	5	3	0	4
Triphasia trifolia (Burm.f.)	Suwa2x	NN	LC	4	0	0	3
Salicaceae							
Flacourtia jangomas	Ceriales	NE	LC	2	0	2	2

(Lour.)							
Flacourtia rukam Zoll. & Moritzi	Mala-inyam	NE	LC	4	0	2	14
Xylosma suluensis Merr.	Madagascar plum	NE	LC	9	0	0	3
Sapindaceae							
Alectryon glaber (Blume) Radlk.	Sala	NE	LC	0	0	0	5
Allophylus cobbe (L.)	Allophylus	NE	LC	28	16	12	9
Pometia pinnata J.R.Forst. & G.Forst.	Malugai	NE	LC	0	0	1	0
Sapotaceae							
Chrysophyllum cainito L.	Caimito	NN	LC	1	1	1	0
Manilkara zapota (L.)	Chicos	NN	LC	0	0	0	4
Planchonella obovata (R.Br.) Pierre	Mangkas	NE	LC	15	0	0	20
Solanaceae							
Solanum torvum Sw.	Malatalong	NE	LC	0	0	1	0
Stemonuraceae							
Gomphandra mappioides Valeton	Mabunot	NE	LC	1	0	1	1
Sterculiaceae							
Pterocymbium tinctorium (Blanco) Merr.	Taloto	NE	LC	3	0	4	5
Sterculia foetida L.	Kalumpang	NE	LC	1	0	8	4
Verbenaceae							
Lantana camara L	Iring-iring	NN	LC	9	2	4	2
Stachytarpheta jamaicensis (L.)	Triphante	NN	LC	1	0	0	0
			Total Species:	**92**	**42**	**89**	**75**

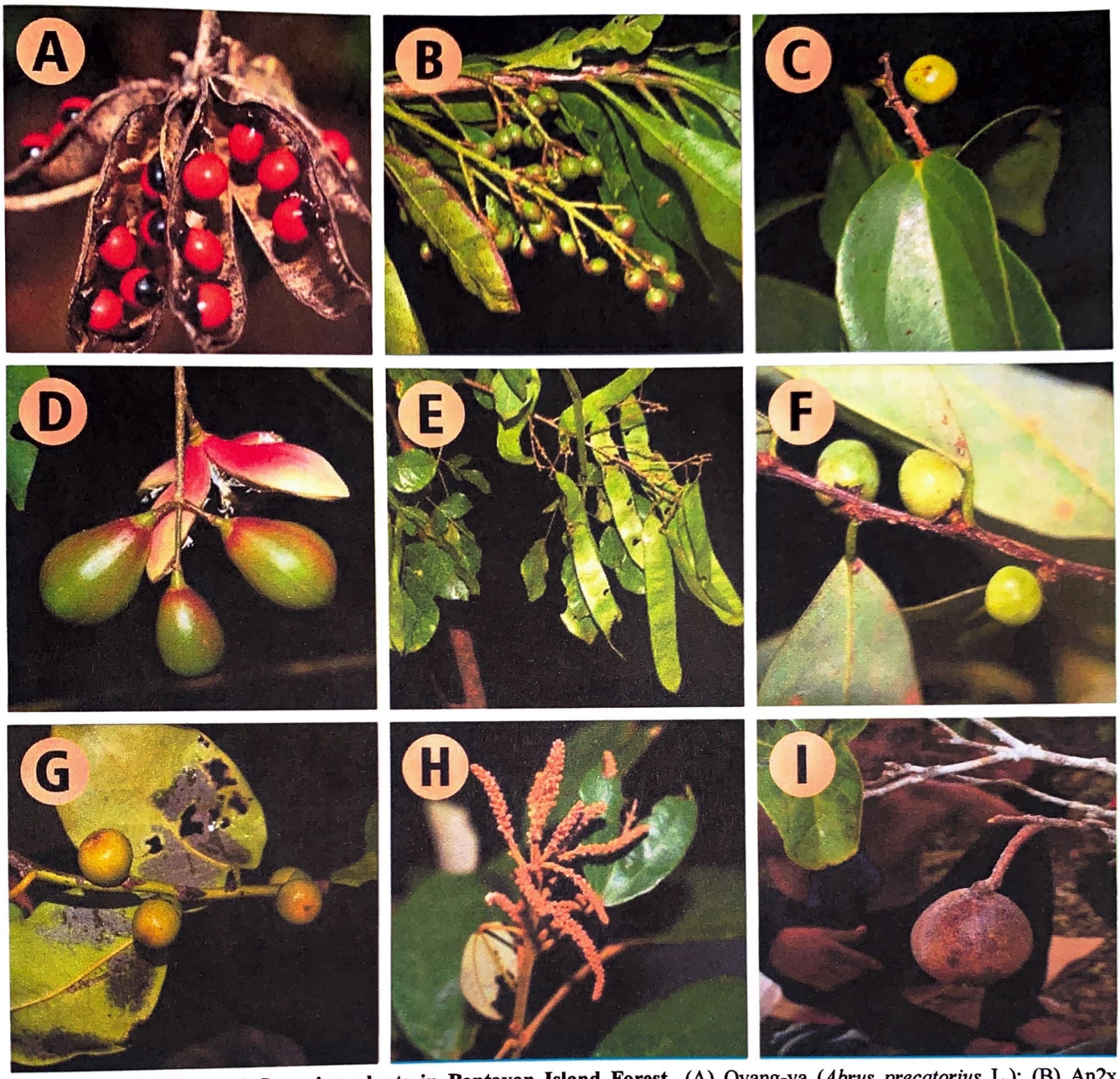

Figure 8A. Fruiting and flowering plants in Bantayan Island Forest. (A) Oyang-ya (*Abrus precatorius* L.); (B) An2x (*Buchanania arborescens* Blume); (C) Mala-inyam (*Flacourtia rukam* Zoll. & Moritzi); (D) Kuling manuk (*Dysoxylum pauciflorum* Merr.); (E) Salingkugi (*Albizia saponaria* (Lour.) Miq.); (F) Subiang (*Bridelia stipularis* L. Blume); (G) Malatinta (*Diospyros maritima* Blume); (H) Lakot (*Helicia paucinervia* Merr); (I) Banato (*Mallotus philippensis* (Lam.) Müll.Arg.).

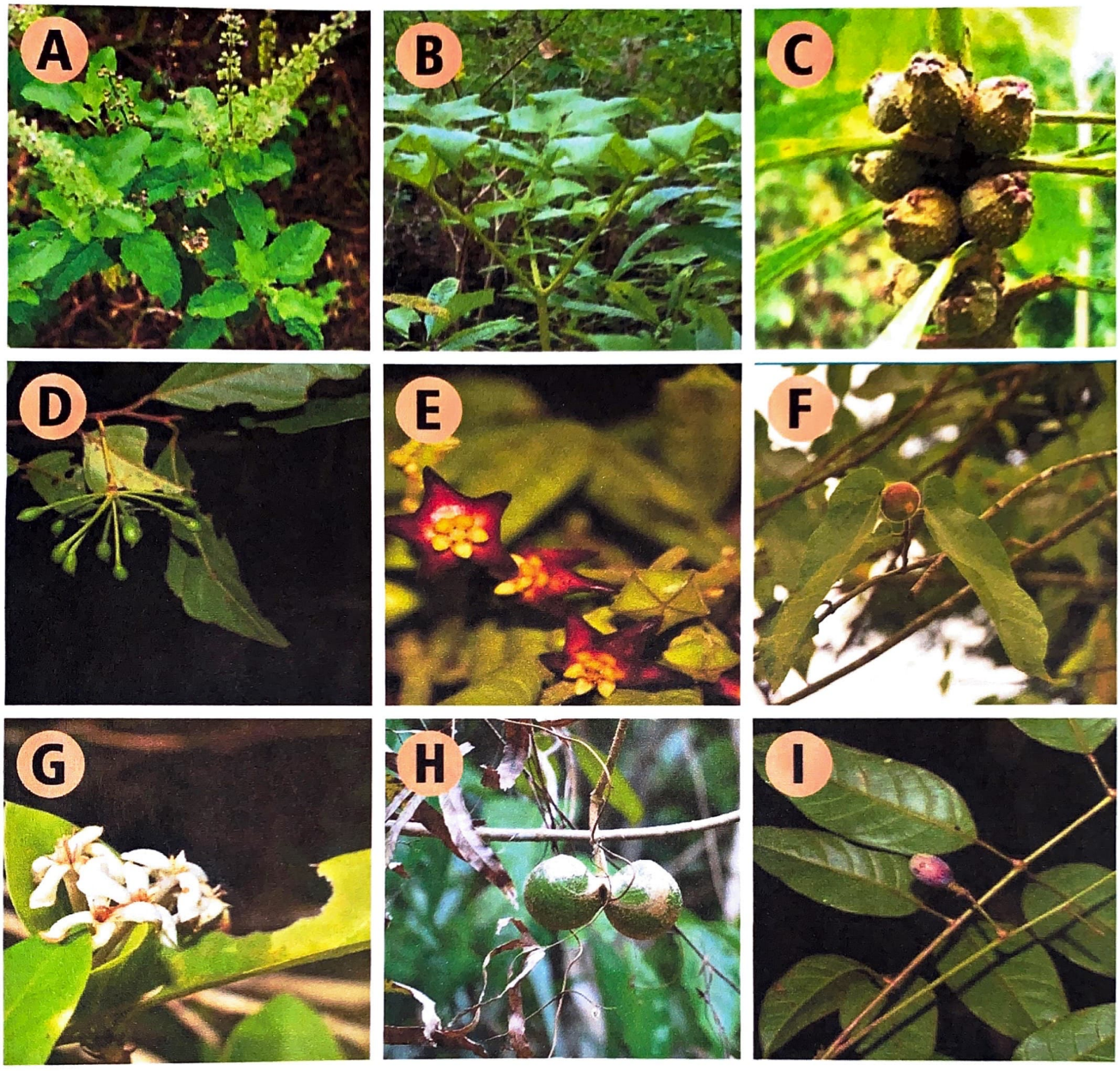

Figure 8B. Fruiting and flowering plants in Bantayan Island Forest. (A) Mala-sangig (*Ocimum tenuiflorum* L.); (B) Pangapong (*Amorphophallus merrillii* K.Krause); (C) Niyog-niyogan (*Ficus pseudopalma* Blanco); (D) Pugan (*Meiogyne mindorensis* Merr.); (E) Hoya (*Hoya madulidii* Kloppenb.); (F) Pakiling (*Ficus odorata* (Blanco) Merr.); (G) Wild santan (*Ixora philippinensis* Merr.); (H) Bayag-usa (*Voacanga globosa* (Blanco) Merr.); (I) Pagsahingin bolog (*Canarium luzonicum* (Blume) A.Gray.).

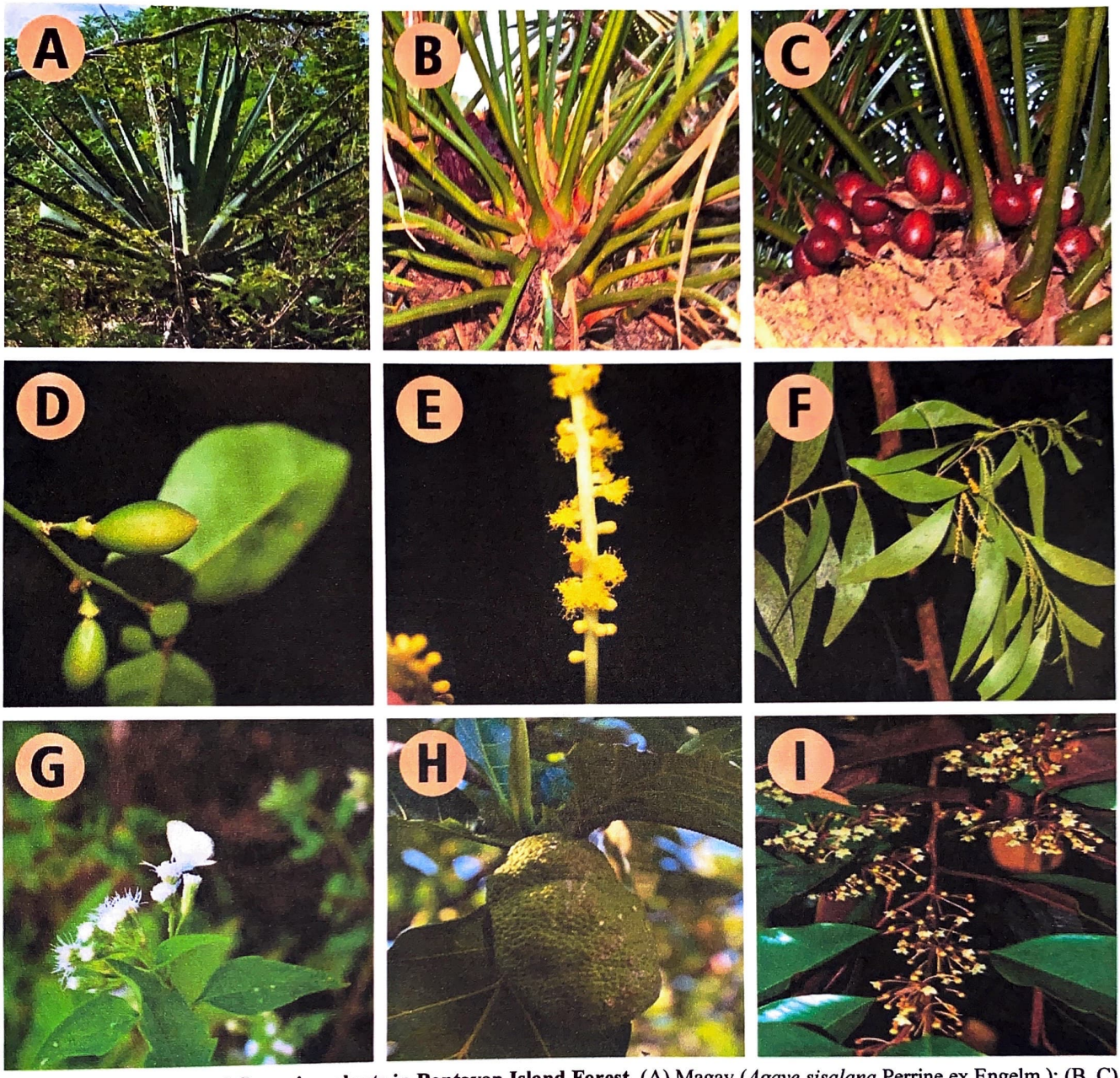

Figure 8C. Fruiting and flowering plants in Bantayan Island Forest. (A) Magay (*Agave sisalana* Perrine ex Engelm.); (B, C) Pitogo (*Cycas edentata* de Laub.); (D) Suha2x (*Triphasia trifolia* (Burm.f.); (E, F) Ayangile (*Acacia auriculiformis* A.Cunn. ex Benth); (G) Hagonoy (*Chromolaena odorata* L.); (H) Kolo (*Artocarpus altilis* (Parkinson) Fosberg,); (I) Caimito (*Chrysophyllum cainito* L.)

Species Diversity

Compilation of diversity values in all the sampling sites would provide valuable information on their production output, management practices, as well as their environmental stability. Based on the result, the average computed species diversity using the Shannon diversity index was H'= 3.2675 (**Table 3**). The result implies that the estimation of species diversity by the Shannon index signifies that species diversities are relatively high. The Simpson diversity index also signifies that the study sites have a relative value of very high species diversity (0.9445). Almost 82% of the plant species were common in all sampling sites.

Among the sampling sites with very high species diversity were Barangay Atop-atop (H'=3.628), and Barangay Tamiao (H'=3.799) (**Table 3**). The sampling site with lower species diversity was Barangay Kampingganon (H'=2.93), with a relative value of moderate diversity. (**Table 3**). Barangay Atop-atop and Tamiao have very high species diversity due to the strict implementation of the environmental policy by its local officials, as well as the existing of the NGO (Goodland) with the mandate of protecting the environment, resulting to intact forest with less disturbance as compared to both Kampingganon and Kabangbang study sites. The NGO collaborated with the barangay officials in the protection of its existing forest vegetation.

Table 3. Species Diversity per Site Based from Shannon and Simpson Diversity Index.

Study Sites	Diversity Index		Evenness	Relative Value (Diversity)
	Shannon Index	Simpson Index		
Atop-Atop	3.628	0.947	0.802	Very High
Kampingganon	2.599	0.948	0.802	Moderate
Kabangbang	3.044	0.916	0.814	High
Tamiao	3.799	0.967	0.88	Very High
Average	**3.2675**	**0.9445**	**0.8245**	

Clustering of Species (Jaccard's, Simpson's, and Sorensen Similarity/dissimilarity Matrix)

Clustering of plant species community in the Municipality of Bantayan were analyzed using both Jaccard's, Simpson's, and Sorensen coefficient similarity/dissimilarity matrix. In this study, under Jaccards and Sorensen coefficient, it shows that all the four (4) sampling sites were forming three (3) clusters/ groups correspondingly. The four (4) sampling sites proved to have distinctive species association, hence grouping them together into three (3) distinct clusters in terms of their species composition, sampling sites having found similar in terms of species composition were grouped together as one subgroup (**Figures 9a, 9b, and 9c**). Based on Figures and Table (Figure 9a and 9b; Table 2) Barangay Kabangbang sampling site formed as one subgroup, Kampingganon sampling site also formed another subgroup. While Tamiao and Atop-atop sampling sites formed together as one cluster/subgroup.

In Simpson's similarity/dissimilarity matrix, shows different results from both Jaccards and Sorensen's coefficient. Based on Figure and Table (**Figure 9c; Table 2**), the four (4) sampling sites proved to have distinctive species association, hence grouping them together into three (3) distinct clusters/subgroups. The Kampingganon formed as one subgroup, Tami-aw

sampling site also formed as one subgroup, While Kabangbang and Atop-atop formed together as one subgroup. While in Jaccard's and Sorensen coefficient consider these two sampling sites as a different subgroup.

The cluster analysis using Jaccard's and Sorensen indices reveals that the Strict Protected Area (SPA) of Bantayan Municipality was covered by three species communities with high species diversity. The result implies that similarity in species composition among sampling sites implies similarity in management practices, as well as on conservation technique.

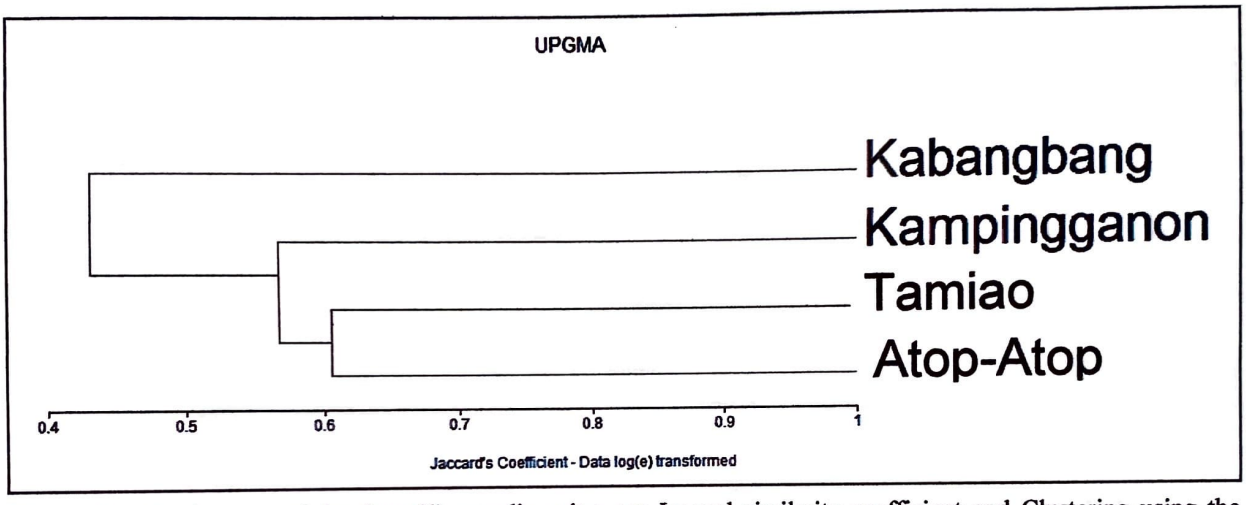

Figure 9a. Dendrogram of the four (4) sampling sites per Jaccard similarity coefficient and Clustering using the Unweighted Pair Group Method with Arithmetic mean (UPGMA)

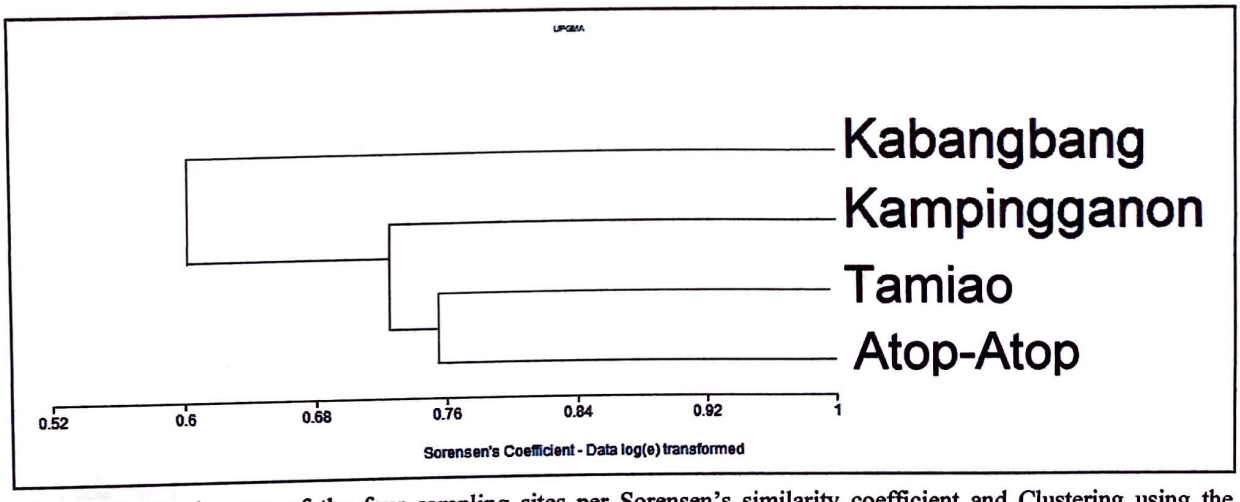

Figure 9b. Dendrogram of the four sampling sites per Sorensen's similarity coefficient and Clustering using the Unweighted Pair Group Method with Arithmetic mean (UPGMA)

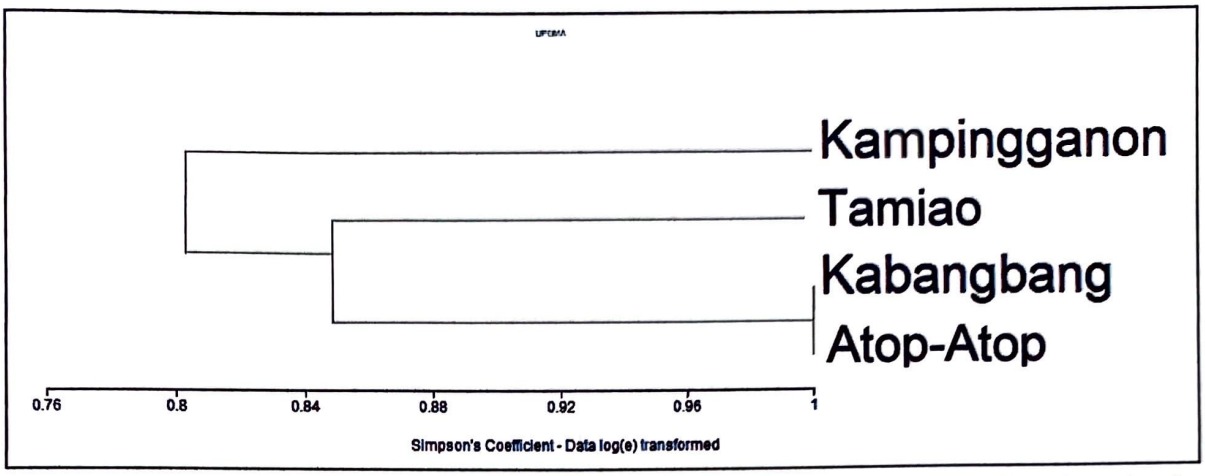

Figure 9c. Dendrogram of the four sampling sites per Simpson's similarity coefficient and Clustering using the Unweighted Pair Group Method with Arithmetic mean (UPGMA)

Faunal Assessment in 600 ha Strict Protected Area under Municipality of Bantayan, Cebu

Mammals

Species composition and Diversity of Mammals

A total of 5 species of Mammals were recorded in this study, with 271 individuals (**Table 4 and 5**). Wherein majority of the species were recorded in barangay atop-atop sampling site (**Table 5**). Out of 5 mammal species, 4 were identified as fruit bats, and 1 species of rodent (*Rattus tanezume*). The most abundant species were represented by *Rousettus amplicaudatus*, and *Cynopterus brachyotis* (**Table 4; Figure 10**).

Of the 5 Mammal species, 1 species found to be an endemic to the Philippines (*Pteropus hypomaelanus*) captured from the sampling sites. These species tolerates degraded habitats (including urban areas) to some extent, and because its population is thought to be stable (Ong et al., 2008).

One species of rodent (*Rattus tanezume*) was also recorded in the study site, with more than 5 individuals. The species was capture within the forest associated particularly within Corn Farm.

However, Shannon and Simpson diversity index found out that the Mammal species in Bantayan SPA forest reserve were occupying a lower species diversity. Based from computation, both Natural Forest and Plantation Forest has a diversity index of 0.983 for Shannon index and 0,569 for Simpson index, indicating for a lower species diversity (**Table 4**). The lower species diversity of Mammal species was also attributed to the rampant disturbance in the area due to charcoal making activity.

Table 4. Species Composition and Diversity of Mammal Species for 75 Net Nights Duration.

Common Name	Scientific Name	Family Name	IUCN Status ver. 2019-2	Individuals	Diversity Indices	
					Shannon Index	Simpson Index
Common Roussete	*Roussete amplicaudatus*	Pteripodidae	LC	130		
Lesser Dog-Faced Fruitbat	*Cynopterus brachyotis*	Pteripodidae	LC	121		
Common Nectar Bat	*Eonycteris spelaea*	Pteripodidae	LC	8	0.983	0.569
Island Flying Fox	*Pteropus hypomelanus*	Pteripodidae	LC	4		
Oriental House Rat	*Rattus tanezume*	Rodentia	LC	8		
			Total:	**271**		

Table 5. Distribution and Frequency of Mammals per Sampling Sites.

Common Name	Scientific Name	Family Name	Frequency			
			Atop-Atop	Kabangbang	Kampingganon	Tamiao
Common Roussete	*Roussete amplicaudatus*	Pteripodidae	5	0	3	0
Lesser Dog-Faced Fruitbat	*Cynopterus brachyotis*	Pteripodidae	104	4	12	10
Common Nectar Bat	*Eonycteris spelaea*	Pteripodidae	82	8	23	8
Island Flying Fox	*Pteropus hypomelanus*	Pteripodidae	1	0	3	0
Oriental House Rat	*Rattus tanezume*	Rodentia	3	1	4	0
		Total:	**195**	**9**	**45**	**18**

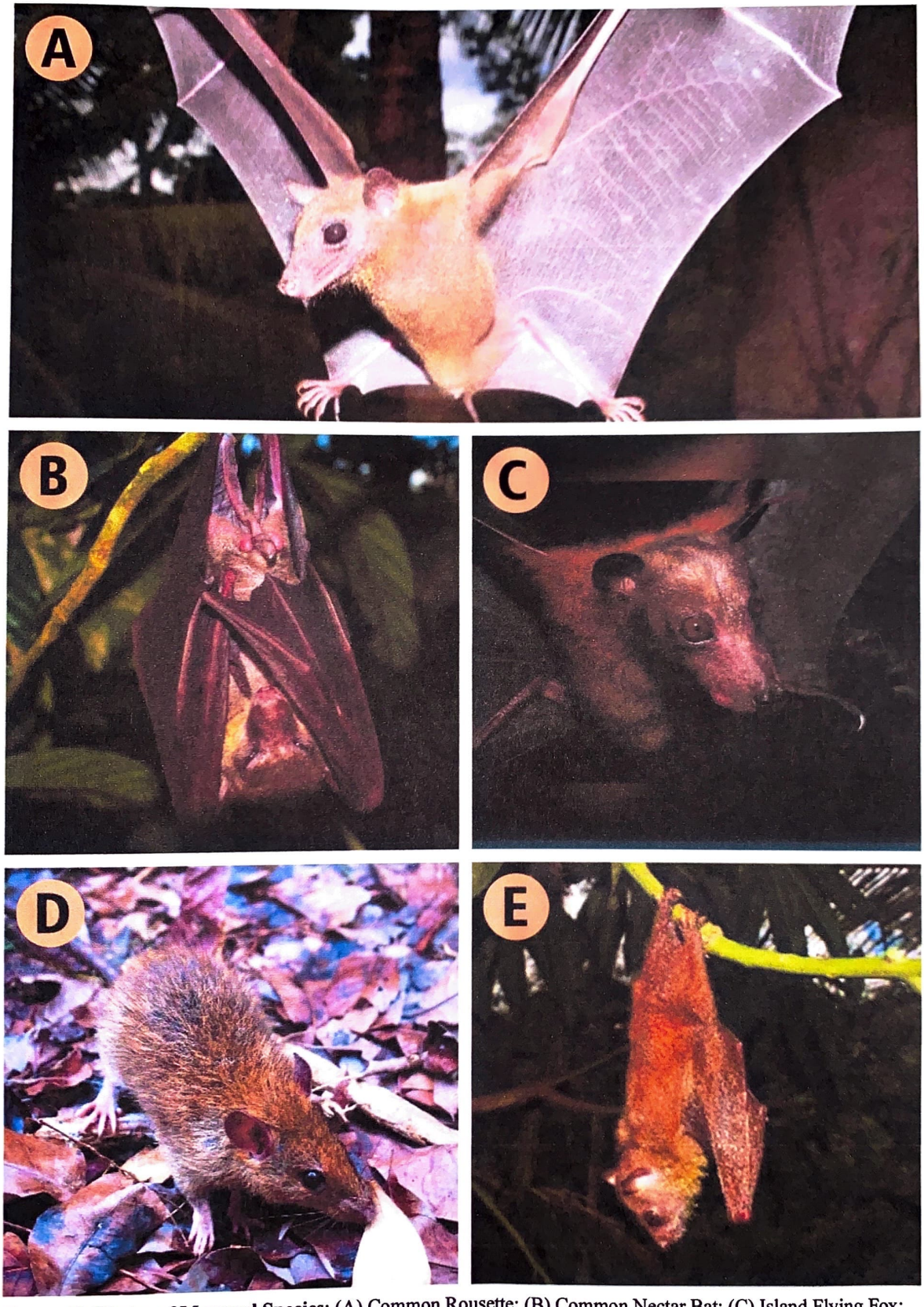

Figure 10. Photos of Mammal Species; (A) Common Rousette; (B) Common Nectar Bat; (C) Island Flying Fox; (D) Oriental House Rat; (E) Lesser Dog-Faced Fruitbat.

Avifauna

Species Composition and Diversity

A total of 28 species of birds recorded in the study sites, classified into 22 families, and 29 genera, with 747 individuals (**Table 6 and 7; Figure 12**). Based from the result of the computation of species diversity by Shannon (3.084), and Simpson (0.943), it signifies that Bantayan SPZ forest reserve has a high species diversity.

Among the top three bird families were as follows, Sturnidae, Apodidae, and Columbidae. In terms of the distribution of the bird species, four or around 25% out of 25 species were Philippine endemics such as Philippine Bulbul, Philippine Coucal, and Philippine swiftlet. This Philippine swiftlet serve as the only endemic bird species belong to the swiftlet families. Majority or 87% of the bird species have been recorded and considered as resident species (**Table 6 and 7; Figure 12**).

As regards to the conservation status of the bird species based on the International Union for Conservation of Nature (IUCN) category, all of the species encountered were not found to be under threatened category. All of which are having of Least Concern under IUCN category, wherein the population of these bird species are still dominant in the wild and/or still increasing.

In terms of relative abundance three bird species dominate in the number of individuals record across the four sampling sites (**Table 6 and 7**) and these were the following, a) Philippine Bulbul, b) Asian Glossy Starling or Galansiyang, and c). White-collared Kingfisher or Tikarol. All these three species were tolerant to degraded habitat condition and they were widely distributed across the Philippine islands.

However, there were also species of birds that have been recorded with few or less abundant such as the Tawny Grass Bird, and Philippine Coucal. This could be attributed to the presence of grassland and open areas a favorite habitat for this bird species. The Tawny Grassbird was encountered in the two sampling sites. This could be attributed also to the presence of vegetation in the area such as shrubs, trees, and grasses. The main reason why not all species were present in different sampling sites due to the limited or the absence of food supply.

Table 6. Species Composition and Conservation Status of Birds in Bantayan Strict Protected Area.

Common Name	Scientific Name	Family Name	IUCN Status ver. 2019-2	Individuals	Diversity Indices	
					Shannon Index	Simpson Index
White-collared kingfisher	*Todiramphus chloris*	Alcedinidae	LC	41		
Philippine swiftlet	*Collocalia mearnsi*	Apodidae	LC	7		
Pygmy Swiftlet	*Collocalia troglodytes*	Apodidae	LC	2		
Glossy Swiftlet	*Collocalia esculenta*	Apodidae	LC	6		
Cattle Egret	*Bubulcus ibis*	Ardeidae	LC	30		
White-breasted Wood swallow	*Artamus leucorynchus*	Artamidae	LC	10		
Pied Triller	*Lalage nigra*	Campephagidae	LC	5		
Philippine night jar	*Caprimulgus manillensis*	Camprimulgidae	LC	3		
Common Emerald Dove	*Chalcophaps indica*	Columbidae	LC	12		
Zebra Dove	*Geopelia striata*	Columbidae	LC	66		
Spotted Dove	*Streptopelia chinensis*	Columbidae	LC	12		
Reddish Cuckoo dove	*Macrophygia phasianella*	Columbidae	LC	6		
Pink-necked Green Pigeon	*Treron vernans*	Columbidae		29		
Large-billed Crow	*Corvus macrorhynchos*	Corvidae	LC	33		
Philippine Coucal	*Centropus viridis*	Cuculidae	LC	18	3.084	0.943
Chestnut Munia	*Lonchura malacca*	Estrildidae	LC	25		
Brown Shrike	*Lanuis cristatus*	Laniidae	LC	19		
Tawny Grassbird	*Megalurus timoriensis*	Locustellidae	LC	6		
Pied Bushchat	*Saxicola caprata*	Muscicapidae	LC	42		
Oriental Magpie-robin	*Copsychus saularis*	Muscicapidae	LC	34		
Oliveback Sunbird	*Cinnyris jugularis*	Nectariniidae	LC	29		
Black-naped Oriole	*Orios chinensis*	Oriolidaea	LC	4		
Eurasian tree Sparrow	*Passer montanus*	Passeridae	LC	39		
Hooded Pitta	*Pitta sordida*	Pittidae	LC	7		
Yellow-vented Bulbul	*Pycnonotus goiavier*	Pycnonotidae	LC	32		
Philippine Bulbul	*Ixos philippinicus*	Pycnonotidae	LC	81		
Pied Fantail	*Rhipidura javanica*	Rhipiduridae	LC	37		
Coleto	*Sarcops calvus*	Sturnidae	LC	8		
Asian Glossy Starling	*Aplonis panayensis*	Sturnidae	LC	80		
Blue-breasted quail	*Coturnix chinensis*		LC	8		
Blue-throated Bee-eater	*Merops viridis*		LC	16		
			Total:	**747**		

Table 7. Distribution and Frequency of Mammals per Sampling Sites.

Common Name	Scientific Name	Family Name	Frequency			
			Atop-Atop	Kabangbang	Kampingganon	Tamiao
White-collared kingfisher	*Todiramphus chloris*	Alcedinidae	15	6	8	12
Philippine swiftlet	*Collocalia mearnsi*	Apodidae	4	1	0	2
Pygmy Swiftlet	*Collocalia troglodytes*	Apodidae	0	0	1	1
Glossy Swiftlet	*Collocalia esculenta*	Apodidae	2	0	1	3
Cattle Egret	*Bubulcus ibis*	Ardeidae	4	7	5	14
White-breasted Wood swallow	*Artamus leucorynchus*	Artamidae	0	2	2	6
Pied Triller	*Lalage nigra*	Campephagidae	0	1	1	3
Philippine night jar	*Caprimulgus manillensis*	Camprimulgidae	3	0	0	0
Common Emerald Dove	*Chalcophaps indica*	Columbidae	7	0	0	5
Zebra Dove	*Geopelia striata*	Columbidae	32	8	12	14
Spotted Dove	*Streptopelia chinensis*	Columbidae	4	0	2	6
Reddish Cuckoo dove	*Macrophygia phasianella*	Columbidae	2	0	0	4
Pink-necked Green Pigeon	*Treron vernans*	Columbidae	12	4	5	8
Large-billed Crow	*Corvus macrorhynchos*	Corvidae	14	3	5	11
Philippine Coucal	*Centropus viridis*	Cuculidae	6	2	2	8
Chestnut Munia	*Lonchura malacca*	Estrildidae	12	2	0	11
Brown Shrike	*Lanuis cristatus*	Laniidae	5	2	6	6
Tawny Grassbird	*Megalurus timoriensis*	Locustellidae	0	0	2	4
Pied Bushchat	*Saxicola caprata*	Muscicapidae	18	5	2	17
Oriental Magpie-robin	*Copsychus saularis*	Muscicapidae	8	6	6	14
Oliveback Sunbird	*Cinnyris jugularis*	Nectariniidae	2	3	7	17
Black-naped Oriole	*Orios chinensis*	Oriolidaea	0	0	0	4
Eurasian tree Sparrow	*Passer montanus*	Passeridae	8	14	11	6
Hooded Pitta	*Pitta sordida*	Pittidae	4	0	0	3
Yellow-vented Bulbul	*Pycnonotus goiavier*	Pycnonotidae	12	8	6	6
Philippine Bulbul	*Ixos philippinicus*	Pycnonotidae	26	11	16	28
Pied Fantail	*Rhipidura javanica*	Rhipiduridae	11	8	5	13
Coleto	*Sarcops calvus*	Sturnidae	2	0	0	6
Asian Glossy Starling	*Aplonis panayensis*	Sturnidae	36	14	11	19
Blue-breasted quail	*Coturnix chinensis*		0	2	2	4
		Total:	**253**	**111**	**120**	**263**

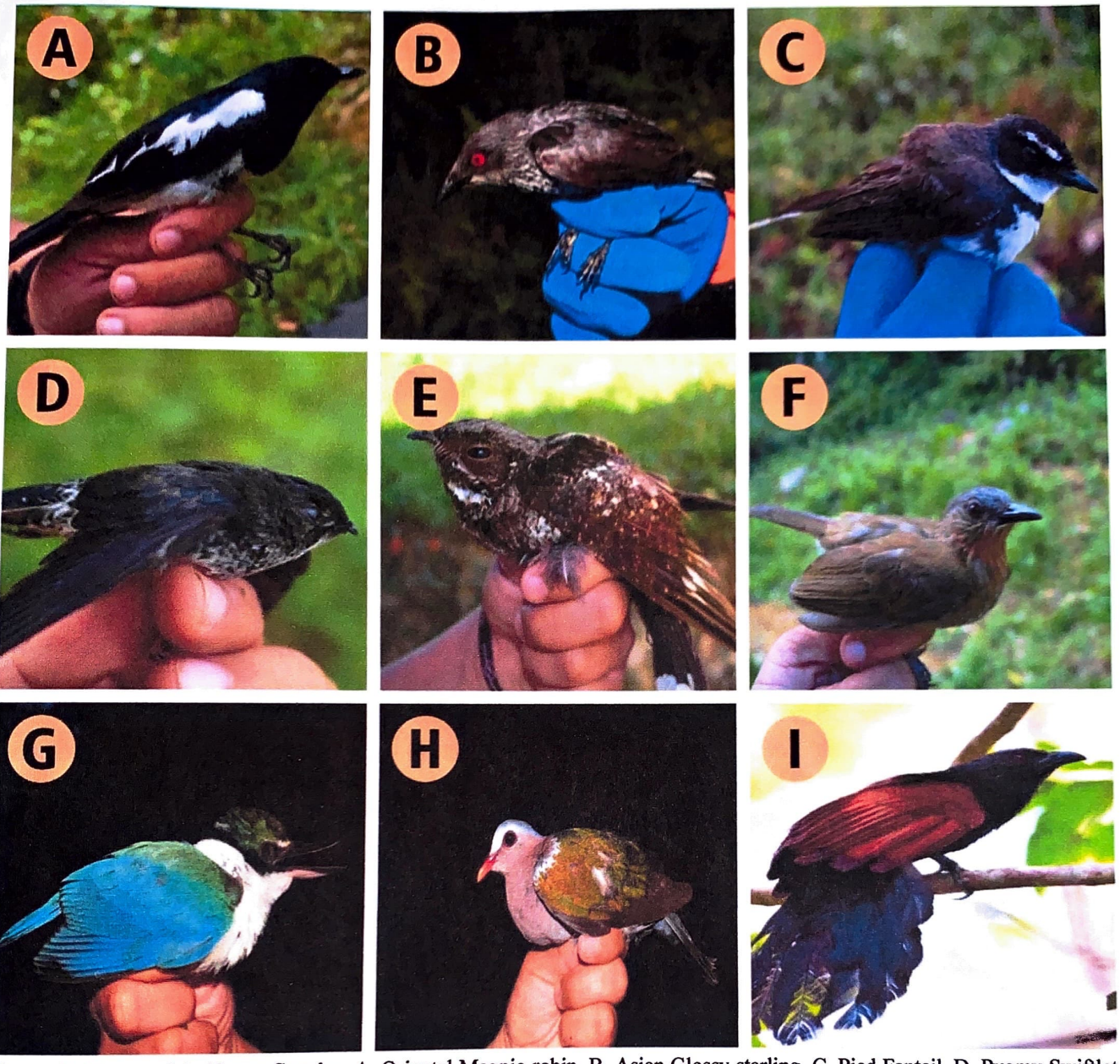

Figure 11 Photos of Avifauna Species, A. Oriental Magpie-robin, B. Asian Glossy starling, C. Pied Fantail, D. Pygmy Swiftlet E. Philippine Nightjar, F. Philippine Bulbul, G. White-collared Kingfisher, H. Common Emerald dove, I. Philippine Coucal

Herpetofauna species

Species composition and Diversity of Herpetofauna

Herpetology define as the branch of zoology dealing with reptiles and amphibians (Webster). In this study a total of 7 herpetofauna species were recorded, with 48 individuals (**Table 8; Figure 12**). Out of the 7 species, 5 species were reptiles, and 2 amphibians. For reptiles, majority of the species were Gecko. While for amphibians the dominant species was American Toad *Anaxyrus americanus* with 78 individuals, recorded mostly along the rocks and on intermittent stream. The Reptiles were collected on trees and rocks (**Table 8; Figure 12**). Both species were not yet threatened based from IUCN, which signifies, that the species were still dominant in the wild.

Based from Shannon and Simpson diversity index, the herpetofauna species in Bantayan Strict Protected Forest reserve were occupying a lower species diversity. Based from computation, both Natural Forest and Plantation Forest has a diversity index of 1.454 for Shannon index and 0,674 for Simpson index, indicating for a lower species diversity (**Table 8**). The lower species diversity of herpetofauna species was attributed by rampant disturbance in the area due to quarrying activity, Kaingin, and charcoal making.

All the captured herpetofauna species were components of an ecosystem and play vital roles in facilitating ecological functions and processes. Therefore, the continued disturbance and further degradation of their habitats may cause extreme impacts on their lives. So, to ensure of their continued growth, survival and reproduction, conservation measures should be prioritized and urgent actions should be undertaken.

Table 8. Herpetofauna Species (Reptiles and Amphibian) Diversity Indices.

Common Name	Scientific Name	Family Name	IUCN Status ver. 2019-2	Individuals	Diversity Indices	
					Shannon Index	Simpson Index
American Toad	*Anaxyrus americanus*	Bufonidae	LC	78		
Philippine Trinket Snake	*Coleognathus erythrurus*	Colubridae	LC	1		
Maren's Bronzeback	*Dendilaphis marenae*	Colubridae	LC	2		
Gecko	*Gecko gecko*	Gekkonidae	LC	4	0.964	0.482
Asian Painted Frog	*Kaloula pulchra*	Michrohylidae	LC	25		
Philippine Shrub Snake	*Oxyrhabdium leporinum*	Lamprophiidae	LC	2		
Common House Gecko	*Hemiductylus fernatus*	Gekkonidae	LC	2		
			Total:	**114**		

Distribution of Herpetofauna Species

Atop-atop sampling site has the highest number of individuals for herpetofauna species among the four sites in Bantayan, with a total of 53 individuals. Tamiao and Kampingganon are next with 24 individuals, and Kabangbang has the fewest herpetofaunal species observed, with only 13 individuals. (**Table 9; Figure 12**).

Out of 7 species recorded in the site, Barangay Atop-atop and Kampingganon have the most number of species observed with 6 species followed by Barangay Tamiao with 3 species and Kabangbang with 2 species recorded.

The rarest species, the Philippine Trinket snake (*Coelognathus erythrurus*), is only found in Barangay Kampingganon and has only ever been observed by one individual. American toads (*Anaxyrus americanus*) and Common Geckos (*Gecko gecko*) are widespread at all sites.

Table 9. Distribution of Herpetofauna Species per Sampling Site.

Common Name	Scientific Name	Family Name	Frequency			
			Atop-Atop	Kabangbang	Kampingganon	Tamiao
American Toad	*Anaxyrus americanus*	Bufonidae	31	12	16	19
Philippine Trinket Snake	*Coleognathus erythrurus*	Colubridae	0	0	0	1
Maren's Bronzeback	*Dendilaphis marenae*	Colubridae	1	0	0	1
Common Gecko	*Gecko gecko*	Gekkonidae	1	1	1	1
Asian Painted Frog	*Kaloula pulchra*	Michrohylidae	18	0	7	0
Philippine Shrub Snake	*Oxyrhabdium leporinum*	Lamprophiidae	1	0	0	1
Common House Gecko	*Hemiductylus fernatus*	Gekkonidae	1	0	0	1
		Total:	**53**	**13**	**24**	**24**

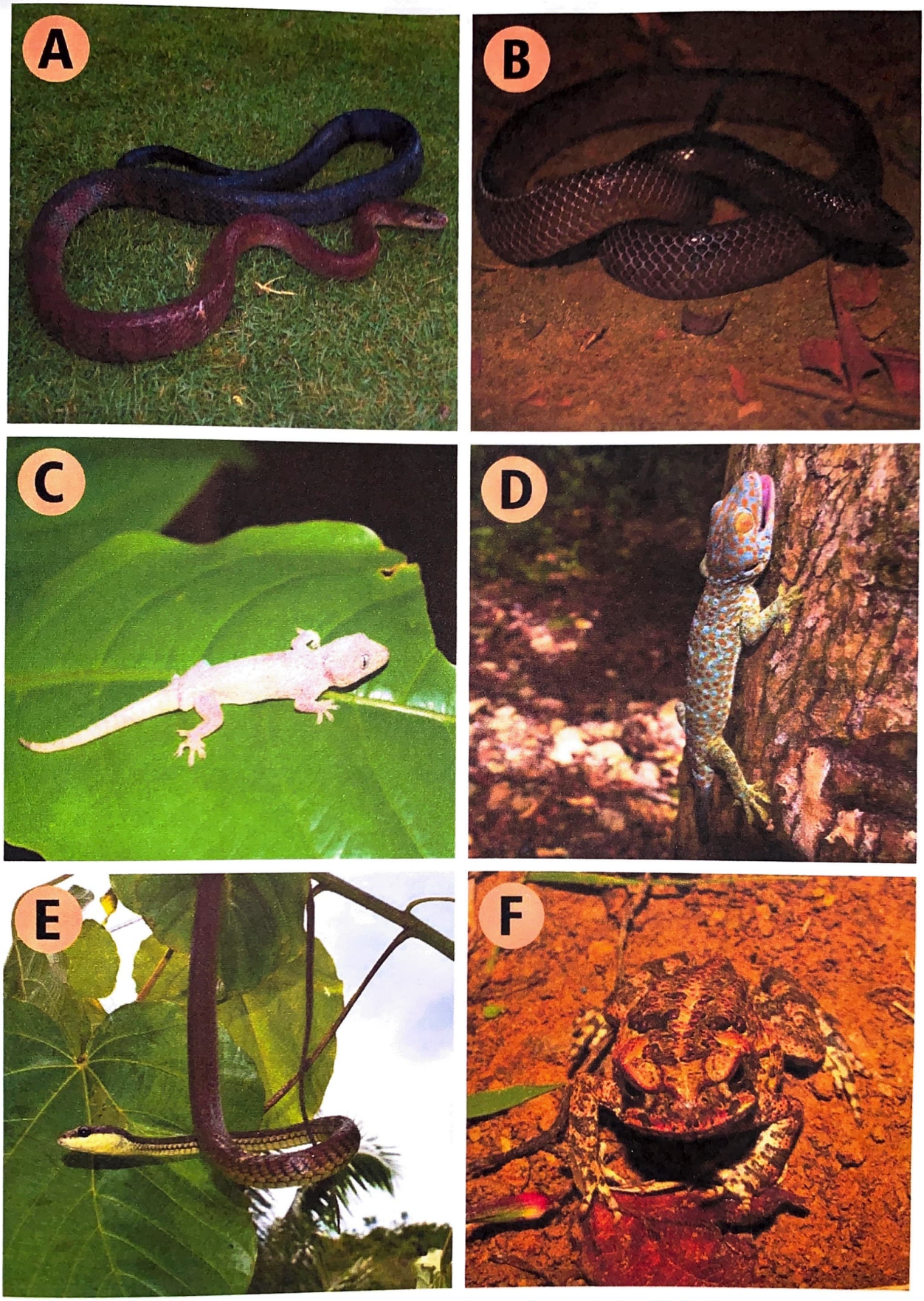

Figure 12. Photos of Herpetofauna species; (A) Philippine Trinket Snake; (B) Philippine Shrub Snake, (C) Common House gecko; (D) Gecko, (E) Maren's Bronzeback; (F) American Toad.

SUMMARY AND CONCLUSION AND RECOMMENDATION

SUMMARY

The assessment of the existing biodiversity (flora and fauna) status within the urban areas, formulation and implementation of urban biodiversity management plan, and the development of CBI will be the bases for formulation of policies, possible integration in the Comprehensive Land Use Plan (CLUP), Zoning Ordinance (ZO) and other plans in the management of the city's/municipal biodiversity and updated actions for the succeeding plans. This is in accordance with Republic Act 7160, also known as the Local Government Code of 1991, as well as the DENR Administrative Order 2016-12 titled Adopting the Philippine Biodiversity Strategy and Action Plan 2015–2028.

In order to determine the overall value of the flora and fauna of the study area, data was collected during a field survey to assess two different botanical attributes using Biodiversity Assessment and Monitoring System (BAMS): (1) The Flora occurring within the area were determined that focused on sampling technique. The assessment of species indicated the distribution and relative abundance of each vegetation unit, which helped to define units of particular conservation value; and (2) the overall fauna species occurring in the study area. This survey provided a measure of the overall flora and fauna richness of the area, and identified the individual species present. The result of the biodiversity monitoring was compared to the previous assessment.

The Natural Forest of the Municipality of Bantayan in general was characterized as forest over limestone habitat types with an elevation, ranges from 40–100m, having a mountainous topography. The site has a geological composition of mostly raised sedimentary and metamorphic rocks, a considerable part of it being limestone. The forest was dominated by less dense vegetation, small size trees, and few large trees. Lesser vegetation and smaller size trees were observed in the whole part of the mountain. The forest was also covered by large size of outcrop bedrocks with shallow soil and undecomposed organic matters. The smaller size trees ranging from 5–10 cm, with a vegetation cover to almost 30%, canopy cover of 20%, and understory of 50%.

A total of 123 flora species were recorded in the study sites. The species were classified into 51 families and 114 genera. Among the 123 species, 72 were trees, 7 vines, 35 shrubs, 4 herbs, 3 palms, 1 pandan, and 2 ferns. Among the 123 plant species, 120 species were categorized as Angiosperm, 1 species as Gymnosperm, and 2 species as Pteridophyte. The most represented families were Fabaceae, Lamiaceae, Annonaceae, Sapindaceae, Moraceae, Anacardiaceae, and Euphorbiaceae. The most recorded genus was Ficus.

Out of the 123 species, 92 species (75%) were recorded in Barangay Atop-atop, 42 (34%) in Barangay Kabangbang, 89 (72%) in Barangay Kampingganon, and 75 (61%) in Barangay

Tamiao. Based on the result, based from Shannon diversity index signifies for high species diversities.

In this study a total of 7 herpetofauna species were recorded, with 48 individuals. Out of the 7 species, 5 species were reptiles, and 2 amphibians. For reptiles, majority of the species were Gecko. While for amphibians the dominant species was American Toad (*Anaxyrus americanus*) with 78 individuals, recorded mostly along the rocks and on intermittent stream. The Reptiles were collected on trees and rocks. Both species were not yet threatened based from IUCN.

The lower species diversity of herpetofauna species was attributed by rampant disturbance in the area due to quarrying activity, Kaingin, and charcoal making.

For Mammals, a total of 5 species recorded in the sampling site, with 271 individuals. Out of 5 mammal species, 4 were categorized as fruit bats, and 1 species of rodent (*Rattus tanezume*). The most abundant species were represented by *Rousettus amplicaudatus*, and *Cynopterus brachyotis*. For Birds, a total of 28 species recorded in the study sites, classified into 22 families, and 29 genera, with 747 individuals, indicating for a high species diversity.

CONCLUSION

Based on the result of the study, a total of 123 flora species were recorded, classified into 51 families and 114 genera. Out of the 123 species, 92 species (75%) were recorded in Barangay Atop-atop, 42 species (34%) in Barangay Kabangbang, 89 species (72%) in Barangay Kampingganon, and 75 species (61%) in Barangay Tamiao. A total of 7 herpetofauna species recorded, with 48 individuals. Out of the 7 species, 3 species were reptiles, and 4 amphibians. For Mammals, a total of 5 species recorded in the sampling site, with 271 individuals. Out of 5 mammal species, 4 were categorized as fruit bats, and 1 species of rodent (*Rattus tanezume*). For Birds, a total of 28 species recorded in the study sites, classified into 22 families, and 29 genera, with 747 individuals, indicating for a high species diversity.

All the flora and fauna species were important components of an ecosystem and play vital roles in facilitating ecological functions and processes. Therefore, the continued disturbance and further degradation of their habitats may cause extreme impacts on their lives. So, to ensure of their continued growth, survival and reproduction, conservation measures should be prioritized and urgent actions should be undertaken.

RECOMMENDATIONS

Based on the findings of the assessment the following were recommended:

1. The Municipality of Bantayan must priorities the protection and conservation of the declared 600 hectares Strict Protected Zone (SPZ), since the area has still an existing naturally-grown secondary forest, and was threatened with rampant charcoal production, and slash and burned cultivation.
2. The area must be planted with native and endemic tree species such as Narra, Molave, Lauan, Ipil, Tindalo, Cynometra, Cinnamon, and other native trees adopted to forest over limestone particularly in areas classified as timber land, to restore its original cover.
3. Areas in the SPZ found in lower elevation, and along cultivated areas must be planted with fruit trees adopted to forest over limestone, to secure food security and increase the income of the community living within.
4. Areas found along the creeks must be planted with Bamboo species, to minimize and protect the soil from erosion. Bamboo could also provide additional income of the community because of its potential for industry.
5. The Municipality must collaborate with the Department of Environment and Natural Resources (DENR) in the creation of a Protected Area Management Board (PAMB) for the management of the area under RA 7586 or knowns as Nipas Act, since the area was declared as protection zone.
6. The Management board designated by the Municipality for the management of the SPZ, must set aside an area for production to be planted with fast growing tree species to support the charcoal production of the Municipality, in preparation for the formulation of their Forest Land Use Plan (FLUP) and Comprehensive Land Use Plan (CLUP).

ACKNOWLEDGEMENTS

The Cebu Technological University Research Team would like to acknowledge the Municipality of Bantayan for the opportunity and the funding allotted for the project. The CTU System for supporting the research team and allowing the research staff to conduct the study. The Department of Forestry in CTU-Argao, Campus, for allowing their faculty to be part in the team.

GLOSSARY

Biodiversity – The variety and variability among living organisms and the ecological complexes in which they occur.

Critically Endangered (CR) – DENR threat category stating that there is an extremely high possibility of the taxon's extinction in the wild because all available data meets criteria for Critically Endangered.

Density refers to a number of individuals representing the species in the predetermined samples plots.

Forest Cover is a spatial character either measured by basal area of tree trunks or crown area.

Frequency is the percentage presence of the species in the set of sample plots.

Endangered (EN) – DENR threat category stating that there is a very high possibility of the taxon's extinction in the wild because the best available data meets any of the criteria for Endangered. It is one step below Critically Endangered and one step above Vulnerable.

Forest – A portion of land more than half a hectare in size with trees that are at least 5 meters in height and having a canopy cover of more than 10% of the land area.

Habitat – The place where a population (e.g., human, animal, plant, microorganism) lives and its surroundings, both living and non-living.

High Conservation Value Area (HCVA) – natural habitat of outstanding significance and critical importance to species conservation because it is the habitat of threatened and/or endemic species. Any major habitat changes in this area will almost certainly lead to species extinctions and should therefore become protected areas non-negotiable.

Key Biodiversity Areas (KBA) – nationally identified sites of global significance. The identification of KBAs is an important approach to address biodiversity conservation at the site scale i.e., at the level of individual protected areas, concessions, and land management units.

Multi-Variate Statistical Package (MVSP) – A multivariate statistical method used to explain the relationships between biological assemblages of species and their environment.

Not yet assessed – DENR threat category stating that the possibility of the taxon's extinction in the wild is low. This is because it does not qualify as Near Threatened, Vulnerable, Endangered, or Critically Endangered. This category includes widespread and abundant taxa.

Near Threatened (NT) – An IUCN threat category stating that the possibility of a taxon's extinction in the wild is medium, being worse than Least Concern taxa but not as bad as Vulnerable taxa. Although it does not qualify as Vulnerable, Endangered, or Critically Endangered, it is close to being threatened and may be classified as such in the near future.

Species Occupancy Modelling – A method to show the proportion of an area, patches, or sampled units that is occupied by a species.

Species Richness – The number of species within a region.

Trigger Species – Species of high conservation importance. In this study, the trigger species were chosen based on their distribution and DENR Red List Classification: the species (or subspecies) are endemic and/or threatened. List classification. In addition, these species should be manageable as a distinct unit.

Vulnerable (VU) – DENR threat category stating that the possibility of a taxon's extinction in the wild is high. This is because the best available data meet any of the criteria A to E for Vulnerable. It is one step below Endangered.

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