AVIFAUNAL DIVERSITY IN BULOSAO WATERSHED FOREST RESERVE LAWAAN, EASTERN SAMAR, PHILIPPINES

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ABSTRACT

Bulosao Watershed Forest Reserve is regarded as one of the most important areas in terms of biodiversity in the island of Samar and within the greater Mindanao faunal region. Four study sites representing different habitat types, elevation range and degree of human disturbance were surveyed for their faunal composition. Standard faunal survey methods such as transect survey was used during the entire duration of the study. The methods were augmented with observations and ethnobiological interviews.

A total of 41 species of birds belonging to 12 orders, 25 families and 35 genera were recorded. Of these, twelve (29 %) are endemic to the Philippines and one to the greater Mindanao faunal region. Among avian species, sixteen (40%) are considered threatened or at risk.

Major threats birds and other wildlife populations in the reserve include hunting and habitat alteration. Hunting among the local community is not only for subsistence but also for commercial purposes. Major activities leading to habitat destruction include conversion of logged-over areas into cultivation, illegal logging and indiscriminate collection of other forest products.

KEY WORDS: *Bulosao watershed. Avifaunal diversity. Biodiversity conservation*

INTRODUCTION

The Bulosao Watershed Forest Reserve is located in the southern part of the island of Samar and lies within the coordinates 11°22'N and 125°20'E. Having an area of about 4,055 hectares, it was declared as a watershed forest reserve through Proclamation Number 106 on 10 December 1992, for inclusion in the National Integrated Protected Areas System (NIPAS) by virtue of R.A. 7586 (DENR, 2003). It is under the administrative jurisdiction of the municipality of Lawaan, Eastern Samar.

Samar is within the greater Mindanao faunal region. This faunal region is comprised of Mindanao Island and all islands that were connected to it at low sea level periods of the Pleistocene such as Samar, Leyte, Bohol, Basilan, Dinagat and Siargao. Considered biologically the richest and one of the most distinctive in the Philippines, this faunal region contains at least 29 species of endemic birds and 26 species of endemic mammals (DENR, 1997).

Recently, the Birdlife International and the Haribon Foundation (Mallari et al., 2001) recognized Samar as an endemic bird area with three important bird areas (IBA), one of which is the Bulosao Watershed Forest Reserve. Avifaunal diversity survey in this IBA however is still in the pipeline due to some constraints.

The wild fauna of the Bulosao Watershed Forest Reserve is still virtually unknown. The extensive forests in this reserve must support important populations of several of the threatened and endemic species of the greater Mindanao faunal region. With the current resource utilization patterns, which are responsible for the degradation of highly sensitive and fragile ecosystems in this landscape, the biodiversity is likely to be heavily affected. The study is a modest attempt to determine the existing faunal biodiversity, which must have resulted from the constant interaction between the local community and the resources base. The study is timely and significant, as it would serve as valuable input in formulating integrated conservation strategies that would promote biodiversity conservation at the same time address the economic needs of the local communities.

MATERIALS AND METHODS

Description of the study area

Bulosao Watershed Forest Reserve is adjacent to the MacArthur Mountains, and straddles the boundary of Samar and Eastern Samar Provinces (Figure 1). The highest peak is Mt Honop at 731 m. The northern and western boundaries of the IBA approximately follow the Sulat River. Closed canopy lowland dipterocarp forest covers c.2,624 ha (65%) of the watershed, open canopy lowland dipterocarp forest covers c.952 ha (24%), cultivated areas with brush cover c.208 ha (5%), coconut plantations cover c.171 ha (4%) and contract reforestation plots (planted with exotic tree species) cover c.100 ha (2%). There are a few small settlements present in the area, and the small patches of agricultural land and kaingin are planted with coconut, banana and fruit trees (Mallari et al 2001).

Site Characterization

Sampling in the area was done in four sites, which cover different habitat types, disturbance levels and altitudinal gradients. Site 1 was located in a heavily disturbed lower mountain forest dominated by agricultural cultivation particular devoted to coconut below 100 meters above sea level (masl). Site 2 was situated in a disturbed lower mountain forest dominated by cultivated areas with patches of secondary forest and regeneration areas between 100 and 200 masl. Site 3 was located in the upper mountain forest with patches of primary and secondary forests, reforestation, and cultivation between 200 and 300 masl. Site 4 was situated in the less disturbed upper mountain forest dominated by a mix of primary and secondary forests with patches of regeneration and active cultivation from 300 to 400 masl.

Figure 1. Map of Samar Island showing the location of Bulosao Watershed in Lawaan, Eastern Samar

Figure 2. Vegetation type at 100-200 masl

Figure 3. Vegetation type at 200-300 masl

Avifaunal Survey

Composition and distribution of avian species were assessed using the transect survey method based on Mallari (1992). Transect lines measuring 2 kilometers each were set in every sampling site. The number of transect lines in each sampling site vary depending upon the variability of the sites which include types of habitat, disturbance level and elevation. All species of birds encountered along the transects were recorded. For each species seen or heard, the following information were noted: species name, number of individuals, and habitat types. The avifaunal inventory was conducted early in the morning (from 6:00 to 9:00) and late in the afternoon (from 3:00 to 6:00).

Identification was up to the species level whenever possible. Nomenclature and classification were based on Gonzales and Rees (1988) and Kennedy et al. (2000).

Similarity Index

Sampling sites cover different habitat types, disturbance levels and altitudinal gradients. The Sorensen's Index of Similarity (Magurran, 1988) was used to compare species composition between sampling sites. Similarity values (expressed in percentage) were calculated using the following equation:

$$SI = \frac{2K}{A + B} \times 100$$

Where, K = number of species common to sites A and B;

A = number of species for site A, and

B = number of species for site B.

Species Richness

Species richness for each sampling site was measured using Menhinick's Richness Index (Magurran, 1988) with the following equation:

$$R = S / \sqrt{N},$$

Where:

S = total number of species per sampling site/elevation,

N = total number of individuals per sampling site/elevation.

The overall pattern of species richness in each site was determined by plotting the values of species richness indices against the sampling sites in a line graph.

Species Diversity

Diversity was computed for each sampling site using Shannon's Diversity Index (Magurran, 1988):

$$H' = -\sum [n_i / n] \ln [n_i / n]$$

Where: n_i = number of individuals per species and
 n = total number of individuals.

The overall pattern of species diversity was determined by plotting computed Shannon diversity indices of sampling sites in a line graph.

Other methods of Faunal Survey

Ethnobiological interviews were conducted to determine the presence of other birds that were not recorded during the field observations. Information on vernacular or local names, habitat type, socioeconomic importance and other patterns of behavior were noted. Other activities related to the overall decline or loss of wildlife species in the area were also recorded.

RESULTS AND DISCUSSION

Species Composition

A total of 41 bird species were recorded in the four study sites primarily based on transect survey results (Table 1). These species belong to Columbidae is the most represented family with 5 species of dove and 1 species of pigeon. It is followed by family Pycnonotidae with three species of bulbul. Most Columbidae species are frugivorous and are often encountered in brushlands bordering secondary forest areas. Their ability as good agents for seed dispersal enables them to play vital role in the forest ecosystem.

Of the 41 avian species recorded in Bulasao Watershed Forest Reserve, 12 (29%) are endemic to the Philippines. Only one is endemic to Samar and the rest of Greater Mindanao faunal region.

Table 1. List of avian taxa recorded in Bulosao Watershed Forest Reserve, Lawaan, Eastern Samar

ORDER	FAMILY	SCIENTIFIC NAME	COMMON NAME
Apodiformes	Apodidae	<i>Collocalia troglodytes</i> *	Pygmy Swiftlet
Caprimulgiformes	Caprimulgidae	<i>Caprimulgus manillensis</i>	Philippine Nightjar
Columbiformes	Columbidae	<i>Chalcophaps indica</i>	Common Emerald Dove
		<i>Ducula aenea</i>	Green Imperial Pigeon
		<i>Macropygia phasianella</i>	Reddish Cuckoo Dove
		<i>Phapitreron amethystine</i> *	Amethyst Brown Fruit Dove
		<i>Phapitreron leucotis</i> *	White-eared Brown Fruit Dove
Coraciiformes	Alcedinidae	<i>Ptilinopus leclancheri</i>	Black-Chinned Fruit Dove
		<i>Halcyon chloris</i>	White-collared Kingfisher
	Bucerotidae	<i>Halcyon smyrnensis</i>	White-throated Kingfisher
		<i>Buceros hydrocorax</i> *	Rufous Hornbill
Cuculiformes	Cuculidae	<i>Penelopides panini</i> *	Tariktik Hornbill
		<i>Centropus viridis</i> *	Philippine Coucal
		<i>Eudynamis scolopacea</i>	Common Koel
Falconiformes	Accipitridae	<i>Haliastur Indus</i>	Brahminy Kite
Galliformes	Phasianidae	<i>Gallus gallus</i>	Red Jungle Fowl
Gruiformes	Rallidae	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen
		<i>Gallinula chloropus</i>	Common Moorhen
Passeriformes	Artamindae	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow
	Corvidae	<i>Corvus macrorhynchos</i>	Large-billed Crow
	Dicruridae	<i>Dicrurus hottentottus</i>	Spangled Drongo
	Estrildidae	<i>Lonchura mallaca</i>	Chestnut Munia
	Pittidae	<i>Pitta steerii</i> **	Steere's Pitta
	Muscicapidae	<i>Rhipidura javanica</i>	Pied Fantail
	Nectariniidae	<i>Nectarinia jugularis</i>	Olive-backed Sunbird
		<i>Nectarinia sperata</i>	Purple-throated Sunbird
	Oriolidae	<i>Oriolus chinensis</i>	Black-naped Oriole
		<i>Oriolus xanthonotus</i>	Dark-throated Oriole
	Pycnonotidae	<i>Hypsipetes philippinus</i> *	Philippine Bulbul

Table 1. (cont'd.)

ORDER	FAMILY	SCIENTIFIC NAME	COMMON NAME
	Sylviidae	<i>Orthothomus castaneiceps</i> *	Philippine Tailorbird
	Timaliidae	<i>Macronous striaticeps</i>	Brown Tit-babbler
	Turdidae	<i>Copsychus saularis</i>	Oriental Magpie Robin
Piciformes	Picidae	<i>Dryocopus javanensis</i>	White-bellied Woodpecker
Psittaciformes	Psittacidae	<i>Loriculus philippensis</i> *	Colasisi
		<i>Tanygnathus lucionensis</i>	Blue-naped Parrot
Stringiformes	Tytonidae	<i>Bubo philippensis</i> *	Philippine Eagle-owl
		<i>Tyto capensis</i>	Grass Owl

*Endemic to the Philippines

**Endemic to Samar and the Greater Mindanao faunal region.

Species Distribution

The distribution of bird species in the four sites is shown in Table 2. Site 3 had the highest number of species with a total of 31; site 2 had the lowest with 16. Site 1 and 4 had 23 and 20 species, respectively.

Six species were found to be present in the four sites and are considered common. Nine species were recorded in a single site only. The rest (26) were observed either in 2 or in 3 sites.

Most frequently occurring and most abundant species were the bulbuls and the sunbirds. Most of these species are either insectivorous, or nectivorous or both. The presence of dense undergrowth in regeneration areas which harbor high insect population and the availability of fruit-bearing (mostly pioneer) tree species across the four sites warrant the steady supply of food for these group of birds species.

Of the nine species, which appeared to be in their restricted range as they were recorded in a single site only, the Philippine Grass-owl (*Tyto capensis*) was the only avian species observed in Site 1 where there are vast grasslands near active cultivation.

Table 2. Distribution of bird species recorded in the four sampling sites in Bulosao Watershed Forest Reserve, Lawaan, Eastern Samar

SCIENTIFIC NAME	SAMPLING SITES			
	1	2	3	4
<i>Collocalia troglodytes</i>	x		x	
<i>Caprimulgus manillensis</i>		x	x	
<i>Buceros hydrocorax</i>	x		x	
<i>Penelopides panini</i>			x	x
<i>Phapitreron leucotis</i>	x	x	x	x
<i>Phapitreron amethystina</i>	x			
<i>Ptilinopus leclancheri</i>		x	x	x
<i>Chalcophaps indica</i>	x	x	x	
<i>Macropygia phasianella</i>				
<i>Ducula aenea</i>			x	
<i>Halcyon smyrnensis</i>	x	x	x	
<i>Halcyon chloris</i>			x	
<i>Centropus viridis</i>	x	x	x	
<i>Eudynamis scolopacea</i>	x		x	x
<i>Haliastur indus</i>			x	x
<i>Gallus gallus</i>				x
<i>Amauornis phoenicurus</i>	x		x	
<i>Gallinula chloropus</i>			x	
<i>Artamus leucorhynchus</i>	x			
<i>Corvus macrorhynchos</i>	x	x	x	x
<i>Dicrurus hottentottus</i>	x	x	x	x
<i>Lonchura mallaca</i>	x		x	
<i>Pitta steerii</i>				x
<i>Rhipidura javanica</i>	x			x
<i>Nectarinia jugularis</i>	x	x	x	x
<i>Nectarinia sperata</i>	x	x	x	
<i>Oriolus chinensis</i>	x		x	x
<i>Oriolus xanthonotus</i>			x	
<i>Hypsipetes philippinus</i>	x	x	x	x
<i>Pycnonotus goiavier</i>	x		x	
<i>Hypsipetes everetti</i>			x	

Table 2 (cont'd)

SCIENTIFIC NAME	SAMPLING SITES			
	1	2	3	4
<i>Pitta steeril</i>				x
<i>Rhipidura javanica</i>	x			x
<i>Nectarinia jugularis</i>	x	x	x	x
<i>Nectarinia sperata</i>	x	x	x	
<i>Oriolus chinensis</i>	x		x	x
<i>Hypsipetes philippinus</i>	x	x	x	x
<i>Pycnonotus goiavier</i>	x		x	
<i>Hypsipetes everetti</i>			x	
<i>Sarcops calvus</i>	x	x	x	
<i>Aplonis panayensis</i>			x	
<i>Orthothomus castaneiceps</i>				x
<i>Macronous striaticeps</i>	x		x	x
<i>Copsychus saularis</i>	x	x	x	
<i>Dryocopus javanensis</i>		x	x	x
<i>Loriculus philippinensis</i>		x		x
<i>Tanygnathus lucionensis</i>	x	x	x	x
<i>Bubo philippinensis</i>				x
<i>Tyto capensis</i>	x			
Total number of species	23	16	31	20

Green Imperial Pigeon (*Ducula aenea*), Dark Throated Oriole (*Oriolus xanthonotus*), Yellowish Bulbul (*Hypsipetes everetti*), White Collard Kingfisher (*Halcyon chloris*), Common Moorhen (*Gallinula Chloropus*) and Asian Glossy Starling (*Aplonis panayensis*) were observed only in Site 3. Green Imperial Pigeon, Dark Throated Oriole and Yellowish Bulbul were observed deep in the interior of intergrading secondary and primary forests. White Collard Kingfisher and Common Moorhen were found in relatively open area near a creek. Surprisingly, several Asian Glossy Starlings were observed in a reforestation site feeding on the fruits of buntan (*Engelhardia rigida*), a naturally occurring pioneer species in reforestation sites.

Steere's Pitta (*Pitta steerii*), Philippine Tailorbird (*Orthothomus castaneiceps*) and Philippine Eagle-owl (*Bubo philippensis*) were all observed in Site 4 only. Steere's Pitta and Philippine Tailorbird were observed in the interior of primary forest while Philippine Eagle-owl was observed in the edge of a primary forest near a headwater of a creek.

Species Similarity

The similarity indices of the 4 sites are shown in Table 3. Site 1 and 3 had the highest index of similarity (74%). Site 2 and 3 ranked second (63%) while site 1 and 4 had the lowest percentage (46%).

The similarity in terms of degree of habitat heterogeneity and the habitat types present could explain the high similarity between Site 1 and 3. These sites were composed mainly of a combination of secondary forests, agricultural cultivation, and regeneration areas under coconut plantations. This combination of habitats provided adequate and quality food sources to a many species of birds particularly those with broad food preference and wide altitudinal range. Dense under growth of secondary forests and regeneration areas supports high diversity of insects and fruits, which are the primary sources of food of these bird species.

The low similarity of Site 4 when compared to the rest of the sites could be attributed to the difference in habitat types and structural complexity. Site 4 being at the highest altitudinal range among the four sites, was composed mainly of a mix of primary and secondary forests and small openings in cultivation areas. The less structural complexity associated to this site condition made it fit to harbor mostly interior bird species, which are usually adapted to the secondary and primary forests.

Table 3. Avifaunal similarity indices of the study sites in Bulosao Watershed Forest Reservation, Lawaan, Eastern Samar

STUDY SITE	SIMILARITY INDEX (%)*			
	1	2	3	4
1	-	11	20	10
2	56.41	-	15	9
3	74.07	63.83	-	12
4	46.51	50.00	47.06	-

*Values in shaded cells refer to the number of species common to both sites.

Species Richness and Diversity

As shown in Table 4, site 4 had the highest species richness of 1.61 with 156 individuals belonging to 20 species. Site 2 had the lowest species richness of 1.43 with 125 individuals belonging to only 16 species. Figure 2 shows that generally species richness increases with elevation.

Table 4. Species richness and diversity of the four study sites in Bulosao watershed Forest Reservation, Lawaan, Eastern Samar

STUDY SITE	TOTAL NUMBER OF SPECIES	TOTAL NUMBER OF INDIVIDUALS	SPECIES RICHNESS (Mean)	SPECIES DIVERSITY (Mean)
1	23	223	1.54	2.41
2	16	125	1.43	2.06
3	31	382	1.58	2.21
4	20	156	1.61	2.02
Bulosao Watershed	41	886	1.54	2.18

Figure 4. Avian species richness of Bulosao Watershed Forest Reserve, Lawaan, Eastern Samar

Legend:

- Site 1 – 100 masl dominated agricultural cultivation particularly devoted to coconut*
- Site 2 – between 100 and 200 masl dominated by cultivated areas with patches of secondary forest and regeneration*
- Site 3 – between 200 and 300 masl patches of primary and secondary forests, reforestation, and cultivation*
- Site 4 – between 300 and 400 masl dominated by a mix of primary and secondary forests with patches of regeneration and active cultivation*

The increasing trend in species richness along altitudinal gradient could be due to the decreasing abundance of individuals in a species and the increasing number of species. The decrease in the number of individuals per species could be a result of limited amount of food for a specific species. The limited amount of food inhibits increase of species population especially that of specialist species. The increasing number of species could be attributed to the decreasing degree of disturbance along altitudinal gradient. Site 2 was highly disturbed and highly homogenous because it was close to settlements and

areas under cultivation. Site 4, on the other hand, was situated far from settlement thus less disturbed and probably must support a variety of small niches for specialization.

Site 1, on the other hand, had the highest diversity while site 4 had the lowest. Species diversity generally decreases with elevation (Figure 3). The decreasing diversity along altitudinal gradient could be due to the decreasing evenness of distribution of individuals among species and the increasing dominance of few aggressive species. In site 1, aside from the high abundance due to the seemingly unlimited and highly diverse food materials because of overlapping habitats, individuals were evenly distributed among the different species. In site 4 where food materials were of limited supply due to less diverse habitats and less structural complexity, some species tend to dominate thereby decreasing the evenness.

Conservation Status of Avifaunal Species

Conservation status of avian species recorded in Bulosao Watershed Forest Reserve is presented in Table 5. The conservation status of at least twenty-four species appeared in various literature such as the IUCN Red List Category of Species, CITES, and Birdlife International and Haribon Foundation. Of the twenty species recognized by IUCN, 16 were considered near threatened (nt), 2 vulnerable (VU), 1 lower risk (LR) and 1 endangered (E). Under CITES, 4 were listed in Appendix II and 1 in Appendix I. The Birdlife and Haribon Foundation recognized 1 as threatened, 1 restricted and 1 threatened and restricted to Samar only.

Figure 5. Avian species diversity of Bulosao Watershed forest Reserve, Lawaan, Eastern Samar

Legend:

- Site 1 – 100 masl dominated agricultural cultivation particularly devoted to coconut
- Site 2 – between 100 and 200 masl dominated by cultivated areas with patches of secondary forest and regeneration
- Site 3 – between 200 and 300 masl patches of primary and secondary forests, reforestation, and cultivation
- Site 4 – between 300 and 400 masl dominated by a mix of primary and secondary forests with patches of regeneration and active cultivation

The Birdlife International and Haribon Foundation has recognized the whole island of Samar as endemic bird area (EBA) in Mallari et al (2001). The Bulosao Watershed Forest Reserve was recognized as one its important bird areas (IBA) in the Southern Samar mountains along with Mt Yacgun-Mt Sohoton complex, and Mt Cabalantian-Mt Capoto-an complex. The different bird species found in Samar Island as reported by Mallari et al. (2001) is presented in Table 6. Unfortunately, only three species encountered in the field survey were included in the list. This calls for a thorough and intensive survey to determine what is actually left of the bird biodiversity of Bulosao Watershed Forest Reserve.

Table 5. Conservation status of avian species recorded in, Lawaan, Eastern Samar

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS		
		IUCN-RCL*	CITES**	HF&BI***
<i>Amaurornis phoenicurus</i>	White-breasted Waterhen	nt		
<i>Bubo philippensis</i>	Philippine Eagle-owl	VU	II	T
<i>Buceros hydrocorax</i>	Rufous Hornbill	LR	II	
<i>Copsychus saularis</i>	Oriental Magpie Robin	nt		
<i>Corvus macrorhynchos</i>	Large-billed Crow	nt		
<i>Dryocopus javanensis</i>	White-bellied Woodpecker	nt	I	
<i>Ducula aenea</i>	Green Imperial Pigeon	nt		
<i>Eudynamys scolopacea</i>	Common Koel	nt		
<i>Gallinula chloropus</i>	Common Moorhen	nt		
<i>Gallus gallus</i>	Red Jungle Fowl	nt		
<i>Halcyon smyrnensis</i>	White-throated Kingfisher	nt		
<i>Haliastur indus</i>	Brahminy Kite	nt	II	
<i>Ixos everetti</i>	Yellowish Bulbul			R
<i>Lonchura mallaca</i>	Chestnut Munia	nt		
<i>Loriculus philippensis</i>	Colasisi		II	
<i>Nectarinia jugularis</i>	Olive-backed Sunbird	nt		
<i>Nectarinia sperata</i>	Purple-throated Sunbird	nt		
<i>Oriolus chinensis</i>	Black-naped Oriole	nt		
<i>Penelopides panini</i>	Tariktik Hornbill	EN	II	
<i>Pitta steerii</i>	Steere's Pitta	VU		RT
<i>Pycnonotus goiavier</i>	Yellow-vented Bulbul	nt		
<i>Rhipidura javanica</i>	Pied Fantail	nt		
<i>Tanygnathus lucionensis</i>	Blue-naped Parrot		II	
<i>Tyto capensis</i>	Grass Owl		II	

*IUCN Red List Category: EN=endangered; VU=vulnerable; nt=near threatened

**CITES: I=appendix I; II=appendix II

***Haribon Foundation & Birdlife International: R=restricted range; T=threatened

One important specie that has been observed in the area was the Rufous Hornbill (*Buceros hydrocorax*), which normally inhabits secondary and primary forests. This specie, however, was observed in flocks of six to ten individuals perching on a "toog" (*Petersianthus quadrialatus*) tree in an active cultivation near a falls. "Toog", the tallest tree in most cultivated fields in the area, is usually left uncut during logging operation because of its poor lumber quality. This avian species is recognized as **Lower Risk** by IUCN and listed in **CITES Appendix II**.

Another important specie that has been observed in the area was the Tariktik Hornbill (*Penelopides panini*), which is considered **Endangered** by the IUCN and **CITES Appendix II**. A local resident had caught one individual of this bird species during the field survey. Sadly, the bird has suffered gunshot from an air rifle. This species is primarily hunted for its meat.

Conservation Issues

In Bulosao Watershed Forest Reserve, the most serious threat to birds is hunting. Birds are not just hunted for food but also sold live as pet in the market. Most preferred bird for hunting is the Jungle Fowl (*Gallus gallus*) followed by the doves and pigeons owing to their large meat. Key informants revealed that a number of local hunters possessed air rifle for hunting birds. Most preferred birds collected for pet trade are Colasisi (*Loriculus philippensis*) and Blue-naped Parrot (*Tanygnathus lucionensis*). Several individuals of White-eared Brown Fruit Dove (*Phapitreron leucotis*) were observed in the possession of local residents. These will be used as live lure in trapping the same species.

Habitat alteration is another threat to wildlife in Bulosao Watershed Forest Reserve. The conversion of forest to agricultural cultivation through slash-and-burn and illegal logging operations are serious threats to wildlife. Aside from lumber, local residents are also extracting timber to be made into boat keels,

which is indirectly associated to the fishing activities in Lawaan and adjoining municipalities. Clearing of forests to some extent may be beneficial to wildlife because of increased habitat diversity and complexity. However if the trend continues, forests may be decimated to the disadvantage of those highly sensitive interior species of wildlife, which are mostly affected by the habitat transformation.

Table 6. Threatened and restricted-ranged bird species found in Samar Island as reported by Mallari et al. (2001). Highlighted cells indicate avifauna species observed during the avian survey

SCIENTIFIC NAME	COMMON NAME	CONSERVATION STATUS		
		HF&BI*	IUCN-RLC**	CITES***
<i>Anas luzonica</i>	Philippine Duck	T	VU	
<i>Pithecophaga jefferyi</i>	Philippine Eagle	T	CR	
<i>Spizaetus philippensis</i>	Philippine Hawk-eagle	T	VU	
<i>Gallicolumba criniger</i>	Mindanao Bleeding-heart	RT	CR	
<i>Cacatua haematuropygia</i>	Philippine Cockatoo	T	CR	I
<i>Bubo philippensis</i>	Philippine Eagle-owl	T	VU	
<i>Alcedo argata</i>	Silvery Kingfisher	RT	VU	
<i>Ceyx melanurus</i>	Philippine Kingfisher	T	VU	
<i>Todirhamphus winchelli</i>	Rufous-lored Kingfisher	T		
<i>Penelopides samarensis</i>	Samar Hornbill	R		II
<i>Eurylaimus samarensis</i>	Visayan Broadbill	RT	VU	
<i>Pitta steerii</i>	Steer's Pitta	RT	VU	
<i>Ixos everetti</i>	Yellowish Bulbul	R		
<i>Chloropsis flavipennis</i>	Philippine Leafbird	RT		
<i>Ptilocichla mindanensis</i>	Straited Wren-babbler	R		
<i>Stachyris plateni</i>	Pygmy Babbler	R		
<i>Orthotomus samarensis</i>	Yellow-breasted Tailorbird	R		
<i>Muscipapa randi</i>	Ashy-breasted Flycatcher	RT		
<i>Ficedula basilanica</i>	Little Slaty Flycatcher	RT	VU	
<i>Hypothymis helenae</i>	Short-crested monarch	R		
<i>Hypothymis coelestis</i>	Celestial Monarch	RT	VU	

* Haribon Foundation & Birdlife International: R=restricted range; T=threatened

** IUCN Red List Category: CR=critically endangered; VU=vulnerable;

*** CITES: I=appendix I; II=appendix II

CONCLUSION AND RECOMMENDATION

Of the 668 bird species in the Philippines, 41 are recorded in Bulosao Watershed Forest Reserve. These species belong to 12 orders, 25 families and 35 genera. The most represented order is Passeriformes with 18 species belonging to 13 families. The second most represented order is Columbiformes with 6 species belonging to two families. Columbidae and Pycnonotidae are the most represented family.

Of the 41 avian species recorded in the reserve, twenty-nine percent are endemic to the Philippines. Only one is endemic to Samar and the rest of Greater Mindanao faunal region.

Twenty species of birds are included in the IUCN Red List Category. Of these, 16 are considered near Threatened, 2 Vulnerable, 1 Lower risk and 1 Endangered. Under CITES, 4 were listed in Appendix II and 1 in Appendix I. The Birdlife and Haribon Foundation recognized 1 as threatened, 1 restricted and 1 threatened and restricted to Samar only.

The most serious threat to birds and other wildlife in the reserve is hunting for both subsistence and commercial purposes. Possession of air rifle of many villagers in the area poses great threat to bird population particularly the doves and pigeons, the favorite hunting target bird species. Aside from hunting for meat, collection of birds for the pet trade is also becoming evident.

Habitat alteration brought about by conversion of forests to agricultural cultivation through slashes and burn cultivation, continued illegal logging activities and indiscriminate collection of non-timber products in the reserve are also great threat to birds and other wildlife.

Considering the magnitude of the present and foreseeable disturbances in the reserve, there is therefore an urgent need to implement some conservation measures. Such conservation measures must integrate economical viable and socially acceptable livelihood alternatives for the local

communities in order to lessen their dependence on the resources of the reserve.

Ecological studies on threatened avifauna must be carried out before any conservation measures are effectively implemented. More intensive faunal survey must be done to fully account for other important species that might not have been covered by the present avifaunal inventory.

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