

Bird surveys in Turtle Islands Wildlife Sanctuary, Philippines

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ABSTRACT

Bird observations were conducted in all six islands within the Turtle Islands Wildlife Sanctuary, Tawi-Tawi, Philippines in May 2017, March 2018 and August 2019. Purposive sampling technique using digital cameras, binoculars and spotting scopes were used to document the bird species and to assess their population. A total of 44 species were observed including the IUCN Vulnerable Grey Imperial Pigeon *Ducula pickeringii* (Cassin, 1854), the near-threatened Mantanani Scops Owl *Otus mantananensis* (Sharpe, 1892) and the Philippine Megapode *Megapodius cumingii* (Dillwyn, 1853). Baguan Island recorded the highest number of species (38) followed by Taganak Island with 25 species, Boan Island with 21 species, Great Bakkungan and Lihiman Islands has 18 species each, while the island with the least number of species observed was Langaan (14). Among the islands, only Baguan retained mature beach forest. Locals in Boan Island were observed keeping native birds as pets. The presence of these restricted-range bird species as well as the updated baseline data, provide significant contribution in defining priority islands for avian conservation. Additional surveys are recommended in the area particularly in the relatively undisturbed Baguan Island during migratory season.

Keywords: Mantanani scops owl, Sulu, Tawi-Tawi

INTRODUCTION

The Philippines consists of 7,641 islands (Maritime Industry Authority 2021) is located at the western most part of the Pacific Ocean and is identified

as one of the world's biologically rich countries when it comes to diversity of ecosystems, species and genetic diversity. Avian diversity in the country is among the highest in the world where more than 7% of the land area was declared as Important Bird Areas (IBAs) and secondary regions (Stattersfield et al. 1998; Collar et al. 1999). Important Bird Areas are sites that are significant for the conservation of bird populations in a worldwide scale due to the presence of threatened, endemic and restricted-range species (Haribon Foundation 2014). Among the outstanding IBAs is the Sulu Archipelago (Alban 2005).

A number of threatened birds are known to occur only in Sulu archipelago and nowhere else in the world (Ong et al. 2002; BirdLife International 2019). Despite the high concentration of endemic and restricted-range species, very few ornithological expeditions have been conducted on the smaller islands including the Turtle Islands (Dickinson et al. 1991; Kennedy et al. 2000; Mallari et al. 2001) and earlier collections were concentrated on Tawi-Tawi, Jolo, Sitangkai and Simunol (Guillemard 1885; Mearns 1909; Dickinson et al. 1991; Kennedy et al. 2000; Peterson et al. 2000).

The Turtle Islands is located at the southwestern edge of Sulu Sea right at the tip of the international treaty limits separating the Philippines and Malaysia. It ranked as the 11th major marine nesting grounds in the world for the endangered Green Sea Turtle *Chelonia mydas* (Linnaeus, 1758). This small group of islands is highly valued and recognized for its critical marine turtle habitat. Hence, the entire municipality covering six islands, namely Langaan, Lihiman, Baguan, Great Bakkungan, Boan, and Taganak, was declared as a protected area known as Turtle Islands Wildlife Sanctuary (TIWS) pursuant to Republic Act 7586 as amended by RA 11038. It has a total area of 242,967 ha (242.97 km²), including its surrounding waters (PAMB 2018).

Knowledge on the birds of TIWS is important in helping us understand the relationships of the birds in TIWS to Borneo and Philippines and whether the endemic and restricted-range species of the Sulu archipelago are also found in TIWS. The bird observations of Ivan Sarenas in Baguan and Taganak Islands (Yu et al. 2016) added 28 new records and was the only available recent information on the avifaunal community of TIWS. This study presents the status of the forest habitats on each island, bird species composition, abundance, and diversity in the islands of Baguan, Taganak, Boan, Lihiman, Langaan and Great Bakkungan. These are essential in identifying priority islands for bird conservation.

METHODS

Site Description

Langaan (6°12'17.306"N, 118°8'59.02"E) - The island measures 7 ha with a relatively flat, sandy landscape. Its vegetation is dominated by coconut *Cocos nucifera* (L.) and with some beach forest trees covering a quarter of the island (3 ha). This was visited on 22-23 May 2017 and 24 August 2019.

Lihiman (6°13'56.114"N, 118°4'7.53"E) - A 29 ha island with an active mud volcano on the northern section. The mud volcano forms a 20 m crater that drains directly to the sea. A plantation of "agoho" *Casuarina equisetifolia* (L.) (estimated at 4 ha) surrounds the volcano and are the only known plants growing around the mud volcano. On the lower sections of the steep hill are native species of trees e.g. "talisay" *Terminalia catappa* (L.) and "kapok" *Ceiba pentandra* (L.). Patches of mangroves are observed on the uninhabited coastal areas. This was visited on 22-23 May 2017 and 24 August 2019.

Baguan (6°6'13.171"N, 118°26'50.411"E) - This 29.1 ha island is designated as a strict protection zone. It is the only uninhabited island within TIWS. It is mostly flat in the southern section with a hilly northern portion that reached an elevation of 40 m above sea level and leads to a steep drop with large volcanic boulders on the northern sandy shoreline. The "Balinghasai" *Buchanania arborescens* (Blume), coconut and other beach forest trees dominated the terrestrial flora. This was visited on 21 May 2017, 21 March 2018, and 22-23 August 2019.

Great Bakkungan (6°11'14.045"N, 118°7'10.514"E) - This 51 ha hilly island is dominated by coconuts *C. nucifera*, mangoes *Mangifera indica* (L.) and bananas *Musa* sp. interspersed with grassland that serve as grazing areas for goats. An active mud volcano in the northern end is surrounded with grasslands and occasional "bignay" *Antidesma* spp. trees. The highest altitude reaches 58 m elevation. This was visited on 22-23 May 2017 and 24 August 2019.

Boan (6°17'6.912"N, 118°4'41.43"E) - A 76 ha island has an elevation of 59 m above sea level. The island features a cluster of coastal communities and a hilly landscape. Few native trees are observed on the island. A patch of residual forest on the northern side was reported in the 1990s, but only *Ficus* spp., coconuts, bananas and brushland are observed during the survey. A patch of mangroves composed mostly of *Rhizophora* spp. is observed in the southern coastal area. We visited on 22-23 May 2017 and 24 August 2019.

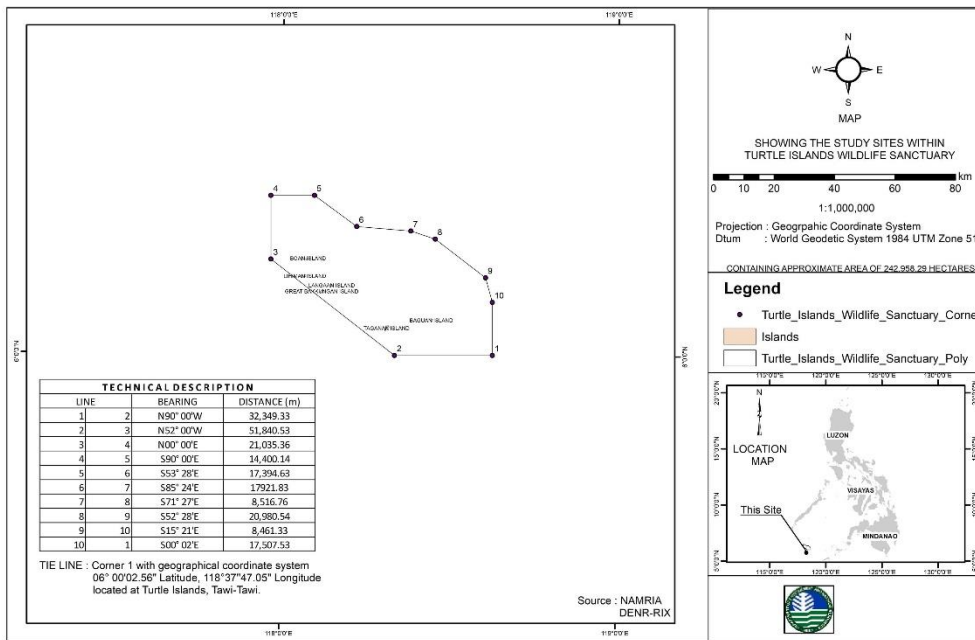


Figure 1. Map of Turtle Islands Wildlife Sanctuary, Philippines.

Taganak (6°4'44.375"N, 118°18'53.611"E) - The island has an estimated land area of 116 ha and elevation at 148 m above sea level. It is mostly flat on the southern side with a low plateau-like feature at the central section. Mainly devoid of forest except for the native vegetation on the rocky section in the north. The rest of the island is covered with “cogon” *Imperata cylindrica* (L.) with mango and banana plantation as well as other seasonal agricultural plants. We visited last 19-20 May 2017, 21 March 2018, and 25 August 2019. The exact location of the study sites visited during the survey is shown in Figure 1.

Status of Forest Habitats

To identify priority islands for bird conservation, basic description of the general type of habitat was conducted by a) recording the most numerous plants identified at least at the family level, b) presence of fruiting and flowering plants, c) average height of canopy and understory plants and d) anthropogenic disturbances. A drone was also used to take images and videos to determine the different land uses and in estimating remaining natural vegetation. Photos of flowering and fruiting trees were also taken for taxonomic identification using the works of Pelser et al. (2011) and Primavera (2009).

Birds Species Composition and Abundance

A purposive sampling method and photo documentation were carried out in the six islands. Birds seen and heard calling were recorded using 8 x 42, 10 x 42 roof prism binoculars and 80 x 45 degree spotting scopes, and photographed using digital cameras with 600 mm telephoto lenses. In the case of Baguan Island, four count stations were used by observers to search and record the species and numbers of birds for at least eight minutes (Bibby et al. 2000; Lee and Marsden 2008). Taxonomy and nomenclature followed the Handbook of Birds of the World and the BirdLife International Illustrated Checklist of the Birds of the World (del Hoyo et al. 2014; del Hoyo and Collar 2016). Kennedy et al. (2000), Lee et al. (2018) and Jakosalem et al. (2019) were used in identifying birds while Allen (2020) was used as reference for the residency and conservation status. A total of 27 observation hours were spent in the whole area as follows; 16 hours - Baguan; 8 hours - Taganak; 2.5 hours - Lihiman; 4.5 hours - Langaan; 5.5 hours – Boan; 2 hours - Great Bakkungan.

Birds Species Diversity

The Shannon – Weiner index of diversity was determined between islands. This index takes both abundance and richness into account using the formula: $H = - \sum [p_i \cdot \ln(p_i)]$ where, *Sum* is the summation; *pi* is the proportion of each species in a sample.

RESULTS

Status of Forest Habitats

Very little natural vegetation exists on the islands except in Baguan and Langaan. In Baguan, 89% of the island was covered with beach forest (Table 1). The “balinghasai” *Buchanania* spp. was the most common species encountered followed by figs *Ficus* spp., “culasi” *Lumnitzera littorea* (Jack) Voigt, “buta-buta” *Excoecaria agallocha* (L.), “tabigi” *Xylocarpus granatum* (Koen.), “piagao” *Xylocarpus moluccensis* (Lam.) M. Roem and “tungog” *Ceriops* spp. There were still traces of secondary growth beach forests in Taganak and Langaan Island. In Great Bakkungan and Boan, *Antidesma* spp. grows in the grassland areas. The *Buchanania* spp., *Antidesma* spp. and *Ficus* spp. appear to be the major source of fruits for fruit-eating wildlife e.g., doves *Ptilinopus* sp., *Ducula* sp. and many others.

Table 1. Estimated forest cover on the islands of Turtle Islands Wildlife Sanctuary.

Name of Island	Size (ha)	Estimated forest (ha)	Description of habitats	Encountered Plant Species
Baguan	29	26	Secondary beach forest	<i>Buchanania</i> spp., <i>Ficus</i> spp., <i>Xylocarpus</i> spp., <i>Excoecaria</i> sp.
Taganak	116	8	Second growth with grassland	<i>Xylocarpus</i> spp., <i>Excoecaria</i> sp., <i>Cocos nucifera</i> (L.), <i>Mangifera indica</i> (L.), <i>Musa</i> sp.
Lihiman	29	5	<i>Casuarina</i> tree plantation	<i>Casuarina equisetifolia</i> (L.), <i>Cocos nucifera</i> , <i>Terminalia catappa</i> (L.)
Langaan	7	2	Beach forest	<i>Excoecaria agallocha</i> (L.), <i>Cocos nucifera</i>
Boan	76	24	Brushland and mangroves	<i>Cocos nucifera</i> , <i>Ficus</i> spp., <i>Macaranga</i> sp., <i>Terminalia catappa</i>
Great Bakkungan	51	20	Brushland and grassland	<i>Cocos nucifera</i> , <i>Antidesma</i> spp., <i>Mangifera indica</i> , <i>Terminalia catappa</i>

Birds Species Composition and Abundance

Of the six islands visited, Baguan Island (38) recorded the highest number of species followed by Taganak (25), Boan (21), Lihiman (19), Great Bakkungan (18), and lastly was Langaan with 14 species (Table 2).

Table 2. Counts and relative abundance of birds (in parenthesis) recorded during current surveys on the six islands of TIWS. Note that 1 – Baguan; 2 – Boan; 3– Langaan; 4 – Lihiman; 5 – Great Bakkungan and 6 – Taganak. An asterisk placed before the scientific name denotes migratory birds.

Scientific Name	1	2	3	4	5	6
* <i>Fregata ariel</i> (Gmelin, 1789)	4 (3)					
* <i>Fregata minor</i> (Gray, 1845)	1 (1)					
<i>Haliaeetus leucogaster</i> (Gmelin, 1788)	1 (1)	1 (1)	1 (3)	1 (1)	1 (2)	1 (2)
<i>Haliastur indus</i> (Boddaert, 1783)	1 (1)	2 (2)	1 (3)	3 (2)	1 (2)	2 (3)
<i>Butorides striata</i> (Linnaeus, 1758)		1 (1)		1 (1)	1 (2)	
<i>Amaurornis phoenicurus</i> (Pennant, 1769)		1 (1)				
<i>Hypotaenidia torquatus</i> (Linnaeus, 1766)		1 (1)				
<i>Egretta sacra</i> (Gmelin, 1789)	1 (1)	1 (1)	1 (3)	1 (1)		1 (2)
<i>Bubulcus ibis</i> (Linnaeus, 1758)	1 (1)					

Scientific Name	1	2	3	4	5	6
* <i>Tringa brevipes</i> (Veillot, 1810)	1 (1)					1 (2)
* <i>Charadrius leschenaultia</i> (Lesson, 1826)	1 (1)					1 (2)
<i>Sterna sumatrana</i> (Raffles, 1822)	16 (13)	4 (4)	2 (6)	5 (3)	2 (4)	1 (2)
* <i>Chlidonias hybrida</i> (Pallas, 1811)	8 (7)				5 (11)	5 (8)
<i>Onychoprion anaethetus</i> (Scopoli, 1786)	1(1)					
<i>Thalasseus bergii</i> (Lichtenstein, 1823)				64 (44)		
* <i>Phalaropus lobatus</i> (Linnaeus, 1758)			2 (6)			
<i>Megapodius cumingii</i> (Dillwyn, 1853)	9 (8)					3 (5)
<i>Treron vernans</i> (Linnaeus, 1771)	4 (3)	3 (2)			7 (15)	2 (3)
<i>Treron axillaris</i> (Bonaparte, 1855)	1(1)					
<i>Ptilinopus melanospila</i> (Salvadori, 1875)		3 (2)				6 (10)
<i>Ducula pickeringii</i> (Cassin, 1854)	8 (7)					
<i>Ducula bicolor</i> (Scopoli, 1786)	5 (4)					
<i>Columba vitiensis</i> (Quoy & Gaimard, 1830)	1(1)					
<i>Chalcophaps indica</i> (Linnaeus, 1758)	1(1)	2 (2)				1 (2)
<i>Spilopelia chinensis</i> (Scopoli, 1786)	3 (3)	3 (4)	1 (3)	26 (18)	4 (9)	1 (2)
* <i>Cuculus saturatus</i> (Blyth, 1843)	1 (1)					
<i>Eudynamys scolopaceus</i> (Linnaeus, 1758)	1 (1)					
<i>Otus mantananensis</i> (Sharpe, 1892)	1 (1)					2 (3)
<i>Pelargopsis capensis</i> (Linnaeus, 1766)	2 (2)					1 (2)
<i>Todiramphus chloris</i> (Boddaert, 1783)	10 (8)	8 (10)	8 (24)	3 (2)	3 (6)	4 (7)
<i>Aerodramus cf amelis</i> (Oberholser, 1906)	1 (1)					
<i>Gerygone sulphurea</i> (Wallace, 1864)	2 (2)	1 (1)	1 (3)	4 (3)	1 (2)	1 (2)
* <i>Hirundo rustica</i> (Linnaeus, 1758)	3 (3)	2 (2)	6 (18)	1 (1)	6 (13)	3 (5)
<i>Pycnonotus goaivier</i> (Scopoli, 1786)	1 (1)	2 (2)		2 (1)	1 (2)	5 (8)
<i>Rhipidura nigritorquis</i> (Vigors, 1831)	2 (2)	1 (1)	1 (3)	1 (1)		2 (3)
<i>Aplonis panayensis</i> (Scopoli, 1783)	3 (3)	23 (28)	1 (3)	1 (1)	2 (4)	1 (2)
<i>Lalage nigra</i> (Forster, 1781)	2 (2)			1 (1)	1 (2)	1 (2)
<i>Artamus leucorhynchus</i> (Linnaeus, 1771)	1 (1)	1 (1)		1 (1)	2 (4)	1 (2)
<i>Oriolus chinensis</i> (Linnaeus, 1766)	1 (1)			1 (1)		
* <i>Motacilla cinerea</i> (Tunstall, 1771)	1 (1)		1 (3)			
<i>Anthreptes malacensis</i> (Scopoli, 1786)	5 (4)	5 (6)	3 (9)	2 (1)	2 (4)	1 (2)

Scientific Name	1	2	3	4	5	6
<i>Cinnyris jugularis</i> (Linnaeus, 1766)	1 (1)				2 (4)	
<i>Lonchura atricapilla</i> (Veillot, 1807)	7 (6)	2 (2)		2 (1)	2 (4)	3 (5)
<i>Passer montanus</i> (Linnaeus, 1758)	6 (5)	18 (22)	3 (9)	27 (18)	4 (9)	9 (15)
Total individuals	119	85	32	147	47	59
Total species	38	21	14	19	18	25
Total breeding residents	30	19	11	18	19	22
Total migratory birds	8	1	3	1	1	3

A total of eight species were found in all islands: White-bellied Sea eagle *Haliaeetus leucogaster* (Gmelin, 1788), Brahminy Kite *Haliastur indus* (Boddaert, 1783) Spotted Dove *Spilopelia chinensis* (Scopoli, 1786), Collared Kingfisher *Todiramphus chloris* (Boddaert, 1783), Yellow-vented Bulbul *Pycnonotus goavivier* (Scopoli, 1786), Asian Glossy Starling *Aplonis panayensis* (Scopoli, 1783), Brown-throated Sunbird *Anthreptes malacensis* (Scopoli, 1786) and Eurasian Tree Sparrow *Passer montanus* (Linnaeus, 1758). The Asian Glossy Starling was the most frequently encountered bird followed by Eurasian Tree Sparrow. Seven of the bird species were represented with only one individual (Table 2).

A total of nine species were newly recorded in TIWS e.g., Barred Rail *Hypotaenidia torquatus* (Linnaeus, 1766), Whiskered Tern *Chlidonias hybridus* (Pallas, 1811), Black-naped Fruit Dove *Ptilinopus melanospila* (Salvadori, 1875), Pied Imperial Pigeon *Ducula bicolor* (Scopoli, 1786), Metallic Pigeon *Columba vitiensis* (Quoy & Gaimard, 1830), Grey-capped Emerald Dove *Chalcophaps indica* (Linnaeus, 1758), Red-necked Phalarope *Phalaropus lobatus* (Linnaeus, 1758), Black-naped Oriole *Oriolus chinensis* (Linnaeus, 1766) and Great Frigatebird *Fregata minor* (Gmelin, 1766).

Birds Species Diversity

Baguan recorded the highest index of species diversity ($H' = 3.2$) compared with the other islands (Figure 2). This is followed by Taganak ($H' = 2.9$) and Great Bakkungan ($H' = 2.7$). The smallest island (Lihiman) recorded the lowest species diversity index ($H' = 1.8$).

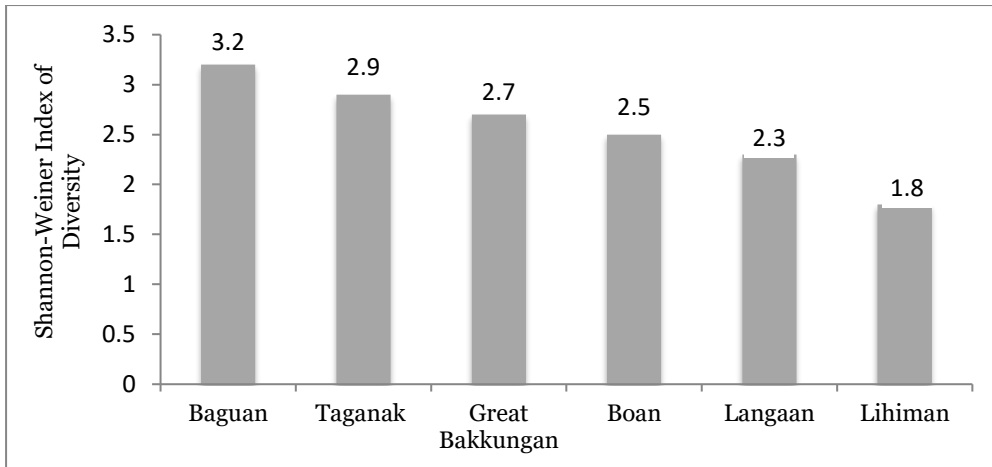


Figure 2. Comparison of species diversity indices (Shannon-Weiner) of all six islands in Turtle Islands Wildlife Sanctuary.

DISCUSSION

Status of the forest habitat

The size of the islands did not appear to influence bird diversity but islands with forest cover recorded more species. Among the six islands, Baguan still retain a substantial beach forest cover. There were small patches of beach forest on Langaan, on steep rock cliffs in Great Bakkungan and surrounding the mud volcanoes in Lihiman. Beach forest on these isolated off-shore islands serve as important habitats for specialized small-island birds e.g. Mantanani Scops Owl and Grey Imperial Pigeon. The increasing scarcity of suitable islands threatens the survival of these species.

The islands of Baguan and Taganak are important habitats for the Vulnerable *D. pickeringii*, the near-threatened *Megapodius cumingii pusillus* (Dillwyn, 1853) and *O.m. mantananensis* as well as terrestrial migratory birds *Lanius tigrinus* (Drapiez, 1828) and *Larvivora cyane* (Pallas, 1776). The islands also recorded species that were affiliated with Bornean avifauna *Aerodramus cf amelis* (Oberholser, 1906) and the *P. moluccensis*. We anticipate that with more surveys (including nocturnal birds), the bird species list is likely to increase particularly during the migratory season.

Based on the current data, priorities should focus on Baguan and Taganak islands for bird monitoring. We also suggest that bio-monitoring should include monitoring of *M.c. pusillus* nests and *O.m. mantananensis*. They are known to prefer to breed in small islands (Lambert 1993; Kennedy et

al. 2000; Sloan 2017). A Biodiversity Assessment and Monitoring System (BAMS) in TIWS should include be conducted within the migratory season but should also include all six islands as sites of this study.

Birds Species Composition and Abundance

In 1997, there were only 30 birds recorded on TIWS (PAMB 2018). It took another 18 years before the list of birds were updated to 58 species (Yu et al. 2016). It should be noted that more bird observations were spent on Baguan and Taganak than the rest of the TIWS islands. The surveys were also conducted off migratory season. These factors introduced bias in our results and we caution readers to take this in consideration when interpreting the information provided.

There were 13 new localities recorded from this survey bringing the total number of birds on TIWS to 71 species (Table 3). At least 21 migratory species recorded in 2015 (Yu et al. 2016) that were not observed during the survey (Table 3). Migrants comprise 37% (26 species) of the total birds in TIWS. Waterbirds on the other hand share 24% (17 species) of the total birds while 13% (10 species) were doves. There were also three species that were not observed during the visit e.g. Oriental Dollarbird *Eurystomus orientalis* (Linnaeus, 1766), Black-headed Munia *Lonchura atricapilla* (Linnaeus, 1766) and Northern Boobok *Ninox japonica* (Temnick & Schlegel, 1844).

Table 3. Checklist of birds in Turtle Islands Wildlife Sanctuary. Note: * means migratory, ^ means new record on TIWS, X means recorded in TIWS and ? means needs further validation. The 1997 records were taken from TIWS (2018) while the 2015 records were lifted from Yu et al. (2016).

Species Name	1997	2015	2017 - 2019
*Lesser Frigatebird <i>Fregata ariel</i>	X	X	X
*^Great Frigatebird <i>Fregata minor</i>			X
White-bellied Sea Eagle <i>Haliaeetus leucogaster</i>	X	X	X
Brahminy Kite <i>Haliastur indus</i>	X	X	X
Peregrine Falcon <i>Falco peregrinus</i>		X	
Striated Heron <i>Butorides striata</i>		X	X
^White-breasted Waterhen <i>Amauornis phoenicurus</i>			X
^Barred Rail <i>Hypotaendea torquatus</i>			X
Red-legged Crake <i>Rallina fasciata</i>		X	
Pacific Reef Egret <i>Egretta sacra</i>	X	X	X
Eastern Cattle Egret <i>Bubulcus ibis</i>		X	X
Little Egret <i>Egretta garzetta</i>		X	
Intermediate Egret <i>Egretta intermedia</i>		X	
*Grey-tailed Tattler <i>Tringa brevipes</i>		X	X
*Common Sandpiper <i>Actitis hypoleucos</i>	X	X	
*^Greater Sand Plover <i>Charadrius leschenaultii</i>			X

Species Name	1997	2015	2017 - 2019
*^Red-necked Phalarope <i>Phalaropus lobatus</i>			X
Black-naped Tern <i>Sterna sumatrana</i>	X		X
*^Whiskered Tern <i>Chlidonias hybrida</i>			X
Bridled Tern <i>Onychoprion anaethetus</i>	X		X
Greater Crested Tern <i>Thalasseus bergii</i>		X	X
*Gull-billed Tern <i>Gelochelidon nilotica</i>		X	
Philippine Megapode <i>Megapodius cumingii</i>	X	X	X
Pink-necked Green Pigeon <i>Treron vernans</i>	X	X	X
^Philippine Green Pigeon <i>Treron axillaris</i>			X
Black-naped Fruit Dove <i>Ptilinopus melanospila</i>			X
Grey Imperial Pigeon <i>Ducula pickeringii</i>	X	X	X
Green Imperial Pigeon <i>Ducula aenea</i>		X	
^Pied Imperial Pigeon <i>Ducula bicolor</i>			X
^Metallic Pigeon <i>Columba vitiensis</i>			X
^Grey-capped Emerald Dove <i>Chalcophaps indica</i>			X
Spotted Dove <i>Spilopelia chinensis</i>	X	X	X
Philippine Collared Dove <i>Streptopelia dussumieri</i>	X		
*Oriental Cuckoo <i>Cuculus optatus</i>		X	X
*Himalayan Cuckoo <i>Cuculus saturatus</i>	X	X	
Asian Koel <i>Eudynamis scolopaceus</i>	X	X	X
*Chestnut-winged Cuckoo <i>Clamator coromandus</i>		X	
Hair-crested Drongo <i>Dicrurus hottentotus</i>		X	
Mantanani Scops Owl <i>Otus mantananensis</i>		X	X
*Northern Boobook <i>Ninox japonica</i>		X	
Collared Kingfisher <i>Todiramphus chloris</i>	X	X	X
*Common Kingfisher <i>Alcedo atthis</i>		X	
^Stork-billed Kingfisher <i>Pelargopsis capensis</i>			X
Sunda Pygmy Woodpecker <i>Picooides moluccensis</i>		X	
Ameline Swiftlet <i>Aerodramus cf amelis</i>		X	X
Oriental Dollarbird <i>Eurystomus orientalis</i>		X	
Golden-bellied Gerygone <i>Gerygone sulphurea</i>	X		X
*Barn Swallow <i>Hirundo rustica</i>	X	X	X
*House Swallow <i>Hirundo javanica</i>	X	X	
Yellow-vented Bulbul <i>Pycnonotus goaivier</i>	X		X
*Arctic Warbler <i>Phylloscopus borealis</i>	X	X	
Philippine Pied Fantail <i>Rhipidura nigritorquis</i>	X		X
*Grey-streaked Flycatcher <i>Muscicapa griseisticta</i>		X	
*Asian Brown Flycatcher <i>Muscicapa dauurica</i>		X	
*Dark-sided Flycatcher <i>Muscicapa sibirica</i>		X	
*Siberian Blue Robin <i>Larivora cyane</i>		X	
*Blue Rock Thrush <i>Monticola solitarius</i>		X	
Mangrove Blue Flycatcher <i>Cyornis rufigastra</i>	X		
Glossy Starling <i>Aplonis panayensis</i>	X	X	X
*Chestnut-cheeked Starling <i>Sturnus philippensis</i>	X	X	
Pied Triller <i>Lalage nigra</i>	X	X	X

Species Name	1997	2015	2017 - 2019
White-breasted Woodswallow <i>Artamus leucorhynchus</i>	X		X
^Black-naped Oriole <i>Oriolus chinensis</i>			X
*Grey wagtail <i>Motacilla cinerea</i>		X	X
*Eastern Yellow Wagtail <i>Motacilla tschutschensis</i>		X	
*Brown shrike <i>Lanius cristatus</i>	X	X	
*Tiger Shrike <i>Lanius tigrinus</i>		X	
Brown-throated Sunbird <i>Anthreptes malacensis</i>		X	X
Olive-backed Sunbird <i>Cinnyris jugularis</i>	X		X
Black-headed Munia <i>Lonchura atricapilla</i>	X	X	X
Eurasian Tree Sparrow <i>Passer montanus</i>	X	X	X
Total number of species	30	49	44
Total number of breeding residents	22	17	34
Total number of migratory birds	8	32	10

The majority of the birds encountered were expected to occur in a wide range of habitats (Kennedy et al. 2000). The *H. torquatus*, *T. chloris* and *Cinnyris jugularis* are considered generalists and survive even in highly modified habitats (Steadman and Freifeld 1998; Kennedy et al. 2000; Sekercioglu 2006; Jakosalem et al. 2019). Rails are also known for their ability to disperse and survive even on remote small islands (Kennedy et al. 2000). We did not encounter birds endemic to the Sulu and Tawi-Tawi archipelago.

The islands support at least 12 frugivorous birds, 10 of which were pigeons. The Vulnerable *D. pickeringgi* was only observed on Baguan. It was frequently encountered feeding on the ripe fruits of *Buchanania* sp. in groups of five to 10 individuals and sometimes flocks with *D. bicolor* and *C. vitiensis*. They appeared to take advantage on the optimal density of *Buchanania* spp., *Antidesma* spp., figs and other fruit trees in the area. We did not observe the species in the other islands but we suspected that the birds were moving across the islands to opportunistically search for fruit. IUCN (2021) reports on the continuing decline of the population and estimated the number of mature individuals from 1,500 to 7,000. Baguan Island is an important site for this Vulnerable small-island specialist.

The Near-threatened *O. m. mantananensis* was distributed on small islets off Borneo and the Philippines (Allen 2020; Kennedy et al. 2000). There have been no previous confirmed records of Mantanani Scops Owl in Turtle Islands (Kennedy et al. 2000). At least two individuals were briefly seen and heard calling on Baguan Island last August 2019. There were at least four subspecies that occur in the country but we could not determine if it was subspecies *sibutuensis* or *mantananensis* occurring in Turtle Islands. Local reports indicated the presence of the bird on Taganak Island but we were not able to validate the record due to the limited time spent on the island.

We observed six adult individuals of the Near-threatened *M.c pusillus* on Baguan on 22-23 August 2019. One individual was seen digging a one-meter deep burrow in one section of a 2 m wide mound (23 August 2019). Three individuals were encountered on separate occasions on Taganak Island (19-20 May 2017). We presumed the bird also occur on the other islands but we only observed breeding mounds on Baguan.

These were also noteworthy records in TIWS. A female Sunda Pygmy Woodpecker *Picoides moluccensis* (Gmelin, 1788) was photographed searching for insects on the main branch of a mango tree on Lihiman Island (Yu et al. 2016). This was the first record of the Sunda Pygmy Woodpecker in the Philippines. The Tiger Shrike *L. tigrinus* and a female Siberian Blue Robin *L. cyane* (Pallas, 1776) were photographed in Baguan while a Chestnut-winged Cuckoo *Clamator coromandus* (Linnaeus, 1776) was observed in Taganak Island (Yu et al. 2016). All three species have been recorded in the Philippines (Allen 2020; Kennedy et al. 2000). The Ameline Swiftlet *A. cf amelis* was first reported on Baguan Island in 2015 (Yu et al. 2016). We have observed one medium-sized individual with a generally light brown coloration and slightly forked tail flying above a cleared section of the beach forest on Baguan Island on 23 August 2019.

The high proportion of migrants (37%) in TIWS illustrate the importance of the islands as stop over points for migrating birds particularly those that are rarely recorded in the country e.g. *L. cyane* and *L. tigrinus*. According to Clarke et al. (2016), the *L. cyane* is a common migrant in the East Asian Australasian flyway and is a winter migrant in the Philippines.

Birds Species Diversity

The high diversity of bird species in Baguan and Taganak islands can be attributed to several factors e.g. presence of a beach forest, island size, disturbance as well as field effort. Bird species composition and abundance are dependent on the overall habitat requirements such as availability of food resources, breeding grounds and protection (Gonzalez et al. 2010; Alviola and Mohagan 2017; Paguntalan et al. 2021). The presence of native trees on beach forest influenced the bird species composition and diversity on Puerco Island (Paguntalan et al. 2021) and may have similar patterns with Baguan Island. The conduct of purposive search in areas where there is still natural vegetation, secondary growth, beach forest, as well as coastal mudflats will likely add new records on each island.

The presence of *D. pickeringii*, *O. m. mantananensis* and *M.c pusillus* raises the importance of the TIWS as refuge to threatened birds found on small islands. These birds are vulnerable to hunting for local pet trade. We observed six households on Boan Island that kept birds as pets. The *H. leucogaster*

(adult and juvenile), Pink-necked Green Pigeon *Treron vernans* (Linnaeus, 1771) (2 individuals), *H. torquatus* (2 individuals) and White-breasted Waterhen *Amaurornis phoenicurus* (Pennant, 1769) (2 individuals) are placed in home-made bamboo cages or shackled with ropes as pets. The conservation management of the TIWS under the Bangsamoro Autonomous Region of Muslim Mindanao (BARMM) should consider conserving forests habitats for restricted-range and forest dependent small island specialists.

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