



AVIFAUNAL SPECIES DIVERSITY AND ABUNDANCE IN THE LAS PINAS–PARANAQUE CRITICAL HABITAT AND ECOTOURISM AREA, 2004–2012

REY MAURICIO T. AGUINALDO¹ and GLENN L. SIA SU^{2*}

¹ Project Manager, Las Pinas–Paranaque Critical Habitat and Ecotourism Area, Department of Environment and Natural Resources-National Capital Region, Quezon City, Philippines.

²Biology Department, University of the Philippines-Manila, Manila, Philippines.

*Corresponding Author: Phone: 6329946626; Email: glss76@yahoo.com

Received: 28th February 2012; Revised: 24th March 2012; Accepted: 30th March 2012

Abstract: Manila Bay is recognized as an important critical habitat for a wide array of inhabitants, which provides numerous benefits to the people depending on its resources. This study aims to assess bird species abundance and diversity in a critical habitat at Manila Bay and was carried out during the months of January and February of 2004–2012. Bird monitoring surveys were consecutively conducted at different point locations during January and February of 2004–2012. Results showed that high species diversity was observed in 2006 ($H = 2.33$) and least species diversity in 2010 ($H = 0.8$). An average of 23 avifaunal species was recorded over the 9-year period. The birds that were commonly observed during this period were endemic (*Anas luzonica*) and migratory (*Himantopus himantopus*) birds. The avifaunal abundance and diversity observed in the critical habitat is a good indicator of the ecosystem revealing the state of the wetland. Continuous monitoring of the wetland should be carried out so as to continuously safeguard the state of the wetland ecosystem.

Keywords: Bird monitoring, wetland, systematics

INTRODUCTION

Wetlands are important and are integral ecosystems providing numerous benefits. Wetlands provide dynamic resources [1] and sources of livelihood to the people who are dependent on these resources [2]. Wetlands are known to harbor a wide array of flora and fauna species, particularly birds that are endemic and migratory. Wetlands also function as

flood control, drought prevention, and water quality protection [3]. Wetlands also play an important role in nutrient cycling [4] and ecological balance.

The Las Pinas–Paranaque Critical Habitat and Ecotourism Area is situated in Manila Bay, as declared on 2007 through the Presidential Proclamation No. 1412 and amended with the Presidential Proclamation No. 1412-A in 2008. The Las Pinas–Paranaque Critical Habitat and Ecotourism Area is one of the important wetland habitats supporting a wide array of dynamic inhabitants. It is recognized as one of the country's remaining wetlands and refuge for endemic and migratory birds, mudflats, and mangrove resources. Through the years, the wetland has been home to several water birds. Several sightings of these water birds have been indicated, but no specific study has explored and assessed the avifaunal diversity and abundance in this particular wetland in the Philippines. The paucity of information on the water birds in the Las Pinas–Paranaque critical area limits our ability to develop conservation measures that will continuously preserve and protect the wetland from further deterioration and possible destruction. This study aims to assess the avifaunal species abundance and diversity in the Las Pinas–Paranaque critical area from 2004 to 2012. Results of this study are valuable, as they serve as baseline information in the development of measures and strategies that will safeguard the wetland from further destruction. Likewise, results of this study will also enable us to be aware of the ecological condition of our environment, as birds are important ecological indicators responsive to changes in the environment [5].

MATERIALS AND METHODS

The Las Pinas–Paranaque Critical Habitat and Ecotourism Area is the study site situated on the southern portion of Manila and is part of the Manila Bay. This critical habitat is bounded by Pasay City on the northeast, Bacoor, Cavite, on the southwest, and Manila Bay on the west. The wetland covers an area of 175 ha encompassing two islands, the Long Island and the Freedom Island, mangrove areas, and mudflat areas. The Long Island is situated at the southwest portion of the Las Pinas–Paranaque Critical Habitat and Ecotourism Area in Paranaque City, whereas the Freedom Island is at the northeast part, under the jurisdiction of Las Pinas City. Both islands are situated along the coastal areas of the communities of La Huerta and San Dionisio of Paranaque City and in four communities of Las Pinas City. The mangrove areas cover an area of 29 ha, whereas the mudflat areas cover an area of 114 ha. The Freedom Island and the Long Island cover an estimated area of 32 ha. The study area is located within the 120°58'12"E to 120°59'20"E longitude and 14°28'30"N to 14°30'15"N latitude. The presence and abundance of the water birds in the Las Pinas–Paranaque wetland were estimated every breeding season once in each year, between the months of January and February of 2004–2012, using the water bird count field method [6] at established fixed point stations. There were six established fixed point stations (Table 1 and Figure 1), and the fixed stations at distance sampling allowed the researchers to estimate the abundance of the water birds.

Table 1: Fixed point stations and actual coordinates of the study site

Fixed Point Stations	Coordinates
1	14°30'0.14"N and 120°59'19.9"E
2	14°29'30.1"N and 120°58'59.1"E
3	14°29'24.1"N and 120°58'51.0"E
4	14°29'30.7"N and 120°58'54.6"E
5	14°29'07.2"N and 120°58'24.0"E
6	14°29'51.8"N and 120°58'55.9"E

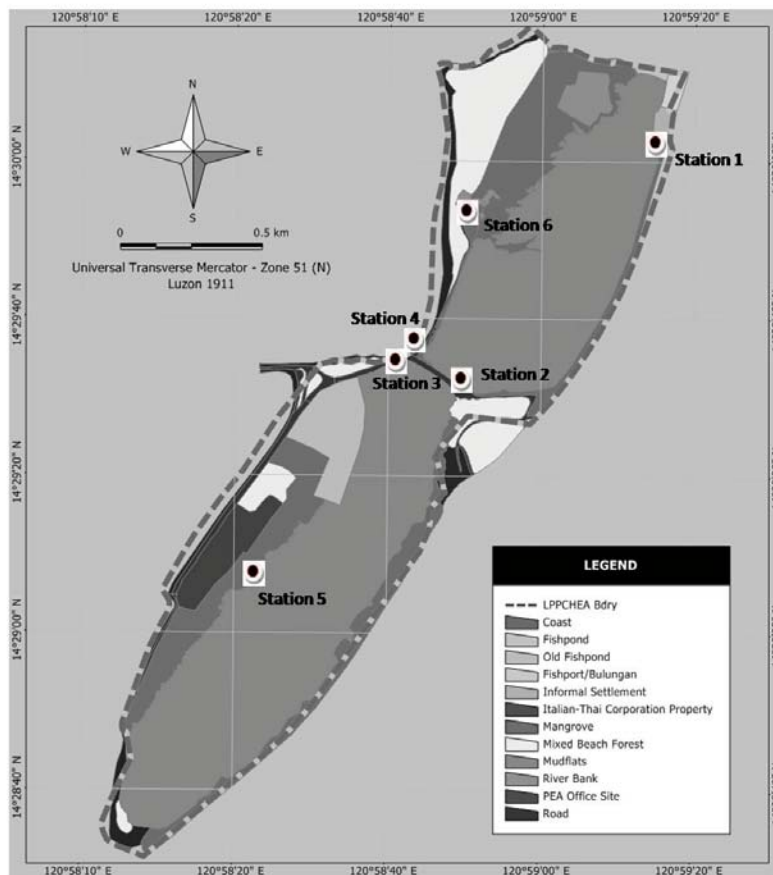


Fig. 1: Study area and bird survey stations in Las Pinas–Paranaque critical habitat and ecotourism area, Philippines

Along each fixed point station, we simultaneously estimated the number of individuals, pairs, or flocks of each species that we detected using binoculars with a magnification of 50 × 20 and a spotting scope (Nikon, Japan) with a magnification of 20×. Birds were counted as they were seen and were also recorded and identified using a field guide [7]. The survey was done early in the morning from 05:30 to 09:30 h. The detection of birds within each fixed point station was done for 10 min. The 10-min count enabled the researchers to sufficiently record the individuals with minimal effort and disturbance [8]. During each survey, all bird species and individuals seen from the point station were estimated. The species diversity (H) through the Shannon Wiener Index was calculated using the information on each individual of each species per year. The species evenness ($H/H_{\max}$) was also determined.

RESULTS AND DISCUSSION

We recorded an average of 23 bird species and an average of 3405 individual birds in the critical habitat for the years 2004–2012. Table 2 shows the avifaunal species diversity and abundance from 2004 to 2012. The highest species diversity index of 2.33 and the highest species evenness of 0.78 were recorded in 2006, whereas the lowest species diversity index of 0.8 and the lowest species evenness of 0.27 were recorded in 2010. The highest bird species abundance was observed in 2010 with a total of 5003 birds recorded, and least species abundance in 2006 with a total of 1625 birds recorded.

Table 2: Avifaunal species diversity and abundance in Las Pinas–Paranaque Critical Habitat and Ecotourism Area, 2004–2012

Year	No. of Species (S)	Abundance (No. of individuals)	Shannon–Wiener Index (H)	Evenness ($H/H_{\max}$)
2004	27	4707	2.00	0.61
2005	27	2083	2.19	0.66
2006	20	1625	2.33	0.78
2007	27	2822	2.05	0.62
2008	27	3682	1.87	0.57
2009	20	2954	1.74	0.58
2010	19	5003	0.80	0.27
2011	24	3368	1.64	0.52
2012	20	4402	1.47	0.49

$$H_{\max} = \ln(S).$$

Most of the bird species (72.34%) recorded in the critical habitat is classified as migrants. The endemic Philippine Duck (*Anas luzonica*) was likewise commonly found in the study area, particularly in ponds situated in the Freedom Island of the Las Pinas–Paranaque Critical Habitat and Ecotourism Area. While the rest of the bird species (25.53%) recorded were classified as residents. The Philippine Duck (*Anas luzonica*) and the Chinese Egret (*Egretta eulophotes*) were identified as vulnerable species based on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) listing. As of 2004 and 2012, the Whiskered Tern (*Chlidonias hybridus*) was the most common bird recorded (38% and 51.5%, respectively). As of 2005, the Kentish Plover (*Charadrius dubius*) was the most common bird recorded (29.4%). As of 2006, the Redshank (*Tringa tetanus*) was the most common bird recorded (24.2%). While for the years 2007–2011, the Black-winged Stilt (*Himantopus himantopus*) was the most commonly recorded bird (37%, 32%, 43%, 83%, and 46%, respectively). Over the years (2004–2012), the 10 most abundant individual water bird species recorded were the Black-winged Stilt ($n = 9960$), Whiskered Tern ($n = 7024$), Kentish Plover ($n = 1974$), Marsh Sandpiper ($n = 1540$), Greenshank ($n = 1414$), Redshank ($n = 1369$), Little Egret ($n = 1994$), Sandpiper sp. ($n = 1087$), Great Egret ($n = 662$), and Black-crowned Night Heron ($n = 437$). Table 3 shows all the recorded bird species in critical habitat.

The most important result in this study is the documentation of avifaunal species in the Las Pinas–Paranaque Critical Habitat and Ecotourism Area. A previous study [2] has shown that there were a wide array of fishes and macroinvertebrates attracting these birds to feed in the area. The majority of the wetland birds observed during this study were the migratory, resident, and endemic birds. The occurrence of the migratory birds in the area indicates that the critical habitat is important for the organisms. Likewise, the occurrence of these birds in the area suggests that the area provides a favorable condition for the bird's breeding, feeding, and nesting. Despite the variations in species diversity and abundance observed over the 9-year period, no significant differences were observed. It is likely that the variations observed in the study area may be because of a number of factors that may have influenced the migratory timing of the birds. Studies have shown that birds migrate to different areas because of seasonal changes [9], availability of food [10], and threat of predation [11].

Table 3: Avifaunal species recorded in the Las Pinas–Paranaque critical habitat, Manila Bay, 2004–2012

Common Name	Scientific Name	Total Individuals Observed over the Duration of 2004–2012
Little Grebe	<i>Tachybaptus ruficollis</i>	5
Yellow Bittern	<i>Ixobrychus sinensis</i>	27
Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	1
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	413
Rufous Night Heron	<i>Nycticorax caledonicus</i>	9
Striated Heron	<i>Butorides striata</i>	61
Chinese or Swinhoe's Egret	<i>Egretta eulophotes</i>	2
Little Egret	<i>Egretta garzetta</i>	1093
Intermediate Egret	<i>Egretta intermedia</i>	152
Great Egret	<i>Ardea alba</i>	449
Purple Heron	<i>Ardea purpurea</i>	5
Grey Heron	<i>Ardea cinerea</i>	384
Unidentified Herons and Egrets	Family Ardeidae	20
Common Kingfisher	<i>Alcedo atthis</i>	15
White-collared Kingfisher	<i>Halcyon chloris</i>	26
Philippine Duck	<i>Anas luzonica</i>	250
Banded Rail	<i>Rallus philippensis</i>	2
Barred Rail	<i>Rallus torquatus</i>	40
White-browed Crane	<i>Poliolimnas cinerea</i>	3
White-breasted Waterhen	<i>Amauornis phoenicurus</i>	12
Moorhen	<i>Gallinula chloropus</i>	58
Black-winged Stilt	<i>Himantopus himantopus</i>	9295
Avocet	<i>Recurvirostra avosetta</i>	1
Asiatic (Pacific) Golden Plover	<i>Pluvialis fulva</i>	425
Grey Plover	<i>Pluvialis squatarola</i>	14
Little-ringed Plover	<i>Charadrius dubius</i>	427
Kentish Plover	<i>Charadrius alexandrinus</i>	1939
Mongolian Plover	<i>Charadrius mongolus</i>	74
Redshank	<i>Tringa totanus</i>	1362
Marsh Sandpiper	<i>Tringa stagnatilis</i>	1540
Greenshank	<i>Tringa nebularia</i>	1387
Wood Sandpiper	<i>Tringa glareola</i>	31
Common Sandpiper	<i>Actitis hypoleucos</i>	87
Grey-tailed Tattler	<i>Heteroscelus brevipes</i>	4
Sanderling	<i>Calidris alba</i>	22
Red-necked Stint	<i>Calidris ruficollis</i>	222
Long-toed Stint	<i>Calidris subminuta</i>	57
Sandpiper species	Family Scolopacidae	1087
Shorebird/Waterbirds species	Order Charadriiformes	150
Unidentified Shorebirds	Order Charadriiformes	321
Black-headed Gull	<i>Larus ridibundus</i>	10
Whiskered Tern	<i>Chlidonias hybridus</i>	4757
Little Tern	<i>Sternula albifrons</i>	1
Osprey	<i>Pandion haliaetus</i>	1
Brahminy Kite	<i>Haliastur Indus</i>	1
Peregrine Falcon	<i>Falco peregrines</i>	1
Barn Swallow	<i>Hirundo rustica</i>	2

CONCLUSION

The results of this study have established that, through the years, the Las Pinas–Paranaque wetland harbors a sizeable number of bird species. The presence of the wetland birds has been found to be a good indicator on the state of the wetland ecosystem. Continuous monitoring of the wetland is recommended as this would continuously safeguard the wetland ecosystem from future destruction.

Acknowledgment: We express our sincerest gratitude to all who have assisted us in the course of this study.

References

1. Capers, R. S. 2003. Six years of submerged plant community dynamics in a freshwater tidal wetland. *Freshwater Biology* 48:1640–1651.
2. Sia Su, G. L., Martillano, K., Alcantara, T., Ragragio, E., De Jesus, J., Hallare, A. and Ramos, G. 2009. Assessing heavy metals in the waters, fish and macroinvertebrates in Manila Bay Bay, Philippines. *Journal of Applied Sciences in Environmental Sanitation* 4(3):187–195.
3. Mitsch, W. J. & Gosselink, J. G. 2000. The values of wetlands: importance of scale and landscape setting. *Ecological Economics* 35:25–33.
4. Noe, G. B., Scinto, L. J., Taylor, J., Childers, D. L. and Jones, R. D. 2003. Phosphorous cycling and partitioning in an oligotrophic Everglades wetland ecosystem: a radioisotope tracing study. *Freshwater Biology* 48:1993–2008.
5. Canterbury, G. E., Martin, T. E., Petit, D. R., Petit, L. J. and Bradford, D. F. 2000. Bird communities and habitat as ecological indicators of forest condition in Regional monitoring. *Conservation Biology* 14:544–558.
6. Howes, J. and Bakewell, D. 1989. *Shorebird studies manual*. AWB Publication No. 55. Kuala Lumpur, Malaysia.
7. Kennedy, R. S., Gonzales, P. C., Dickinson E. C., Miranda, JR., H. C. & Fisher, T. H. 2000. *A guide to the birds of the Philippines*. Oxford University Press Inc., New York.
8. Lee, D. C. and Marsden, S. J. 2008. Adjusting count period strategies to improve the accuracy of forest bird abundance estimates from point transect distance sampling surveys. *Ibis* 150:315–325.
9. Telleria, J. L., Perez-Tris, J. & Carbonell, R. 2001. Seasonal changes in abundance and flight-related morphology reveal different migratory patterns in Iberian Forest Passerines. *Ardeola* 48(1):27–46.
10. Miller, J. R., Wiens, J. A., Thompson Hobbs, N. & Theobald, D. M. 2003. Effects of human settlement on bird communities in lowland riparian areas of Colorado (USA). *Ecological Applications* 13(4):1041–1059.
11. Lank, D. B., Butler, R. W., Ireland, J. & Ydenberg, R. C. 2003. Effects of predation danger on migration strategies of sandpipers. *Oikos* 103:303–319.