

Research Article

AVIFAUNA DIVERSITY IN THE ANCESTRAL DOMAIN OF THE TAGBANUA TRIBE IN ABORLAN, PALAWAN, PHILIPPINES

^{1,*} Reynald M. Quilang, ^{1,*} Alejandro A. Bernardo, ^{2,*} Edgar D. Jose, ³Oscar P. Cardenas, ³Heherson B. Ong, ³Maria Visitacion D. Guingab, ³Emerson V. Barcellano

¹Western Philippines University, Aborlan, Palawan, Philippines.

²Noreastern Mindanao State University, Lianga, Surigao del Sur, Philippines.

³Isabela State University, Cabagan, Isabela, Philippines.

Received 12th November 2021; Accepted 13th December 2021; Published online 21th January 2022

ABSTRACT

The human activities in the ancestral domain of the Tagbanua tribe in Aborlan, Palawan, may adversely affect the avifaunal diversity. Thus, it is crucial to understand its current status and provide baseline data for management and monitoring. Avifaunal community attributes in an ancestral domain of the Tagbanua tribe in this area was surveyed in August 2020 using a standard transect count method. This study described the bird assemblage in terms of index of diversity, species richness, abundance, evenness, level of endemism, and presence of conservation priority species. A total of 61 species of birds from 29 families were recorded. The ancestral domain, particularly in the forest area supports high avifaunal diversity as manifested by the high species richness, abundance, diversity index, and evenness values. The high avifaunal diversity and the presence of many endemic and conservation priority bird species accentuate the need to protect and conserve the forest in the ancestral domain of the Tagbanua. It also supports many forest-dependent endemic birds and threatened species that are priority for conservation. The data suggest that the forest ecosystem in the ancestral domain is still in good condition and emphasizing that the degree of resource extraction and utilization by the tribe in the area remain sustainable. Although, a sustainable, science-based, and culture-sensitive community-based management plan must be crafted by multisector oversee committee to guide the local managers in the management and utilization of the forest resource.

Keywords: Birds, indigenous people, aboriginal, threatened species, biodiversity.

INTRODUCTION

Forests play crucial roles in the perpetuation of life on earth. They perform vital ecosystem functions and provide countless goods and services to the people (Brockerhoff *et al.*, 2017; Thompson *et al.*, 2011). Human survival largely depends on the forests' ability to provide clean air (Nowak *et al.*, 2014; Pan *et al.*, 2011), crystal clear water (Dudley & Stolton, 2003; Neary *et al.*, 2009), food (Asprilla-Perea & Diaz-Puente, 2019; Pimentel *et al.*, 1997), medicine (Voeks, 1996) and other raw materials. These ecosystems are also important in climate change mitigation, soil conservation, and flood control (De la Paix *et al.*, 2011). Moreover, forests also have great social and cultural significance like recreation (Eriksson *et al.*, 2012; Getzner & Meyerhoff, 2020), tourism (Ahtikoski *et al.*, 2011), and religious activities (Moore, 2007). Considered as the most biologically diverse terrestrial ecosystem (Gallery, 2014; Gibson *et al.*, 2011), forests serve as critical habitats to a wide variety of wildlife many of which have not been discovered. They also serve as sanctuaries to many endemic and endangered species of wildlife. The Philippines is one of the megadiverse countries in the world. It has remarkably rich biodiversity and a high level of endemism. However, it is also a biodiversity hotspot because of the high number of threatened species in the region (Ong *et al.*, 2002). The country already lost most of its forest cover due to uncontrolled resource utilization in the past (Bankoff, 2007). Based on the 2015 land cover data of the National Mapping and Resource Information Authority (NAMRIA), the estimated remaining forest cover of the Philippines is only 23.4% of its total land area (FAO, 2020; FMB-DENR, 2019). Because of the differences in the management and utilization practices, the

remaining forest in the country is not evenly distributed. Palawan is one of the provinces of the Philippines that are still covered with lush forest vegetation. Known as the "last frontier", it is dominantly covered by pristine stands of primary forests and various stages of regenerating secondary forests. However, its forest cover is slowly opening due to pressures brought by agriculture, logging, and mining. Its mountainous landscape is also home to different indigenous groups that are highly dependent on the forest where they obtain food, medicine, and other important raw materials (Dressler, 2005; Eder, 1987; Shively, 1997). These indigenous groups are allowed by the government to utilize the resources and manage their ancestral domain to ensure their economic, social, and cultural wellbeing (Republic Act 8371, 1997). Since they are involved in activities that may affect the biological diversity in the area, it is important to know the status of the biological resources in their ancestral domain. This study attempts to describe the avifaunal assemblage in an ancestral domain located of the Tagbanua indigenous peoples in Aborlan, Palawan. It aims to provide baseline information on the attributes of the avifaunal community that can be found in the area. Specifically, it aims to describe the bird assemblage in terms of diversity, species richness, abundance, evenness, level of endemism, and presence of conservation priority species.

METHODOLOGY

Study Area

The study was conducted in a forest that is covered by a certificate of ancestral domain title (CADT) by the local Tagbanua indigenous community in Aborlan, Palawan. It is located in the eastern slopes of the Victoria-Anipahan mountain range and part of the watershed that provides a year-round supply of water to the Talakaigan River. The

*Corresponding Authors: Reynald M. Quilang, Alejandro A. Bernardo and Edgar D. Jose

gentle to a steep rolling landscape in the study area is covered with lush vegetation that is dominated by large and tall trees typical to the lowland forests. The forest has a complex multiple-layered vegetation structure that provides crucial habitat for a variety of arboreal and ground-dwelling indigenous wildlife species. The noticeable anthropogenic activities in the area are harvesting of non-timber forest products such as rattan, honey, wild fruits, medicinal plants, and wildlife. Few indications of small scale timber harvesting were also noted in the area. Meanwhile, only a few areas in the community forest were currently used as swidden farms.

Data Collection

Prior to the conduct of the study, a certificate of pre-and prior informed consent (FPIC) was secured from the tribe and the National Commission on Indigenous People (NCIP) in the Philippines. The avifaunal survey was conducted on August 2020 using a standard transect count method described by the Biodiversity Management Bureau (BMB) of the Department of Environment and Natural Resources (DENR) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (BMB-DENR & GIZ, 2017). The study used a standard two-kilometer transect line that was established between the coordinates 9.44688 N 118.44363 E and 9.45959 N 118.43153 E. The survey was carried out by identifying, counting, and recording all the birds detected using visual and auditory cues while walking along the transect route. The counting of birds was repeated six times based on the species discovery curve. All transect walks were done early in the morning (6:00 am) and late in the afternoon (3:00 pm) as the bird activities peak at these periods. The researcher used a binocular to verify the identity of the birds and a digital camera for photographic documentation. A supplementary observation was also made to record the species of birds detected outside the survey period.

Data Analysis

The data were analyzed and reported using descriptive statistics such as frequency, percentage, species richness, relative abundance, diversity index (Shannon-Weiner Diversity Index), and evenness (Shannon's Evenness Index).

A total of 372 birds representing 61 species from 29 families were recorded during the survey (Table 1). The family Pycnonotidae has the highest number of individuals (14.5%), followed by the families Dicaeidae (12.6%), and Nectariniidae (9.1%). Meanwhile, the Columbidae family has the most number of species representations (7 species) followed by Cuculidae (6 species), Pycnonotidae (4 species), and Nectariniidae (4 species). The other families were mostly represented by either one or two species. The first two commonly recorded species were the Pygmy Flowerpecker (*Dicaeum pygmaeum palawanorum*) (Figure 1-1) and the Palawan Flowerpecker (*Prionochilus plateni*) (Figure 1-2). These members of the Dicaeidae family have relative abundances of 6.99% and 5.65% respectively. The Pygmy Flowerpecker is a Palawan endemic subspecies, while the Palawan Flowerpecker is a Palawan endemic species. It is also worth noting that the Palawan Flowerpecker was already considered "Vulnerable" by the Palawan Council for Sustainable Development (PCSD, 2015). These birds are usually found in small groups of 2-4 individuals, or mixed with other feeding birds in the canopy. As their diet is mainly fruits, these birds contribute a lot to seed dispersal (Corlett, 1998; Sritongchuy *et al.*, 2014).

The next well-represented species (Figure 1) were both insectivores, the Pin-Striped Tit-Babbler (*Macronous gularis woodi*) (Figure 1-3) of the family Timaliidae and the Rufous-Tailed Tailorbird (*Orthotomus sericeus*) (Figure 1-4) of the family Cisticolidae. These birds have relative abundances of 5.38% and 5.11% respectively. Both birds are resident species but the Pin-Striped Tit-Babbler is a subspecies that is endemic to Palawan. Currently, these birds are not classified as threatened or near-threatened within their range.

The high Shannon-Weiner Diversity Index ($H' = 3.69$) and Shannon's Evenness ($H_e = 0.90$) values indicate high avifaunal diversity and equitable distribution among the detected bird species. These values together with species richness and abundance are important baseline information for possible monitoring and assessment in the future. Out of the 61 identified bird species in the study area, 19 (31%) are Philippine endemic species and 17 (89%) of them are confined only to Palawan faunal region.

Table 1. Families, common names, scientific names, frequency, relative abundance, conservation status, and level of endemism of birds found in the Tagbanua ancestral domain

Family	Common Name	Scientific Name	Conservation Status(IUCN/CITES/PCSD)	Level of Endemism	Frequency (n)	Relative Abundance (%)
Pycnonotidae	Palawan Bulbul	<i>Alophoixus frater</i>	P3	PHES*	17	4.57
Pycnonotidae	Ashy-Fronted Bulbul	<i>Pycnonotus cinereifrons</i>	LC	PHES*	14	3.76
Pycnonotidae	Sulphur-Bellied Bulbul	<i>Hypsipetes palawanensis</i>	P3	PHES*	15	4.03
Pycnonotidae	Black-Headed Bulbul	<i>Pycnonotus atriceps</i>	LC	R	8	2.15
Timaliidae	Pin-Striped Tit-Babbler	<i>Macronous gularis woodi</i>	LC	R**	20	5.38
Pellorneidae	Ashy-Headed Babbler	<i>Malacocincla cinereiceps</i>	P3	PHES*	9	2.42
Pellorneidae	Melodious Babbler	<i>Malacopteron palawanense</i>	NT / P3	PHES*	1	0.27
Muscicapidae	White-Vented Shama	<i>Copsychus niger</i>	P3	PHES*	11	2.96
Muscicapidae	Palawan Blue Flycatcher	<i>Cyornis lemprieri</i>	NT / P3	PHES*	5	1.34
Irenidae	Asian Fairy-Bluebird	<i>Irena puella tweedallii</i>	LC	R**	16	4.30
Cisticolidae	Rufous-Tailed Tailorbird	<i>Orthotomus sericeus</i>	LC	R	19	5.11
Picidae	Red-Headed Flameback	<i>Chrysocolaptes erythrocephalus</i>	E/P2	PHES*	1	0.27
Picidae	Spot-Throated Flameback	<i>Dinopium everetti</i>	NT/P3	PHES*	2	0.54
Picidae	Great Slaty Woodpecker	<i>Mulleripicus pulverulentus</i>	V / P3	R	1	0.27
Pittidae	Hooded Pitta	<i>Pitta sordida</i>	LC	R	5	1.34
Pittidae	Red-Bellied Pitta	<i>Erythropitta erythrogaster</i>	LC	PHES	1	0.27
Monarchidae	Blue-Paradise Flycatcher	<i>Terpsiphone cyanescens</i>	NT / P3	PHES*	4	1.08
Monarchidae	Black-Naped Monarch	<i>Hypothymis azurea azurea</i>	LC	R	3	0.81

Dicaeidae	Pygmy Flowerpecker	<i>Dicaeum pygmaeum palawanorum</i>	LC	R**	26	6.99	
Dicaeidae	Palawan Flowerpecker	<i>Prionochilus plateni</i>	P3	PHES*	21	5.65	
Cuculidae	Chestnut-Breasted Malkoha	<i>Phaenicophaeus curvirostris</i>	LC	R	5	1.34	
Cuculidae	Asian Koel	<i>Eudynamis scolopaceus</i>	LC	R	2	0.54	
Cuculidae	Greater Coucal	<i>Centropus sinensis</i>	LC	R	2	0.54	
Cuculidae	Lesser Coucal	<i>Centropus bengalensis javanensis</i>	LC	R	1	0.27	
Cuculidae	Square-Tailed Drongo-Cuckoo	<i>Sumiculus lugubris brachyurus</i>	LC	R	2	0.54	
Cuculidae	Plaintive Cuckoo	<i>Cacomantis merulinus</i>	LC	R	2	0.54	
Corvidae	Slender-Billed Crow	<i>Corvus enca</i>	LC	R	8	2.15	
Nectariniidae	Pale Spiderhunter	<i>Arachnothera dilutior</i>	P3	PHES*	18	4.84	
Nectariniidae	Olive-Backed Sunbird	<i>Cinnyris jugularis</i>	LC	R	6	1.61	
Nectariniidae	Brown-Throated Sunbird	<i>Anthreptes malacensis paraguayae</i>	LC	R**	4	1.08	
Nectariniidae	Lovely Sunbird	<i>Aethopyga shelleyi shelleyi</i>	P3	PHES	6	1.61	
Dicruridae	Hair-Crested Drongo	<i>Dicrurus hottentottus palawanensis</i>	LC	R**	14	3.76	
Dicruridae	Ashy Drongo	<i>Dicrurus leucophaeus leucophaeus</i>	LC	R	4	1.08	
Paridae	Palawan Tit	<i>Periparus amabilis</i>	NT / P3	PHES*	17	4.57	
Estrildidae	White-Bellied Munia	<i>Lonchura leucogastra palawana</i>	LC	R	2	0.54	
Estrildidae	Scaly-Breasted Munia	<i>Lonchura punctulata cabanisi</i>	LC	R	2	0.54	
Alcedinidae	Oriental Dwarf Kingfisher	<i>Ceryx erithaca</i>	LC	R	6	1.61	
Alcedinidae	Collared Kingfisher	<i>Todiramphus chloris collaris</i>	LC	R	2	0.54	
Accipitridae	Crested Serpent-Eagle	<i>Spilornis cheela palawanensis</i>	All / P2	R**	2	0.54	
Accipitridae	Crested Goshawk	<i>Accipiter trivirgatus palawanus</i>	All / P2	R**	1	0.27	
Bucerotidae	Palawan Hornbill	<i>Anthraceros marchei</i>	V / All / P2	PHES*	3	0.81	
Columbidae	Green Imperial Pigeon	<i>Ducula aenea</i>	LC	R	2	0.54	
Columbidae	Common Emerald-Dove	<i>Chalcophaps indica</i>	LC	R	5	1.34	
Columbidae	Pink-Necked Green Pigeon	<i>Treron vernans</i>	LC	R	4	1.08	
Columbidae	Spotted Dove	<i>Spilopelia chinensis tigrina</i>	LC	R	2	0.54	
Columbidae	Zebra Dove	<i>Geopelia striata</i>	LC	R	2	0.54	
Columbidae	Black-Chinned Fruit Dove	<i>Ptilinopus leclancheri gironieri</i>	P3	R**	5	1.34	
Columbidae	Reddish Cuckoo-Dove	<i>Macropygia tenuirostris</i>	LC	R	2	0.54	
Campephagidae	Bar-Bellied Cuckoo-Shrike	<i>Coracina striata difficilis</i>	LC	R**	3	0.81	
Campephagidae	Fiery Minivet	<i>Pericrocotus igneus igneus</i>	NT	R	2	0.54	
Sturnidae	Common Hill Myna	<i>Gracula religiosa palawanensis</i>	All / P1	R**	4	1.08	
Sturnidae	Asian Glossy Starling	<i>Aplonis panayensis</i>	LC	R	8	2.15	
Chloropseidae	Yellow-Throated Leafbird	<i>Chloropsis palawanensis</i>	P3	PHES*	8	2.15	
Coraciidae	Oriental Dollar Bird	<i>Eurystomus orientalis orientalis</i>	LC	R	2	0.54	
Aegithinidae	Common Iora	<i>Aegithina tiphia</i>	LC	R	3	0.81	
Psittaculidae	Blue-Naped Parrot	<i>Tanygnathus lucionensis salvadorii</i>	NT / All / P1	R	3	0.81	
Psittaculidae	Blue-Headed Racket-Tail	<i>Prioniturus platenae</i>	V / P2	PHES*	2	0.54	
Phasianidae	Red Junglefowl	<i>Gallus gallus</i>	LC	R	2	0.54	
Phasianidae	Palawan Peacock-Pheasant	<i>Polyplectron napoleonis</i>	V / All / P1	PHES*	1	0.27	
Oriolidae	Black-Naped Oriole	<i>Oriolus chinensis chinensis</i>	LC	R	2	0.54	
Artamidae	White-Breasted Woodswallow	<i>Artamus leucorhynchus leucorhynchus</i>	LC	R	2	0.54	
					Total	372	100

Legend:**Conservation Status:**

LC – IUCN Status “Least concern”

NT – IUCN Status “Near-threatened”

V – IUCN Status “Vulnerable”

AI – CITES Status “Appendix I”

All – CITES Status “Appendix II”

P1 – PCSD Status “Critically Endangered”

P2 – PCSD Status “Endangered”

P3 – PCSD Status “Vulnerable”

Level of Endemism:

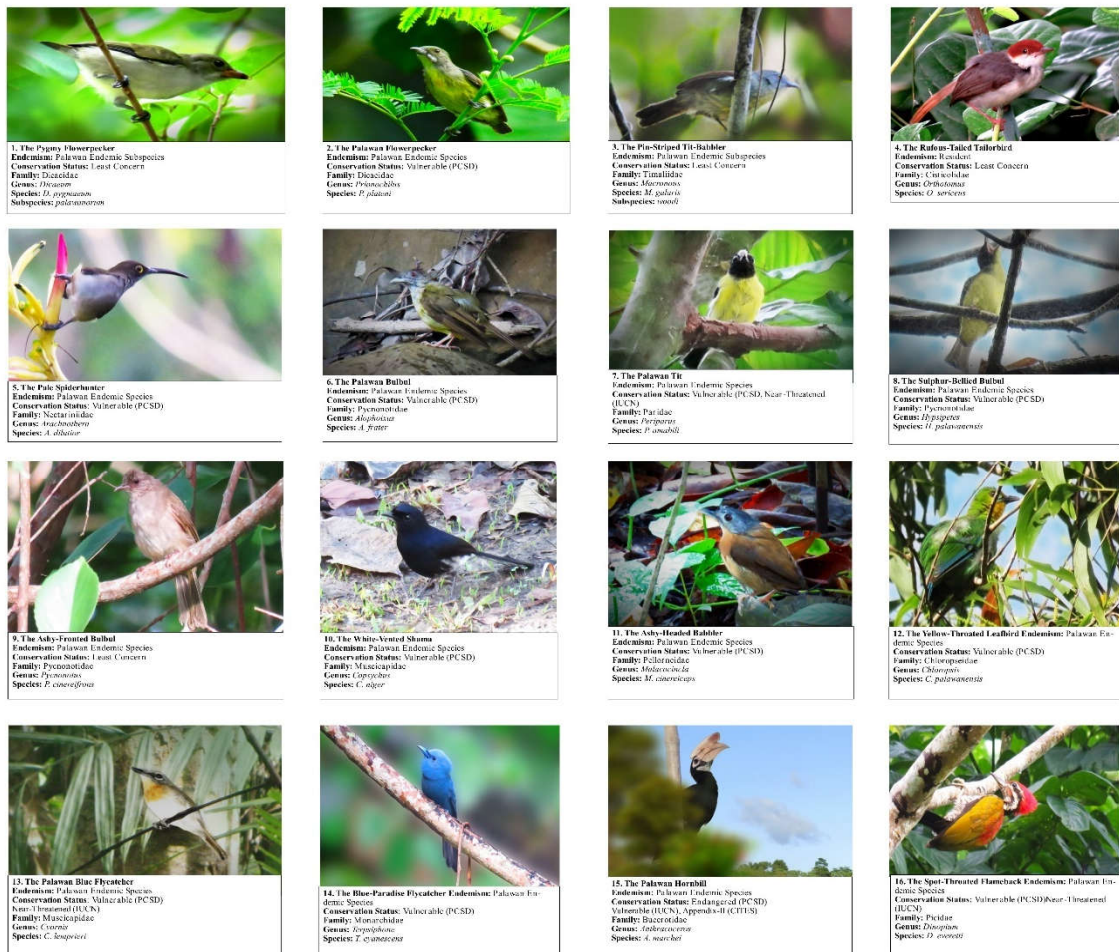
* - Palawan endemic species

** - with Palawan endemic subspecies

PHES – Philippine endemic species

R – Resident species

The common Palawan endemic species recorded in the study area are Palawan Flowerpecker (*Prionochilus plateni*) (Figure 2), Pale Spiderhunter (*Arachnothera dilutor*) (Figure 1-5), Palawan Bulbul (*Alophoixus frater*) (Figure 1-6), Palawan Tit (*Periparus amabilis*) (Figure 1-7), Sulphur-Bellied Bulbul (*Hypsipetes palawanensis*) (Figure 1-8), Ashy-Fronted Bulbul (*Pycnonotus cinereifrons*) (Figure 1-9), White-Vented Shama (*Copsychus niger*) (Figure 1-10), Ashy-Headed Babbler (*Malacocincla cinereiceps*) (Figure 1-11), and Yellow-Throated Leafbird (*Chloropsis palawanensis*) (Figure 1-12). Meanwhile, the less common Palawan endemic species found during the survey are Palawan Blue Flycatcher (*Cyornis lemprieri*) (Figure 1-13), Blue-Paradise Flycatcher (*Terpsiphone cyanescens*) (Figure 1-14), Palawan Hornbill (*Antracoceros marcheii*) (Figure 1-15), Spot-Throated Flameback (*Dinopium everetti*) (Figure 1-16), Blue-Headed Racket-Tail (*Prioniturus platenae*), Palawan Peacock-Pheasant (*Polyplectron napoleonis*) (Figure 1-17), Red-Headed Flameback (*Chrysocolaptes erythrocephalus*) (Figure 1-18), and Melodious Babbler (*Malacopteron palawanense*). In addition, two Philippine endemic species that are not restricted to Palawan faunal region were also recorded in the area. These are the Lovely Sunbird (*Aethopyga shelleyi shelleyi*), and the Red-Bellied Pitta (*Erythropitta erythrogaster*). Based on the highest conservation priority status given to each bird species, twenty-three species were considered threatened with extinction. Three species were classified as “Critically Endangered”, the Common Hill Myna (*Gracula religiosa palawanensis*) (Figure 1-19), Blue-Naped Parrot (*Tanygnathus lucionensis salvadorii*) (Figure 1-20), and Palawan Peacock-Pheasant (*Polyplectron napoleonis*). Another five species were classified as “Endangered”, the Red-Headed Flameback (*Chrysocolaptes erythrocephalus*), Crested Serpent-Eagle (*Spilornis cheela palawanensis*) (Figure 1-21), Crested Goshawk (*Accipiter trivirgatus palawanus*) (Figure 1-22), Palawan Hornbill (*Antracoceros marcheii*), and Blue-Headed Racket-Tail (*Prioniturus platenae*). Meanwhile, fifteen species were classified as “Vulnerable”, the Palawan Bulbul (*Alophoixus frater*), Sulphur-Bellied Bulbul (*Hypsipetes palawanensis*), Ashy-Headed Babbler (*Malacocincla cinereiceps*), Melodious Babbler (*Malacopteron palawanense*), White-Vented Shama (*Copsychus niger*), Palawan Blue Flycatcher (*Cyornis lemprieri*), Spot-Throated Flameback (*Dinopium everetti*), Great Slaty Woodpecker (*Mulleripicus pulverulentus pulverulentus*) (Figure 1-23), Blue-Paradise Flycatcher (*Terpsiphone cyanescens*), Palawan Flowerpecker (*Prionochilus plateni*), Pale Spiderhunter (*Arachnothera dilutor*), Lovely Sunbird (*Aethopyga shelleyi shelleyi*), Palawan Tit (*Periparus amabilis*), Black-Chinned Fruit Dove (*Ptilinopus leclancheri gironieri*) (Figure 1-24), Yellow-Throated Leaf bird (*Chloropsis palawanensis*) (IUCN, 2020; PCSD, 2015). The high level of endemism is expected because Palawan is one of the endemic bird areas (EBA) in the Philippines and the study area is within the eastern slopes of the Victoria-Anipahan mountain range, one of the important bird areas (IBA) in the province (BirdLife International, 2020). Endemic birds are mostly forest-dependent and are sensitive to habitat degradation, thus a good stand of old-growth forests is important to these species (Mallari *et al.*, 2011). Seventy percent of all the Philippine endemic species found in Palawan were recorded in the study area. The presence of many endemic birds indicates that the forest habitat is still in good condition. The ancestral domain is also a home to many threatened and near-threatened bird species. Using the criteria of the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Palawan Council for Sustainable Development (PCSD), a total of 24 (39%) species of birds found in the study area are on the conservation priority list of at least one of the aforementioned criteria.



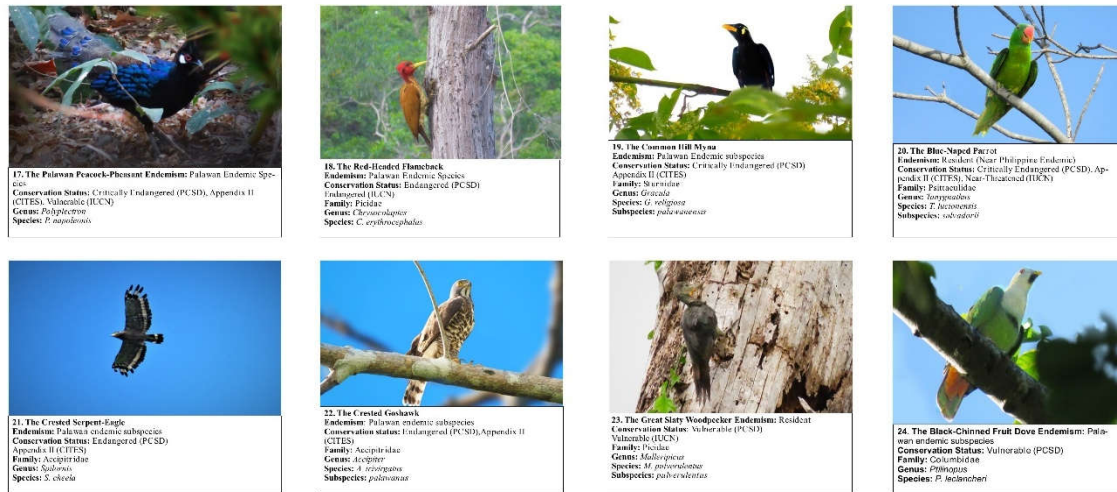


Figure 1. Representative avifauna species of conservation importance.

Twelve species of birds were included on the conservation priority list of the IUCN Red List of Threatened Species (IUCN, 2020). Of these, seven were classified as “Near-Threatened”, four were classified as “Vulnerable”, and one was classified as “Endangered”. Meanwhile, based on the conservation priority criteria of PCSD (PCSD, 2015), twenty-three bird species found in the study area were already threatened by extinction. Among them, fifteen were identified as “Vulnerable”, five were assessed as “Endangered” and three were classified as “Critically Endangered”. Moreover, some of the commonly traded bird species found in the study area were also listed in the CITES Appendices. Five species were listed in CITES Appendix-II which recommends regulating its trade in the international market while one species was listed in Appendix-I which recommends prohibiting the international trade of that species. It is also important to know that most of the conservation priority species recorded in the study area are also Palawan endemic species.

The survival of these birds is threatened to extinction by habitat loss and degradation within their home range. Being restricted in Palawan which is a small geographic region, the deforestation and habitat degradation in the province may drive these species to extinction. This observation further emphasized the importance of the forest in the ancestral domain as a refuge for these endemic and conservation priority species. The supplementary bird watching in the area at night and during rest periods found seven more species. Four species were recorded at night, these are the Spotted Wood Owl (*Strix seloputo wiepkeni*), Palawan Scops Owl (*Otus fuliginosus*), Palawan Frogmouth (*Batrachostomus chaseni*), and Large-Tailed Nightjar (*Caprimulgus macrurus johnsoni*). Meanwhile, three species were found during the daytime, these are the Pied Triller (*Lalage nigra nigra*), Palawan Flycatcher (*Ficedula platenae*), and White-Bellied Woodpecker (*Dryocopus javensis hargitti*). It is also worth mentioning that the Palawan Scops Owl, Palawan Frogmouth, and Palawan Flycatcher are Palawan endemic species. Meanwhile, both the Palawan Scops Owl and Spotted Wood Owl were classified as “Endangered” while the Palawan Frogmouth and Palawan Flycatcher were classified as “Vulnerable”.

The avifaunal assemblage in the in the Tagbanua ancestral domain may reflect a healthy forest ecosystem but the threat of habitat degradation and deforestation is always possible if the current anthropogenic activities intensify and become less sustainable. The dense forest canopy provides fruits to many frugivore species and also keeps the understory and forest floor shaded and cool. Some tall trees in the canopy and emergent layers have trunk cavities that

in this area that serve as nesting places of commonly poached birds such as the Common Hill Myna (*Gracula religiosa palawanensis*) and Blue-Naped Parrot (*Tanygnathus lucionensis salvadorii*) (Bernardo, 2016). Meanwhile, its dark and damp forest floor is completely covered with thick forest litters and ground plants. Vines and lianas also creep on the ground and form dense tangles in the understory and shrub layer. The protruding network of roots and large buttresses further add complexity to the forest floor habitat. The forest also supports a wide array of insects and small vertebrates that provide food for insectivore and carnivore species. Although the current habitat of birds and other wildlife will be affected if a large portion of the forest will be converted into swidden farms. Moreover, if the harvesting of timber and non-timber forest products exceeds the carrying capacity of the forest, it may end up in habitat degradation.

CONCLUSION

The ancestral domain particularly the forest areas supports high avifaunal diversity as evident by the high species richness, abundance, diversity index, and evenness values. Moreover, it also supports many forest-dependent endemic birds and conservation priority species that are threatened by extinction. These avifaunal community attributes indicated that the forest ecosystem in the area is still intact, healthy, in good condition and stable despite existing anthropogenic activities that are taking place in the area. The relatively low level of anthropogenic disturbances suggests that the resource extraction and utilization in the area remain sustainable. The high avifaunal diversity and the presence of many endemic and conservation priority bird species highlight the need to intensify protection and conservation of the forest in the ancestral domain.

RECOMMENDATION

The ancestral domain is a prolific habitat that supports a remarkable assemblage of avifauna. Additional avifaunal assessments are recommended to discover other bird species not found in this study. It may use other avifaunal assessment methods such as trapping, mist-netting, and bird call playback to improve the detection rate. It is also recommended that the study includes a year-round analysis to include the wet and dry seasons, time of fruiting, and the arrival of migratory birds to evaluate seasonality. Moreover, other habitats such as higher elevations, riparian vegetation, streams, rivers, swidden farms, and human settlement areas must be included in the bird study to further understand the biogeography of birds in the area. Recognizing the importance of the forest as avifaunal habitat, it is recommended that the forest portion of the ancestral domain be

conserved and protected. A sustainable, science-based, and culture-sensitive community-based management plan must be crafted to guide the local managers in the management and utilization of the forest resource. It is also recommended that a group which will be composed of representatives coming from different sectors such as non-government organizations, government agencies, academe, and other stakeholders be organized to oversee the management of the area.

ACKNOWLEDGEMENT

The authors would like to acknowledge the Western Philippines University for the providing initial fund in the conduct of the study. Gratitude is extended to the tagbanua tribe community of Barangay Cabigaan, Aborlan, Palawan for granting the FPIC and made fieldwork enjoyable with the company of selected members of the tribe.

REFERECES

- Asprilla-Perea, J., & Diaz-Puente, J. M. (2019). Importance of wild foods to household food security in tropical forest areas. *Food Security*, 11, 15–22. <https://doi.org/10.1007/s12571-018-0846-8>
- Ahtikoski, A., Tuulentie, S., Hallikainen, V., Nivala, V., Vatanen, E., Tyrväinen, L., & Salminen, H. (2011). Potential trade-offs between nature-based tourism and forestry, a case study in Northern Finland. *Forests*, 2(4), 894-912.
- Bankoff, G. (2007). One island too many: reappraising the extent of deforestation in the Philippines prior to 1946. *Journal of Historical Geography*, 33, 314-334.
- Bernardo, A. A. Jr. (2016). Georeferencing and characterization of nesting trees of commonly traded wild birds (Blue-naped Parrot *Tanygnathus lucionensis* and Hill Myna *Gracula religiosa*) in Talakaigan Watershed Aborlan, Palawan, Philippines. *The Palawan Scientist*, 7, 13-30.
- Biodiversity Management Bureau (BMB)-Department of Environment and Natural Resources (DENR) & Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. (2017). Manual on Biodiversity Assessment and Monitoring System for Terrestrial Ecosystems. BMB-DENR and GIZ, Manila, 194p.
- BirdLife International. (2020). Endemic bird areas factsheet: Palawan. Retrieved November 12, 2020, from <http://datazone.birdlife.org/eba/factsheet/154>
- Brockerhoff, E. G., Barbaro, L., Castagneyrol, B., Forrester, D. I., Gardiner, B., Gonzales-Olabarria, J. R., Lyver, P. O., Meurisse, N., Oxbrough, A., Hisatomo, T., Thompson, I. D., Van der Plas, F., & Jactel, H. (2017). Forest biodiversity, ecosystem functioning, and the provision of ecosystem services. *Biodiversity and Conservation*, 26, 3005–3035.
- Corlett, R. T. (1998). Frugivory and seed dispersal by birds in Hong Kong shrubland. *Forktail*, 13, 23-27.
- De la Paix, M. J., Lanhai, L., Xi, C., Ahmed, S., & Varenym, A. (2011). Soil degradation and altered flood risk as a consequence of deforestation. *Land Degradation and Development*, 24, 5, 478-485. <https://doi.org/10.1002/ldr.1147>
- Dressler, W. (2005). Disentangling Tagbanua lifeways, swidden, and conservation on Palawan island. *Human Ecology Review*, 12, 1, 21-29.
- Dudle, N., & Stolton, S. (2003). Running Pure: The importance of forest protected areas to drinking water. World Bank/WWF Alliance for Forest Conservation and Sustainable Use. <https://openknowledge.worldbank.org/bitstream/handle/10986/15006/292830Running0pure>
- Eder, J. F. (1987). On the Road to Tribal Extinction: Depopulation, Deculturation, and Adaptive Well-Being Among the Batak of the Philippines. University of California Press, Berkeley. <http://ark.cdlib.org/ark:/13030/ft5s200701/>
- Eriksson, L., Nordlund, A. M., Olsson, O., & Westin, K. (2012). Recreation in different forest settings: A scene preference study. *Forests*, 3(4), 923-943. <https://doi.org/10.3390/f3040923>
- Food and Agriculture Organization of the United Nations (FAO). (2020). Global forest resource assessment 2020 report. Rome. Retrieved November 9, 2020, from <http://www.fao.org/3/cb0046en/cb0046en>
- Forest Management Bureau (FMB) of the Department of Environment and Natural Resources (DENR). (2019). Philippine Forestry Statistics. Department of Environment and Natural Resources (DENR). 104p. Retrieved October 30, 2020, from <https://drive.google.com/file/d/1Cuy-Sup929NPoxqBdVcDml-3YfG2Nhn/view>
- Gallery, E.R. (2014). Ecology of Tropical Rainforests. In R.K. Monson (Ed), *Ecology and the Environment: The Plant Sciences*. (Volume 8, pp. 247-272). Springer New York.
- Getzner, M., & Meyerhoff, J. (2020). The benefits of local forest recreation in Austria and its dependence on naturalness and quietude. *Forests*, 11(3), 326. <https://doi.org/10.3390/f11030326>
- Gibson, L., Lee, T.M., Koh, L.P., Brook, B.W., Gardner, T.A., Barlow, J., Peres, C. A., Bradshaw, C.J.A., Laurance, W.F., Lovejoy, T.E., & Sodhi, N.S. (2011). Primary forests are irreplaceable for sustaining tropical biodiversity. *Nature*, 478, 378–381.
- IUCN 2020. The IUCN Red List of Threatened Species. Version 2020 -3. Retrieved November 10, 2020, from <https://www.iucnredlist.org>.
- Mallari, N. A. D., Collar, N. J., Lee, D. C., McGowan, P. J. K., Wilkinson, R., & Marsden, S. J. (2011). Population densities of understorey birds across a habitat gradient in Palawan, Philippines: implications for conservation. *Oryx*, 45, 2, 234-242.
- Moore, K. D. (2007). In the shadow of the cedars: the spiritual values of old-growth forests. *Conservation Biology*, 21(4), 1120-1123.
- Neary, D. G., Ice, G. G., & Rhett Jackson, C. (2009). Linkages between forest soils and water quality and quantity. *Forest Ecology and Management*, 258(10), 2269-2281. <https://doi.org/10.1016/j.foreco.2009.05.027>.
- Nowak, D.J., Hirabayashi, S., Bodine, A., & Greenfield, E. (2014). Tree and forest effects on air quality and human health in the United States. *Environmental Pollution*, 193, 119-129.
- Ong, P. S., Afuang, L.E., & Rosell-Ambal, R. G. (2002) Philippine Biodiversity Conservation Priorities: A Second Iteration of the National Biodiversity Strategy and Action Plan. Department of Environment and Natural Resources-Protected Areas and Wildlife Bureau, Conservation International Philippines, Biodiversity Conservation Program-University of the Philippines Center for Integrative and Development Studies, and Foundation for Philippine the Philippine Environment. Quezon City, Philippines. 133p.
- Palawan Council for Sustainable Development (PCSD) 2015. The updated list of threatened terrestrial and marine wildlife in Palawan and their categories pursuant to Republic Act 9147 or the "Wild Life Act" per PCSD Resolution No. 15-521 Series of 2015.
- Pan, Y., Birdsey, R.A., Fang, J., Houghton, R., Kauppi, P.E., Kurz, W.A., Phillips, O.L., Shvidenko, A., Lewis, S.L., Canadell, J.G., Ciais, P., Jackson, R.B., Pacala, S.W., McGuire, A. D., Piao, S., Rautiainen, A., Sitch, S., & Hayes, D. (2011). A large and persistent carbon sink in the world's forests. *Science*, 333(6045), 988-993. <http://doi.org/10.1126/science.1201609>

- Pimentel, D., McNair, M., Buck, L., Pimentel, M., & Kamol, J. (1997). The value of forests to world food security. *Human Ecology*, 25, 91-120.
- Republic Act 8371. (1997). Republic Act 8371. An act to recognize, protect, and promote the rights of indigenous cultural communities/indigenous peoples, creating a national commission on indigenous peoples, establishing implementing mechanisms, appropriating funds therefor, and for other purposes. *Official Gazette of the Republic of the Philippines*. Retrieved November 12, 2020, from <<https://www.officialgazette.gov.ph/1997/10/29/republic-act-no-8371/>>
- Shively, G. E. (1997). Poverty, technology, and wildlife hunting in Palawan. *Environmental Conservation*, 24, 1, 57-63.
- Sritongchuay, T., Gale, G. A., Stewart, A., Kerdkaew, T., & Bumrungsri, S. (2014). Seed rain in abandoned clearings in a lowland evergreen rain forest in Southern Thailand. *Tropical Conservation Science*, 7, 3, 572-585.
- Thompson, I.D., Okabe, K., Tylanakis, J.M., Kumar, P., Brockerhoff, E.G., Schellhorn, N. A., Parotta, J. A., & Nasi, R. (2011). Forest biodiversity and the delivery of ecosystem goods and services: translating science into policy. *BioScience*, 61(12), 972-981.
- Voeks, R. A. (1996). Tropical forest healers and habitat preference. *Economic Botany*, 50, 381-400. <https://doi.org/10.1007/BF02866520>
