DIVERSITY OF AVIFAUNA IN BOHOL BIODIVERSITY COMPLEX, BILAR, BOHOL

College of Agriculture and Natural Resources
BOHOL ISLAND STATE UNIVERSITY
Zamora, Bilar, Bohol

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APPROVAL SHEET

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ABSTRACT

Various intensive studies and researches have been conducted on diversity, abundance and species composition of avifauna in the Philippines and in the Province of Bohol especially in Rajah Sikatuna Protected Landscape (RSPL). However, few, if not none, were focused on Bohol Biodiversity Complex (BBC) thus, the study was conducted to determine the diversity, abundance and species composition of avifauna in BBC. Relative abundance and percent endemicity were used to analyze the diversity of the recorded and documented species using transect survey method. The result of the study revealed a total of 34 species representing 32 genera under 20 families; 16 (47%) of which were endemic species. Among all endemic species, two species are threatened. Furthermore, Asian Glossy Starling *(Aplonis panayensis)* revealed to be the highest with 25.18% relative abundance and followed by Philippine Bulbul *(Hypsipetes philippinus)* with 15.83% relative abundance. Subsequently, the study shows 2.82 diversity index which indicates high diversity based on Shannon Diversity Index. The area should be maintained accordingly through further intensive study so that there would be additional data and monitoring of the bird species. Training and seminars should also be conducted to show the importance of biodiversity particularly on faunal aspects.

Chapter I

THE PROBLEM AND ITS SCOPE

Rationale

The Philippines is a highly biodiverse country. It is listed as one of the seventeen mega biodiverse countries, containing two-thirds of the Earth's biodiversity and seventy percent of world's plants and animal species. According to Bird Life International, there are currently 604 bird species in the country – six percent of the world's total number of known birds. This makes the Philippines one of the richest in avifaunal diversity. A third of the Philippines' bird species are endemic or can only be found in the country. The reason for this richness is the existence of many different types of bird habitats in the Philippines. The country is blessed with tropical rainforests, wetlands, pine forests, peat swamps and mangrove forests (Ranada, 2014).

Given the diverse faunas and floras distributed across its islands, and especially owing to intense threat to its high levels of endemism (ICBP 1992), the country has been ranked among the top five globally in terms of conservation priority (Balmford and Long,1994).

The Province of Bohol is also a home to an abundance of flora and fauna found in different ecosystems. In fact, 1/4 of the province's area is considered environmentally critical areas. Also, over 78 bird species are present in Bohol. Although Bohol is extremely biodiverse, it is faced with various threats to its environment.

Bird extinction and population reduction can result to disruption of ecosystem processes that are of great importance to the society (Chapin, F.S., et al. 2000 and Luck, G. W., et al., 2003). When distinct ecosystems such as forests and wetlands are destroyed, the ecological roles of birds often disappear with them (BirdLife International, 2004). The ecological services that bird provide are crucial and irreplaceable. Birds are also valuable indicators of global patterns in biodiversity conservation and field study on birds is an information key for assessing extinction risks across the avifauna as a whole and, at a local level, to provide clear conservation prescriptions to management authorities (Mohagan et al., 2015).

That being said, taking into consideration the status and risk of bird's population reduction, a study was conducted to assess the diversity of avifauna in Bohol Biodiversity Complex Bilar, Bohol. The Complex is surrounded by 1.2 hectares of rainforest. It showcases various endemic tree and continues to raise awareness and conservation concerns among both locals and tourists (Layug, 2019). The area has now a home for different avifauna and other species. This study will provide necessary information for future studies that will become vital for conservation management, baseline for further research, and policy formulation.

Literature Background

Avifauna is a general name for bird species. They belong to the Kingdom "Animalia," Phylum Chordata and class Aves. They have a worldwide distribution, living in and around oceans, rivers, forest and mountains. They are the most noticeable group in the animal kingdom (Zedler, 2003). They are used as a tool for environmental monitoring. They are good indicators of the general state of our biodiversity. When they start disappearing, it means something is wrong with the environment and is a signal that action must be taken. They are suitable for detecting changes in the environment like environmental contaminants and air pollution. Birds detect changes in the environment which cannot be detected or observed by physical parameters (Ezealor, 2001).

The Philippines is made up of more than 7,000 islands, supporting an extraordinary number of species that occur nowhere else on the planet. Eight- six new endemic birds' species have been described in the Philippines in just the last decade. Overall, nearly one-sixth of the Philippines birds are considered threatened on the IUCN Red List, and of those, more than 43% (40 species) are listed as endangered or critically endangered. The country has the eight-highest number of globally threatened birds' species (Kittelberger, K.D., Neate –Clegg, M. H., 2020). But even more species are at risk than previously thought, according to a new study published in June in *Frontiers in Ecology and Evolution* (Cowan, 2021).

The primary threat to biological diversity is habitat alteration and loss, especially rapid since 1980, caused by destructive resource use, development-related activities, and human population pressure. These factors are exacerbated by resource extraction (mining and logging) and land conversion for infrastructure, industrial, agricultural, and urban development (Critical Ecosystem Partnership Fund, 2001).

The Haribon Foundation, a Philippine-based NGO, is particularly concerned about the critically endangered Philippine eagle (*Pithecophaga jefferyi*), which has seen a rapid population decline over the last 60 years, largely due to extensive deforestation. Haribon is helping it by protecting conservation areas in Gabaldon, Nueva Ecija and part of the Central Sierra Madre Mountains (Cowan, 2021).

Other important conservation species include the rufous-headed hornbill (*Rhabdotorrhinus waldeni*), which is safeguarded through projects in Antique and Aklan provinces (Cowan, 2021). The Rufous-headed Hornbill, like most Hornbills it possesses a bony 'casque', which protrudes from the top of its bill. Despite its heavy-looking appearance this structure is quite light, being made of thin and hollow bone cells. In the Rufous-headed Hornbill this structure is red-orange and has a wrinkled appearance. The remaining population of this species is extremely small and severely fragmented. A combination of extensive loss of low to mid-altitude forest and hunting have resulted in an extremely rapid population decline, although effective conservation measures on Panay offer hope that declines can

be stopped. Nevertheless, it remains listed as Critically Endangered (BirdLife International, 2021).

Another threatened bird species in the Philippines is the Philippine Cockatoo or Red-vented cockatoo (*Cacatua haematuropygia*). The endemic Philippine or Red-vented cockatoo is a small psittacine with a helmet crest and red undertail coverts. The white plumage is extremely conspicuous in flight and in the foliage of the lowland dipterocarp and mangrove forest habitats. It is 12.2 inches long and has an 8.6 inches wingspan. These species can be seen in lowland, riverine, and mangrove forests but may be found in forest edge and open fields as well as high in the mountains (Katala Foundation, 2020). This species has suffered an extremely rapid population reduction owing to extensive loss of its lowland habitats and trapping for the cagebird trade. Now that it is extinct in much of its historic range, and some protected populations are increasing, the rate of decline may have slowed or the decline may even have stopped. However, the bulk of the past declines are believed to have occurred within the past 3 generations and so it is assessed as Critically Endangered (BirdLife International, 2021).

The Sulu bleeding-heart (*Gallicolumba menagei*) is a species of bird in the pigeon and dove family, Columbidae. It is endemic to the island of Tawi-Tawi and its surrounding islets in the Philippines' Sulu Archipelago (https://en.wikipedia.org/wiki/Sulu_bleeding-heart). This species has not been recorded with certainty since two specimens taken in 1891, and it may have declined severely through extensive logging and habitat destruction, compounded by hunting and trapping. However, it is perhaps unlikely to have gone extinct as

there were local reports from a number of islands in 1995, and claims that it was quite abundant until the 1970s. Although disappearing fast, some habitat still remains. Any remaining population is likely to be tiny, and for these reasons it is treated as Critically Endangered. (BirdLife International, 2021).

The Negros bleeding-heart (*Gallicolumba keayi*) is a medium-sized, ground-dwelling species of pigeon endemic to the Philippine islands of Negros and Panay. There are perhaps as few as 70 and no more than 400 individuals of the species left on the two islands it calls home, according to the International Union for the Conservation of Nature (IUCN). The bird gets its colorful name from the blood-red patch of plumage adorning its white chest (Gaworecki, 2018).

The Negros bleeding-heart *(Gallicolumba keayi*) is endemic to the Philippines, where it occurs on Panay and Negros (Collar *et al.,* 1999). On Panay it has been observed regularly in the Northwest Panay Peninsula Natural Park in recent years including breeding records (Slade *et al.*, 2005). On Negros, it was fairly common in the 19th century, but had become extremely rare by the 1930s. Since 1980, it was recorded at just one locality (above Mambucal), despite several weeks of surveys, with unconfirmed local reports from six additional localities. Recent research identified a few small populations in southern Negros (Cariño *et al.,* 2007), but it may now be extinct in the north. It seems unlikely that more than a few hundred individuals remain on each island, although as Panay retains more forest cover, it is likely that this population is larger (P. Hospodarsky *in litt.* 2010). This species has an extremely small, severely fragmented population that is likely to be undergoing a continuing decline owing to

forest loss on the two islands where it occurs. For these reasons, it is listed as Critically Endangered (BirdLife International, 2021).

Cebu Flowerpecker *(Dicaeum quadricolor)* is endemic to the island of Cebu in the Philippines (Collar *et al.* 1999). In the late 1800s, it was known from just two localities, where it was considered not uncommon. Early in the 20th century, it was feared to have become extinct because all the island's forest was thought to have been cleared. However, it was rediscovered in 1992 at a forest in Tabunan (80 ha, plus another 40 ha of surrounding fragments), where it was seen most recently in 2007 (L. M. J. Paguntalan *in litt.* 2007, 2008). In 2005, the population was estimated at 85-105 individuals. (L. M. J. Paguntalan *in litt.* 2005), roughly equivalent to 60-70 mature individuals. This species has an extremely small population. Its range is very small and severely fragmented, owing to catastrophic deforestation which, although it has now slowed, is continuing. These factors qualify it as Critically Endangered (Bird Life International, 2021).

With this endemic species population reduction, the government has also undertaken laws which protects the country's wildlife resources, the "Wildlife Resources Conservation and Protection Act." This act aims to: (a) to conserve and protect wildlife species and their habitats to promote ecological balance and enhance biological diversity; (b) to regulate the collection and trade of wildlife; (c) to pursue, with due regard to the national interest, the Philippine commitment to international conventions, protection of wildlife and their habitats; and (d) to initiate or support scientific studies on the conservation of biological diversity.

Among other government's initiative are the Sagip Wildlife Program, developed through concerted efforts of DENR, other government agencies and non-government sectors; and establishment of the Center for Philippine Raptors and the Philippine Raptors Conservation program of the DENR-Parks and Wildlife Bureau whose function is to serve as a rescue and rehabilitation center for raptorial birds.

The move to protect and conserve is also supported by international organizations which the Philippines is a member of the Conservation of the International Trade in Endangered Species of Wild Fauna and Flora (CITES), Bonn Convention whose concerns are on the conservation and protection of migratory species, and Birdlife International, formerly the International Council for Bird Preservation (Enriquez, 2001).

The researcher, in unison with the International and Local Organizations and the Government, is seeking to protect and conserve the threatened especially the bird species. The study was pursued and developed for the necessary information provided and found herein would be vital for the formulation of policy, conservation programs and laws and timely preventive measures for the bird's extinction not just in Bohol, but to the entire country – the Philippines.

THE PROBLEM

Statement of the problem

The main purpose of this study was to assess the diversity of threatened bird species in BBC, Bilar, Bohol.

Specifically, it addressed to answer the following questions:

1. What are the taxonomic lists of birds in BBC?
2. What is the conservation status and endemicity found in BBC?
3. What is the relative abundance, diversity index and composition of the recorded species based on transect survey method?

Significance of the Study

The result of the study would be vital to the following people or groups;

Local Government Units (LGUs) and the Community. The data would be useful in future formulation or improvement of Natural Resources Management (NRM) plans for the barangays / municipalities.

Department of Environment and Natural Resources (DENR) and Bohol Environment Management Office (BEMO). As leading government agencies in natural resource management, in gathering data from this study would enrich the research database of both agencies, which information would be most useful in

monitoring resource use in the area and improving Natural Resource Management (NRM).

The Academe. The results of the study would be useful to all concerned institutions, most especially BISU Bilar, since the study areas in under its management. It is expected to provide necessary information that would serve as basis in the proper management, protection and conservation od avifauna and its habitat in the area. These results would serve as additional information in wildlife management subject which could be that used by some educators for further research and extension activities.

Students and Researchers. The result of this study would be useful to all students and researchers who wanted to know more about Avifauna. Information would also be useful in terms of its habitat requirements. This would also serve as a source of information for those who are interested in conducting the same or a related study.

RESEARCH METHODOLOGY

This study aimed to look into the diversity and distribution of birds in area of BBC, Bilar, Bohol, Philippines.

Design

This study is a fieldwork design that determine the diversity of avifauna in BBC, Bilar, Bohol.

Environment

The BBC was located in the town of Bilar, a product of Bohol Environment Code of 1998 and occupies the low mountain range in the south of Bohol Island which corresponds geographically with the municipalities of Carmen, Batuan and Loboc. It was situated in the Southern part of the municipality with the coordinates of 9.65129207005 and 123.855198245 and 120 meter above sea level. (Figure 1) The BBC has a total land area of 25 hectares were 6.5 hectares occupied as ecotourism site.

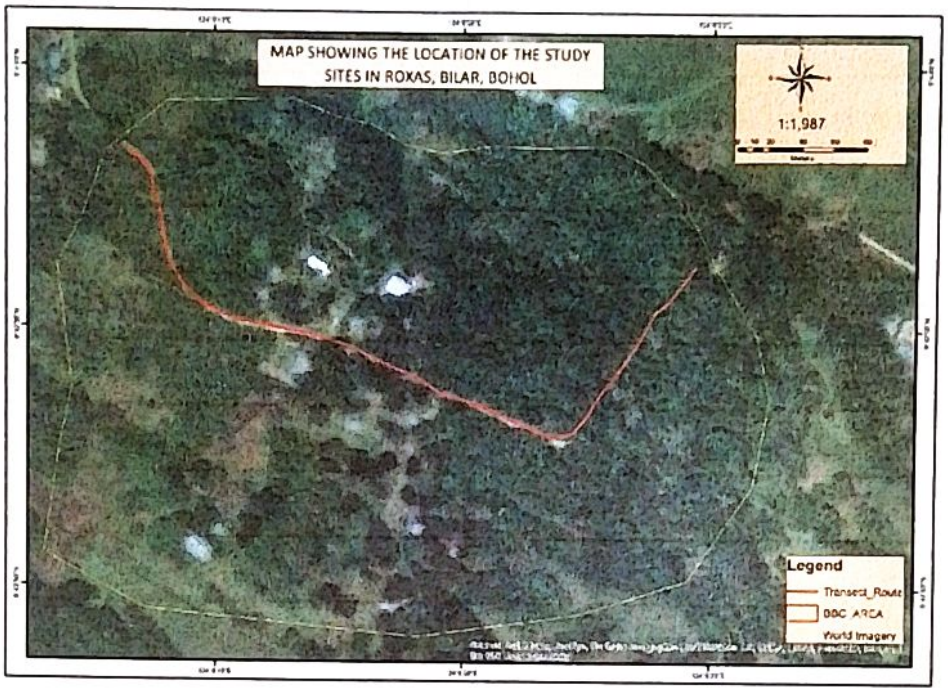

Figure 1. Location of the study site

Research Materials and Instruments

The materials that used in the study were: pen, record book, gloves, flashlight, pesola, DSLR camera and GPS.

Research Procedure

Coordination of Activities. The local municipalities and the barangay government was be informed and notified of the research activity. The researcher also coordinated with local Non-governmental Organizations for further subsidized support.

Reconnaissance Survey. A reconnaissance survey was conducted to prevent hassles during the study.

Data Analysis

There were two analyses done as to assess the efficiency of the conduct of this study.

Relative Abundance. The number of individuals in a given area was computed for each species using the formula below (Ludwig and Reynolds 1988).

$$RA = \frac{Ni}{N} \times 100$$

Where Ni= the number of individuals per species

N= the total number of individuals.

Percent Endemicity. The endemic species of birds present in each sampling site was determined based on the works of Tabaranza and Mallari (1997). The data on endemic species was expressed in percentage using the formula:

$$\% \text{ endemism} = \frac{\text{Number of endemics/sites X100}}{\text{Total number of species}}$$

Shannon Diversity Index. The diversity of individuals in a given area was computed using the formula below.

$$H = -\Sigma pi * \ln(pi)$$

where:

Σ: A Greek symbol that means "sum"

ln: Natural log

pi: The proportion of the entire community made up of species i

DEFINITION OF TERMS

Abundance. A very large quantity of something it could either be the existing or occurring in large amount.

Avifauna. The birds of a particular region, habitat, or geological period. Biodiversity. An environment as indicated by numbers of different species of plants and animals.

Conservation. The protection and preservation of wildlife resources.

Coordination. The organization of the different elements of a complex body or activity so as to enable them to work together effectively.

Critical Area. The wetland areas, aquifer recharge areas, frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservation areas.

Critically Endangered. The group of species whose continued existence are threatened.

Diversity. The state of being diverse variety.

Endemic Species. The plants and animals that exist only in one geographical region.

Extinction. The dying out or extermination of a species

Fauna. The animal life present in a particular region or time.

Habitat Fragmentation. The emergence of discontinuities in an organism's preferred environment, causing population fragmentation and ecosystem decay.

Perching. (Of a bird) alight or rest on something.

Species Distribution. Species distribution is the manner in which a biological taxon is spatially arranged.

Species Composition. The living things within a specific environment.

Threatened Species. Any species which are vulnerable to endangerment in the near future.

CHAPTER II

PRESENTATION OF DATA AND ANALYSIS OF FINDINGS

Species Account

Transect Survey

During the survey in Bohol Biodiversity Complex (BBC), a total of 34 species of birds were based on transect survey method. These species belonged to 32 genera under 20 families (Table 1).

Of these, 16 (47%) species were endemic to the country, these include: Black-chinned Fruit-dove (*Ramphiculus leclancheri*), Brown Tit-Babbler (*Macronus striaticeps),* Coleto (*Sarcops calvus*), Philippine Bulbul (*Hypsipetes philippinus*), Philippine Coucal (*Centropus viridis*), Philippine Hanging-parrot (*Loriculus philippensis*), Philippine Bush-hen (*Leptocoma sperata*), White-eared brown dove (*Phapitreron leucotis*), Whitehead's Swiftlet (*Aerodramus whiteheadi*), Red-keeled Flowerpecker (*Dicaeum australi*), Silvery kingfisher (*Alcedo argentata*), Yellow-wattled Bulbul (*Poliolophus urostictus*), Yellow-breasted Fruit Dove (*Ptilinopus occipitalis*), Wattled Broadbill (*Sarcophanops steerii*), Olive-backed Flowerpecker (*Prionochilus olivaceus*) and Azure-breasted Pitta (*Pitta steerii*). Of all endemic bird species recorded, Philippine bulbul was the most commonly heard and seen s that was recorded in the entire area.

Furthermore, a total 16 (47%) of species were identified to be resident to the country. These were, Asian Glossy Starling (*Aplonis panayensis*), Black-naped

Monarch (*Hypothymis azurea*), Black-naped Oriole (*Oriolus chinensis*), Brahminy Kite (*Haliastur indus*), Chestnut Munia (*Lonchura atricapilla*), Common Emerald Dove (*Chalcophaps indica*), Hair-crested Drongo (*Dicrurus hottentottus*), Olive-backed Sunbird (*Cinnyris jugularis*), Purple-throated Sunbird (*Leptocoma sperata*), White Collared Kingfisher (*Todiramphus chloris*), Large-billed Crow (*Corvus macrorhynchos*), White-breasted Waterhen (*Amaurornis phoenicurus*), Spotted dove (*Spilopelia chinensis*), Philippine Drongo-cuckoo (*Surniculus lugubris*), Bar-bellied Cuckooshrike (*Coracina striata*) and Zebra Dove (*Geopelia striata*). Of all resident bird species recorded, Asian Glossy Starling was the most commonly heard and seen species in the entire area. It was observed during the survey that they often fly in groups.

On the other hand, the Ruddy Kingfisher (*Halcyon coromanda*) was considered to be a resident or migrant having 1 (3%) of the bird species recorded. Lastly, the brown shrike (*Lanius cristatus*) was known to be a migratory bird having 1 (3%) of the total number of bird species observed.

Among the distribution of birds that were recorded using the transect survey technique, both resident and endemic species has equal number of bird species. Furthermore, resident/migratory and migratory bird has recorded 1 species in each composition.

Many species were found in the area primarily because of the various kinds of trees such as native trees which provided the species the habitat and necessary food they need. Subsequently, the site was declared a protected area thus species were also protected and were able to multiply.

Table 1. Taxonomic listing and distribution of bird species.

Family Name	Scientific Name	Common Name	Local Name	Distribution
Accipitridae	*Haliastur indus*	Brahminy Kite	banog	Resident, Common
Alcedinidae	*Halcyon coromanda*	Ruddy Kingfisher		Resident/Migrant
Alcedinidae	*Alcedo argentata*	Silvery kingfisher	Tikarow	Endemic, Uncommon
Alcedinidae	*Todiramphus chloris*	White Collared Kingfisher	Tikarow	Resident, Common
Apodidae	*Aerodramus whiteheadi*	Whitehead's Swiftlet		Endemic
Campephagidae	*Coracina striata*	Bar-bellied Cuckooshrike		Resident, Common
Columbidae	*Ramphiculus leclancheri*	Black-chinned Fruit-dove	Mol	Endemic, Common
Columbidae	*Chalcophaps indica*	Common Emerald Dove	Manatad	Resident, Common
Columbidae	*Phapitreron leucotis*	White-eared brown dove	Limokon	Endemic, Common
Columbidae	*Ptilinopus occipitalis*	Yellow-breasted Fruit Dove		Endemic, Common
Columbidae	*Spilopelia chinensis*	Spotted dove	Tokmo	Resident, Common
Columbidae	*Geopelia striata*	Zebra Dove		Resident
Corvidae	*Corvus macrorhynchos*	Large-billed Crow	Uwak	Resident, Locally Common
Cuculidae	*Centropus viridis*	Philippine Coucal	Kokok Tawid	Endemic, Common
Cuculidae	*Surniculus lugubris*	Philippine Drongo-cuckoo		Resident, Fairly Common

Family Name	Scientific Name	Common Name	Local Name	Distribution
Dicaeidae	*Prionochilus olivaceus*	Olive-backed Flowerpecker		Endemic, Common
Dicaeidae	*Dicaeum australe*	Red-keeled Flowerpecker	Tagtag	Endemic, Common
Dicruridae	*Dicrurus hottentottus*	Hair-crested Drongo		Resident, Common
Estrildidae	*Lonchura atricapilla*	Chestnut Munia	Maya	Resident, Common
Eurylaimidae	*Sarcophanops steerii*	Wattled Broadbill	Antiparah an	Endemic, Uncommon
Laniidae	*Lanius cristatus*	Brown Shrike	Tibas	Migrant, Common
Monarchidae	*Hypothymis azurea*	Black-naped Monarch		Resident, Common
Nectariniidae	*Cinnyris jugularis*	Olive-backed Sunbird	Tamsi	Resident, Common
Nectariniidae	*Leptocoma sperata*	Purple-throated Sunbird		Resident
Oriolidae	*Oriolus chinensis*	Black-naped Oriole	Dimodla w	Resident, Common
Pittidae	*Pitta steerii*	Azure-breasted Pitta		Endemic, Locally Uncommon
Pycnonotida e	*Hypsipetes philippinus*	Philippine Bulbul	Tagmaya	Endemic, Common
Pycnonotida e	*Poliolophus urostictus*	Yellow-wattled Bulbul		Endemic, Fairly Common
Rallidae	*Amaurornis olivacea*	Philippine Bush-hen		Endemic
Rallidae	*Amaurornis phoenicurus*	White-breasted Waterhen	Kijaw	Resident, Common
Sturnidae	*Aplonis panayensis*	Asian Glossy Starling		Resident
Sturnidae	*Sarcops calvus*	Coleto	Iling	Near Endemic, Common
Timaliidae	*Macronus striaticeps*	Brown Tit-Babbler		Endemic, Common

Species Account of Threatened Species in the Research Area

Out of the total number of species recorded, there were two threatened bird species identified (Figure 2). These were: Wattled broadbill (*Sarcophanops steerii*) and Azure-breasted Pitta (*Pitta steerii*).

An individual of Wattled broadbill (*Sarcophanops samarensis*) recorded was endemic to the Eastern Visayas in the Philippines, where it was known from Samar, Leyte and Bohol (Collar et al. 1999). It was restricted to primary lowland forest, occurring up to 750 m, and appears to tolerate only minimal habitat disturbance (BirdLife International, 2022). The chief threat of the species was lowland deforestation.

Another threatened species recorded during the transect survey was Azure-breasted Pitta. (*Pitta steerii)* that was endemic to the Philippines, where it is known from Samar, Leyte, Bohol and Mindanao (BirdLife International 2001). It inhabits lowland forest on limestone karst or forest liberally scattered with limestone boulders, up to 750 m. This pitta was threatened because its whole range suffered extensive lowland deforestation.

Generally, these species were considered threatened due to habitat loss or disturbance, overharvesting, overexploitation and deforestation which was caused by illegal tree-cutting and agricultural expansion. All these activities were common in BBC and its neighboring area.

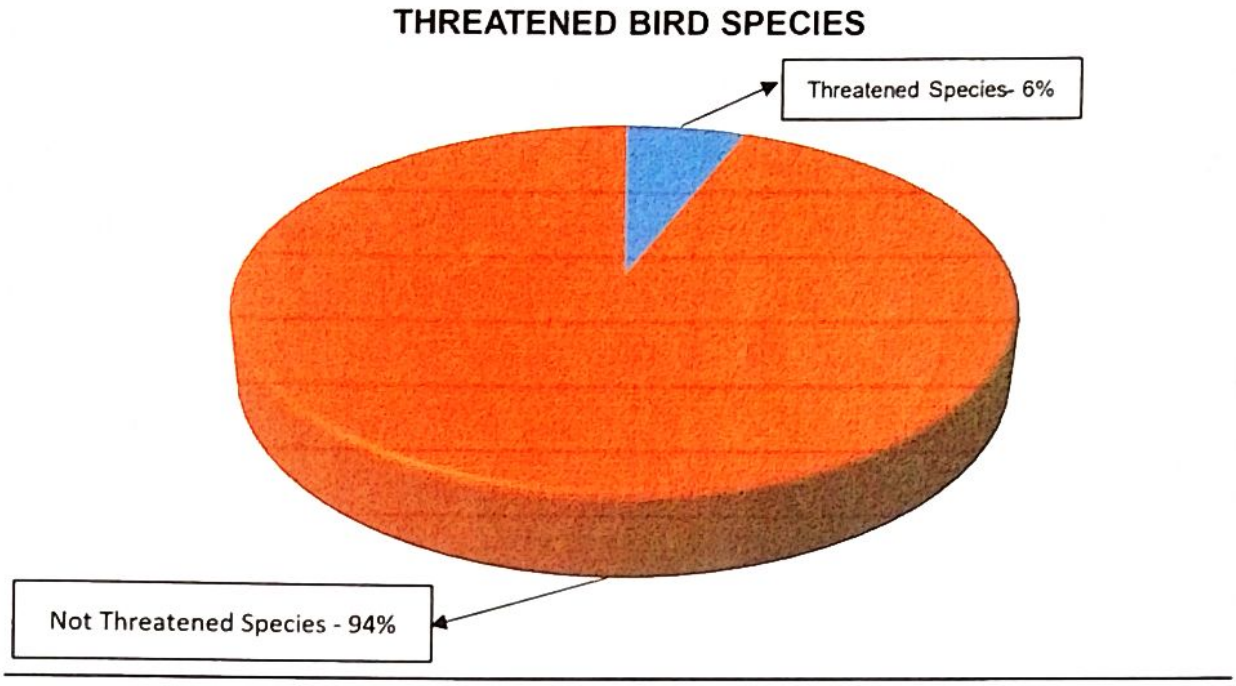

Figure 2. Threatened Bird Species

Relative abundance

Table 2 presents the relative abundance of every species in the entire area. Among the 34 bird species recorded in the area, Asian Glossy Starling (*Aplonis panayensis*) revealed to be the highest with 25.18% relative abundance. This was followed by Philippine Bulbul (*Hypsipetes philippinus*) with 15.83% relative abundance and Black-naped Oriole (*Oriolus chinensis*) with 8.63% relative abundance. All other bird species documented in the surveyed area harbored limited number of individuals.

Table 2. Relative abundance of transect survey results.

Common Name	Scientific Name	Number of Individuals	Relative Abundance
Asian Glossy Starling	*Aplonis panayensis*	35	25.18
Black-naped Monarch	*Hypothymis azurea*	3	2.16
Black-chinned Fruit-dove	*Ramphiculus leclancheri*	2	1.44
Black-naped Oriole	*Oriolus chinensis*	12	8.63
Brown Shrike	*Lanius cristatus*	1	0.72
Brown Tit-Babbler	*Macronus striaticeps*	2	1.44
Brahminy Kite	*Haliastur indus*	1	0.72
Chestnut Munia	*Lonchura atricapilla*	4	2.88
Coleto	*Sarcops calvus*	3	2.16
Common Emerald Dove	*Chalcophaps indica*	2	1.44
Hair-crested Drongo	*Dicrurus hottentottus*	7	5.04
Olive-backed Sunbird	*Cinnyris jugularis*	5	3.60
Olive-backed Flowerpecker	*Prionochilus olivaceus*	2	1.44
Philippine Bulbul	*Hypsipetes philippinus*	22	15.83
Philippine Coucal	*Centropus viridis*	1	0.72
Philippine Hanging-parrot	*Loriculus philippensis*	1	0.72
Philippine Bush-hen	*Amaurornis olivacea*	1	0.72

Common Name	Scientific Name	Number of Individuals	Relative Abundance
Purple-throated Sunbird	*Leptocoma sperata*	2	1.44
White-eared brown dove	*Phapitreron leucotis*	3	2.16
White Collared Kingfisher	*Todiramphus chloris*	3	2.16
Whitehead's Swiftlet	*Aerodramus whiteheadi*	1	0.72
Large-billed Crow	*Corvus macrorhynchos*	1	0.72
Red-keeled Flowerpecker	*Dicaeum australe*	1	0.72
Silvery kingfisher	*Alcedo argentata*	5	3.60
White-breasted Waterhen	*Amaurornis phoenicurus*	1	0.72
Yellow-wattled Bulbul	*Poliolophus urostictus*	1	0.72
Yellow-breasted Fruit Dove	*Ptilinopus occipitalis*	1	0.72
Spotted dove	*Spilopelia chinensis*	6	4.32
Philippine Drongo-cuckoo	*Surniculus lugubris*	3	2.16
Bar-bellied Cuckooshrike	*Coracina striata*	1	0.72
Zebra Dove	*Geopelia striata*	2	1.44
Wattled Broadbill	*Sarcophanops steerii*	1	0.72
Ruddy Kingfisher	*Halcyon coromanda*	2	1.44
Azure-breasted Pitta	*Pitta steerii*	1	0.72
	Total Number of Individuals	139	

Diversity Index

Table 3 presents the bird species diversity index, which helps estimate the diversity of species in BBC. The data resulted to 2.82 which indicates high diversity based on Shannon Diversity Index.

Bird Species	n	p_i	$ln(p_i)$	$p_i*ln(p_i)$
Asian Glossy Starling	35	0.25	-1.379	-0.347
Black-naped Monarch	3	0.02	-3.836	-0.083
Black-chinned Fruit-dove	2	0.01	-4.241	-0.061
Black-naped Oriole	12	0.09	-2.45	-0.211
Brown Shrike	1	0.01	-4.934	-0.035
Brown Tit-Babbler	2	0.01	-4.241	-0.061
Brahminy Kite	1	0.01	-4.934	-0.035
Chestnut Munia	4	0.03	-3.548	-0.102
Coleto	3	0.02	-3.836	-0.083
Common Emerald Dove	2	0.01	-4.241	-0.061
Hair-crested Drongo	7	0.05	-2.989	-0.151
Olive-backed Sunbird	5	0.04	-3.325	-0.12
Olive-backed Flowerpecker	2	0.01	-4.241	-0.061
Philippine Bulbul	22	0.16	-1.843	-0.292
Philippine Coucal	1	0.01	-4.934	-0.035
Philippine Hanging-parrot	1	0.01	-4.934	-0.035
Philippine Bush-hen	1	0.01	-4.934	-0.035
Purple-throated Sunbird	2	0.01	-4.241	-0.061
White-eared brown dove	3	0.02	-3.836	-0.083

White Collared Kingfisher	3	0.02	-3.836	-0.083
Bird Species	**n**	**p_i**	***ln*(p_i)**	***p_i*ln*(p_i)**
Whitehead's Swiftlet	1	0.01	-4.934	-0.035
Large-billed Crow	1	0.01	-4.934	-0.035
Red-keeled Flowerpecker	1	0.01	-4.934	-0.035
Silvery kingfisher	5	0.04	-3.325	-0.12
White-breasted Waterhen	1	0.01	-4.934	-0.035
Yellow-wattled Bulbul	1	0.01	-4.934	-0.035
Yellow-breasted Fruit Dove	1	0.01	-4.934	-0.035
Spotted dove	6	0.04	-3.143	-0.136
Philippine Drongo-cuckoo	3	0.02	-3.836	-0.083
Bar-bellied Cuckooshrike	1	0.01	-4.934	-0.035
Zebra Dove	2	0.01	-4.241	-0.061
Wattled Broadbill	1	0.01	-4.934	-0.035
Ruddy Kingfisher	2	0.01	-4.241	-0.061
Azure-breasted Pitta	1	0.01	-4.934	-0.035
TOTAL	**139**		**H**	**2.82**

Species Composition based on Transect Survey Results

On the transect survey result, there were two endemic species that were identified as threatened. This included: Wattled Broadbill (*Sarcophanops steerii*) and Azure-breasted Pitta (*Pitta steerii*).

Subsequently, there were 16 endemic birds found in the area. These were: Black-chinned Fruit-dove (*Ramphiculus leclancheri*), Brown Tit-Babbler (*Macronus*

striaticeps), Coleto (*Sarcops calvus*), Philippine Bulbul (*Hypsipetes philippinus*), Philippine Coucal (*Centropus viridis*), Philippine Hanging-parrot (*Loriculus philippensis*), Philippine Bush-hen (*Leptocoma sperata*), White-eared brown dove (*Phapitreron leucotis*), Whitehead's Swiftlet (*Aerodramus whiteheadi*), Red-keeled Flowerpecker (*Dicaeum australe*), Silvery kingfisher (*Alcedo argentata*), Yellow-wattled Bulbul (*Poliolophus urostictus*), Yellow-breasted Fruit Dove (*Ptilinopus occipitalis*), Wattled Broadbill (*Sarcophanops steerii*), Olive-backed Flowerpecker (*Prionochilus olivaceus*) and Azure-breasted Pitta (*Pitta steerii*). Of the 16 endemic bird species, the researcher observed the Philippine Bulbul (*Hypsipetes philippinus*), which was the most common that was seen and heard in the area. Philippine Bulbul (*Hypsipetes philippinus*) was seen mainly above the trees and tend to fly with big groups.

Figure 3. Philippine Bulbul (*Hypsipetes philippinus*), one of the endemic bird.

Furthermore, 16 resident species were recorded in the area. These were Asian Glossy Starling (*Aplonis panayensis*), Black-naped Monarch (*Hypothymis azurea*), Black-naped Oriole (*Oriolus chinensis*), Brahminy Kite (*Haliastur indus*), Chestnut Munia (*Lonchura atricapilla*), Common Emerald Dove (*Chalcophaps indica*), Hair-crested Drongo (*Dicrurus hottentottus*), Olive-backed Sunbird (*Cinnyris jugularis*), Purple-throated Sunbird (*Leptocoma sperata*), White Collared Kingfisher (*Todiramphus chloris*), Large-billed Crow (*Corvus macrorhynchos*), White-breasted Waterhen (*Amaurornis phoenicurus*), Spotted dove (*Spilopelia chinensis*), Philippine Drongo-cuckoo (*Surniculus lugubris*), Bar-bellied Cuckooshrike (*Coracina striata*) and Zebra Dove (*Geopelia striata*). Of the 16 resident species recorded, the researcher observed and seen and/or heard Black-naped Oriole (*Oriolus chinensis*), Philippine Drongo-cuckoo (*Surniculus lugubris*) and Asian Glossy Starling (*Aplonis panayensis*). Among the latter, Asian Glossy Starling (*Aplonis panayensis*) was the most common that was seen and heard in the area.

Figure 4. Philippine Drongo-cuckoo (*Surniculus lugubris*), one of the resident bird.

Figure 5. Black-naped Oriole (*Oriolus chinensis*), one of the resident bird species.

Figure 6. Asian Glossy Starling (*Aplonis panayensis*), one of the resident bird.

Of the 34 bird species observed, there was 1 specified as migrant species, the Brown shrike (*Lanius cristatus*). This bird species favors open forests and fields with scattered trees and bushes; often in parks and gardens.

Lastly, there was 1 resident/migrant species seen in the area, the Ruddy Kingfisher (*Halcyon coromanda*). This bird was fairly shy, preferring to dwell in heavily forested areas. Because of this, they were more often heard than seen.

Figure 7 showed the species composition (endemic, resident, migratory and resident/migratory birds species) that were recorded in BBC using transect survey method. Out of 34 bird species documented, 16 species were endemic, 16 species were resident, 1 migratory and 1 resident/migratory bird species.

CHAPTER III

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This study was conducted at Bohol Biodiversity Complex (BBC) within the months April 2022 to May 2022 to study the diversity of avifauna. Specifically, it sought the answer the following questions: What are the taxonomic lists of birds in BBC? What is the conservation status and endemicity found in BBC? What is the relative abundance, diversity index and composition of the recorded species based on transect survey method?

Taxonomic listing was recorded through a transect survey. The taxonomic listing and identification of species was determined with the use of a field guide. The relative abundance, endemicity and diversity index were determined.

The study resulted to a total of 34 bird species recorded using transect survey method representing 32 genera under 20 families. A total of 16 bird species are endemic, 16 resident species, 1 migrant species and 1 resident/migrant species.

During the study there were two threatened bird species encountered and recorded with the use of transect survey method: These were Wattled Broadbill (*Sarcophanops steerii*) and Azure-breasted Pitta (*Pitta steerii*). Both species were heard in the area.

The transect survey method resulted a total of 16 or 47% endemic species, Asian Glossy Starling (*Aplonis panayensis*) with the highest relative abundance of 25.18% and Diversity Index of .90, which indicates high diversity.

Conclusions

Based on the findings of the study, the following were drawn:

The survey resulted to a total of 34 bird species belonging to 32 genera under 20 families. Of these, 16 (47%) of species were endemic in the study site. Of all the endemic bird species recorded, Philippine Bulbul *(Hypsipetes philippinus)* was commonly heard and seen in the area. Furthermore 16 (47%) bird species were resident species in the Philippines. Of all the resident species documented in BBC, Asian Glossy Starling (*Aplonis panayensis*) was the most common that was seen and heard in the area. On the other hand, the Ruddy Kingfisher was considered to be a resident or migrant having 1 (3%) species and the Brown shrike known to be migratory birds having 1 (3%) of the total number of birds observed. Of the two bird species under the red list of threatened species in the International Union for Conservation of Nature (IUCN) and Collar et al., 1999, two threatened bird species were recorded in BBC. These included: Wattled Broadbill (*Sarcophanops steerii*) and Azure-breasted Pitta (*Pitta steerii*). On the transect survey result, there were two endemic species that were threatened. This included: Wattled Broadbill (*Sarcophanops steerii*) and Azure-breasted Pitta (*Pitta steerii*). Relative abundance, Diversity Index and Composition of the Recorded Bird Species. Among the 34 bird species recorded in the area, Asian Glossy Starling (*Aplonis panayensis*) revealed to be the highest with 25.18% relative

abundance. This was followed by Philippine Bulbul (*Hypsipetes philippinus*) with 15.83% relative abundance and Black-naped Oriole (*Oriolus chinensis*) with 8.63% relative abundance. All other bird species documented in the surveyed area harbored limited number of individuals. The bird species recorded using transect survey method resulted to 2.82 which indicated high diversity based on Shannon Diversity Index. Out of 34 bird species documented, 16 species were endemic, 16 species were resident, 1 migratory and 1 resident/migratory bird species.

Recommendations

Based on the findings and conclusion, the following recommendations were hereby suggested:

1. Further study on the diversity, habitat and conservation of wildlife particularly the bird species should be conducted.
2. Constant survey and monitoring in the area, if possible thrice or four times a week, particularly the threatened species using more recommended materials for avifaunal survey.
3. Strict implementation of habitat restoration laws and avifauna laws and policies in the area.
4. Provide trainings and seminars to the public on the importance of biodiversity particularly on faunal aspects.

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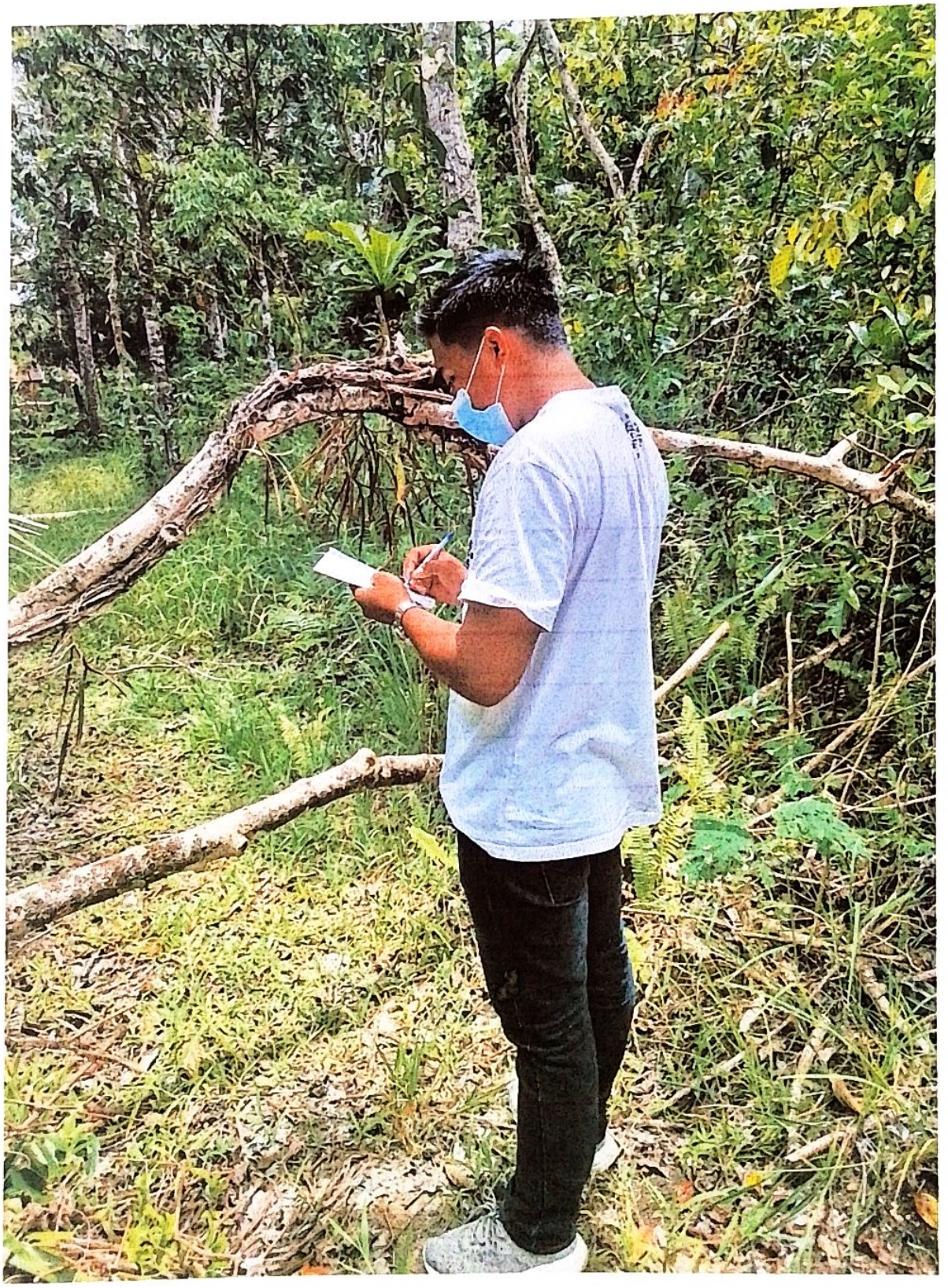
Appendices

Appendix 1. Taking of pictures of the recorded bird species.

Appendix 2. Bird species data collection.



Appendix 3
Letters

Republic of the Philippines
BOHOL ISLAND STATE UNIVERSITY – Bilar Campus
Zamora, Bilar, Bohol

01 June 2022
MANUEL G. JAYECTIN
Municipal Mayor
Bilar, Bohol, Philippines

Dear Sir,
Good Day!

I am Junry S. Cortes, a fourth year Bachelor of Science in Forestry Student of Bohol Island State University – Bilar Campus.

I am Currently working on my undergraduate thesis entitled "DIVERSITY OF AVIFAUNA BBC BILAR, BOHOL". The place is still under your Jurisdiction hence this letter. In line with this, I would like to ask for your approval to allow me to conduct a study starting June 1 – June 5, 2022, every weekday, 4;30 am – 6 am in Mt. Guimba.

Hoping for a positive response with regards to this matter. Thank you and God bless.

Respectfully yours,
JUNRY S. CORTES
Researcher

Noted:

WILBERT A. AUREO, MSc (Sgd)
Research Adviser

Recommending Approval:

NOEL T. LOMOSBOG, PhD (Sgd)
Dean, CANR

Approved:

MANUEL G. JAYECTIN (Sgd)
Municipal Mayor

Republic of the Philippines
BOHOL ISLAND STATE UNIVERSITY – Bilar Campus
Zamora, Bilar, Bohol

01 June 2022
ADELO MANGAYA - AY
Barangay captian
Zamora, Bilar, Bohol

Dear Sir,
Good Day!

I am Junry S. Cortes, a fourth year Bachelor of Science in Forestry Student of Bohol Island State University – Bilar Campus.

I am Currently working on my undergraduate thesis entitled "DIVERSITY OF AVIFAUNA BBC BILAR, BOHOL". The place is still under your Jurisdiction hence this letter. In line with this, I would like to ask for your approval to allow me to conduct a study starting June 1 – June 5, 2022, every weekday, 4;30 am – 6 am in Mt. Guimba.

Hoping for a positive response with regards to this matter. Thank you and God bless.

Respectfully yours,
JUNRY S. CORTES
Researcher

Noted:

WILBERT A. AUREO, MSc (Sgd)
Research Adviser

Recommending Approval:

NOEL T. LOMOSBOG, PhD (Sgd)
Dean, CANR

Approved:

ADELO MANGAYA - AY(Sgd)
Barangay Captain

Republic of the Philippines
BOHOL ISLAND STATE UNIVERSITY – Bilar Campus
Zamora, Bilar, Bohol

01 June 2022
ROMIEO CABUSAO
Barangay captian
Zamora, Bilar, Bohol

Dear Sir,
Good Day!

I am Junry S. Cortes, a fourth year Bachelor of Science in Forestry Student of Bohol Island State University – Bilar Campus.

I am Currently working on my undergraduate thesis entitled "DIVERSITY OF AVIFAUNA BBC BILAR, BOHOL". The place is still under your Jurisdiction hence this letter. In line with this, I would like to ask for your approval to allow me to conduct a study starting June 1 – June 5, 2022, every weekday, 4;30 am – 6 am in Mt. Guimba.

Hoping for a positive response with regards to this matter. Thank you and God bless.

Respectfully yours,
JUNRY S. CORTES
Researcher

Noted:

WILBERT A. AUREO, MSc (Sgd)
Research Adviser

Recommending Approval:

NOEL T. LOMOSBOG, PhD (Sgd)
Dean, CANR

Approved:

ROMIEO CABUSAO(Sgd)
Barangay Captain

Republic of the Philippines
BOHOL ISLAND STATE UNIVERSITY – Bilar Campus
Zamora, Bilar, Bohol

01 November 2021

ELENA G. SUAREZ
OIC, Cenro
Upper de la paz, Cortes, Bohol

Dear Maam,
Good Day!

I am John Paul D. Purog, a fourth year Bachelor of Science in Forestry Student of Bohol Island State University – Bilar Campus.

I am Currently working on my undergraduate thesis entitled "DIVERSITY OF AVIFAUNA BBC BILAR, BOHOL". The place is still under your Jurisdiction hence this letter. In line with this, I would like to ask for your approval to allow me to conduct a study starting June 1 – June 5, 2022, every weekday, 4;30 am – 6 am in Mt. Guimba.

Hoping for a positive response with regards to this matter. Thank you and God bless.

Respectfully yours,
JOHN PAUL D. PUROG
Researcher

Noted:

WILBERT A. AUREO, MSC (Sgd)
Research Adviser

Recommending Approval:

NOEL T. LOMOSBOG, PhD (Sgd)
Dean, CANR

Approved:

ELENA G. SUAREZ (Sgd)
OIC, Cenro