



# Waterbirds in the Wetlands along the National Highway of the Fifth District of the Province of Iloilo, Philippines

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## ABSTRACT

This study was conducted between November 2021 and January 2022, we identified eleven study sites along the National Highway of the Fifth District of Iloilo, Philippine. This study assesses waterbirds' species composition, abundance and species diversity of the wetlands. The point centre count method was used, and 5,456 individuals were observed and recorded, and Family Ardeidae had the highest number of waterbird species. Little Egret (*Egretta garzetta*) had the highest relative abundance, followed by plumed egret (*Ardea intermedia*). All the waterbird species are listed as the least concern in the Red Data Book (IUCN 2019). Eleven species were recorded and observed during the study period. Shannon's and Simpson's Diversity Index indicated greater variation in species diversity between the results obtained.

**Keywords:** Waterbirds, Wetlands, National Highway, Fifth District of the Province of Iloilo, Philippines

## Introduction

The northern part of Iloilo is famous for the vast scenery of marine and upland ecosystems. These natural resources have become the subject of different researches by government agencies (Tupas, 2020). The Fifth Congressional District of the Province of Iloilo is composed of eleven municipalities, and it is famous for its pristine beaches and ecotourism spots. It lies in the northern part of Panay Island. It is bounded by the Province of Capiz in the western side and the Visayas Sea in the eastern side. The National Highway stretches from Barotac Viejo (11° 1' 10"N 122° 50' 2"E) to Carles (11° 33' 31"N 123° 9' 14"E) and passes on the coast of other municipalities. Travelers and tourists travelling along the highway can and do stop to do bird watching on these species of birds (Figure 1).

Wetlands are very important for avifauna conservation and that the composition, abundance, and diversity of birds can be degraded due to various human activities impacting the wetland ecosystems (Dugan, 1990; Stewart, 2007, Soka et al., 2013). Bird species diversity is therefore a good measure of the stability of the wetland ecosystems (Dugan, 1990; Soka et al., 2013).

Thus, this study was conducted to assess the water birds' species composition, abundance, and species diversity in the wetlands along the National Highway of the Fifth District of Iloilo. Further, it also aimed to identify the water birds' residing status in the International Union for Conservation of Nature (IUCN) Red List.



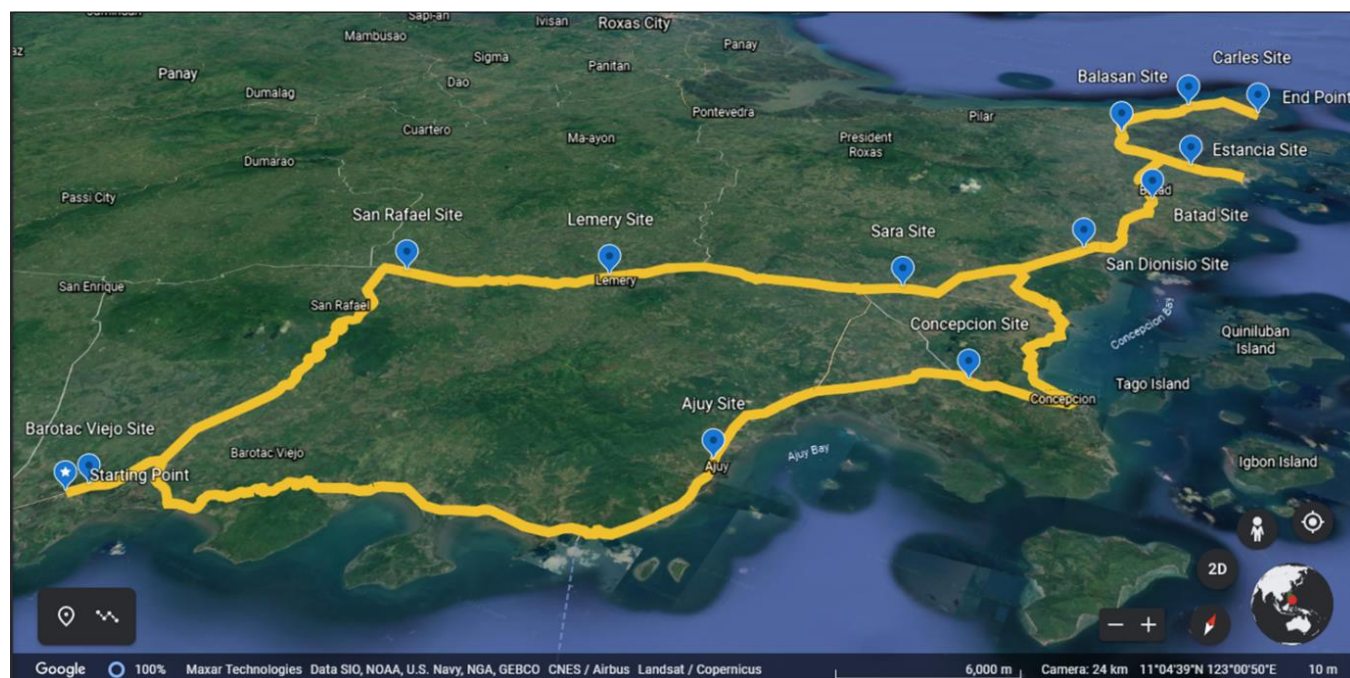


Figure 1: Map of Fifth District with study sites

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Starting Point	Barotac Viejo Site
11° 1' 10"N 122° 50' 2"E	11° 1' 29"N 122° 50' 18"E
Ajuy Site	Concepcion Site
11° 7' 30"N 123° 0' 36"E	11° 12' 38"N 123° 4' 32"E
San Dionisio Site	Sara Site
11° 19' 49"N 123° 5' 38"E	11° 15' 57"N 123° 1' 46"E
Lemery Site	San Rafael Site
11° 12' 56"N 122° 55' 5"E	11° 10' 48"N 122° 50' 19"E
Batad Site	Estancia Site
11° 24' 17"N 123° 6' 51"E	"N 122° 50' 2"E
Balasan Site	Carles Site
11° 29' 28"N 123° 5' 14"E	11° 27' 29"N 123° 7' 33 "E
End Point	
11° 33' 31"N 123° 9' 14"E	

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### Objectives of the Study

Wetlands are among the most productive and fragile ecosystems which deserve special attention due to their biodiversity abundance (Barbier et al., 1997; Tiner, 1999; UNEP-MAP RAC/SPA, 2010; Soka et al., 2013). The primary objective of

this study is to assess waterbirds' species composition, abundance and species diversity in the wetlands along the National Highway of the Fifth District of Iloilo. Further, it also the aimed to check the waterbirds' residing status in the International Union for Conservation of Nature (IUCN) Red List.

## Methodology

This study was conducted in the National Highway of the Fifth District of Iloilo (Figure 1) which is situated in the northern part of Panay Island (11° 1' 10"N 122° 50' 2"E to 11° 33' 31"N 123° 9' 14"E with total length –110.54 km). Data were collected using the point center count method. This method is carried out by constructing a circular plot of 50 m in a particular site, then the observer stands at the center of the circular plot and the birds seen in every direction are counted (except birds in flight) ([Biodiversity Assessment at GAIL Gandhar Complex, 2016](#)). Most of the surveys, on the wetland's waterbirds, were conducted between November 2021 to January 2022 using a point center method to extensively survey throughout the wetland area so as to assess the waterbirds species and abundance. Eleven study sites were established along the national highway with identified wetlands. In each site, an observer took pictures of any bird species and recorded their numbers within the area using a camera. In each study site, waterbird observations were carried out twice daily morning between 0800 to 1000h, and in the afternoon between 1400 and 1600h by standing at the center of the circular plot. Waterbirds were counted as bird seen and birds in flight were also recorded.

Further, in this study, the relative abundance of a species was obtained by dividing the abundance of a species by the total abundance of all species combined based on the assumption that the frequently seen the species the more abundant it is ([Bibby et al., 2000](#); [Soka et al., 2013](#)). Waterbird diversity was calculated using both Shannon-Weiner and Simpson's diversity indices. Shannon-Weiner Diversity Index 'H' was calculated using the formula:

$$H' = - \sum_{i=1}^R p_i \ln p_i$$

Where,  $p_i$  = Proportion of individual species and  $R$  = total number of species of the community (number seen and heard).

Simpson's Diversity Index 'D' was calculated using the formula:

$$D = \sum (n_i * (n_i - 1)) / (N * (N - 1)),$$

Where,  $n_i$  — Number of individuals in the  $i$ -th species; and  $N$  — Total number of individuals in the community. The value of  $D$  ranges between 0 and 1. With this index, 1 represents infinite diversity and 0, no diversity.

## Findings and Discussion

### Bird species composition and relative frequency

A total of 5,456 individuals were observed and recorded in the wetlands along the National Highway of the Fifth District of Iloilo (Tables 1). Family Ardeidae had the highest number of waterbird species (four species) followed by Rallidae (three

species). Family Alcidiidae, Charadriidae, Laridae, and Recurvirostridae had only one species each. In terms of overall abundance in eleven sites, Little Egret (*Egretta garzetta*) had the highest relative abundance (27.69%) followed by Plumed egret (*Ardea intermedia*) 25.40%, Black-Naped Tern (*Sterna sumatrana*) 15.13%, Black-Winged Stilt (*Himantopus himantopus*) 13.48%, Lesser Sand-Plover (*Charadrius mongolus*) 11.54%, Javan Pond Heron (*Ardeola speciosa*) 5.99%, Collared Kingfisher (*Halcyon chloris*) and Purple Heron (*Ardea purpurea*) 0.18%, White Browed Crake (*Amaurornis cinerea*) 0.15%, and Common Moorhen (*Gallinula chloropus*) and Barred Rail (*Gallirallus torquatus*), 0.09%. It was observed that the wetlands attracted many waterbird species to roost, forage and nest in the area. The wetland could have more bird species if intentional measures are taken to manage the area from anthropogenic activities that threaten the life of avifauna Soka, Munishi and Thomas (2013). All the waterbird species found in the wetlands along the national highway during the study period are listed as least concern in the Red Data Book (IUCN 2019).

Table 1: Waterbird species in the wetlands along the National Highway of the Fifth District of Iloilo

No.	Family	Scientific Name	Common Name	Relative Abundance (%)	IUCN Status 2019
1	Alcidiidae	<i>Halcyon chloris</i>	Collared Kingfisher <sup>1</sup>	0.18	LC
2	Ardeidae	<i>Ardea purpurea</i>	Purple Heron <sup>2</sup>	0.18	LC
3	Ardeidae	<i>Ardeola speciosa</i>	Javan Pond-Heron <sup>3</sup>	5.99	LC
4	Ardeidae	<i>Egretta garzetta</i>	Little Egret <sup>4</sup>	27.69	LC
5	Ardeidae	<i>Ardea intermedia</i>	Plumed Egret <sup>5</sup>	25.40	LC
6	Charadriidae	<i>Charadrius mongolus</i>	Lesser Sand-Plover <sup>6</sup>	11.54	LC
7	Laridae	<i>Sterna sumatrana</i>	Black-Naped Tern <sup>7</sup>	15.13	LC
8	Rallidae	<i>Gallinula chloropus</i>	Common Moorhen <sup>8</sup>	0.09	LC
9	Rallidae	<i>Gallirallus torquatus</i>	Barred Rail <sup>9</sup>	0.09	LC
10	Rallidae	<i>Amaurornis cinerea</i>	White-Browed Crake	0.15	LC
11	Recurvirostridae	<i>Himantopus himantopus</i>	Black-Winged Stilt <sup>10</sup>	13.48	LC

See appendices: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

### Bird species diversity

In total, 11 species were recorded and observed on the wetlands along the National Highway during the study period. Species abundance of different feeding guilds might respond differently to changes in vegetation structure and complexity across tropical ecosystems (Walter et al., 2005; Soka et al., 2013). Shannon's Diversity Index indicate that wetlands had higher

species diversity ( $H' = 2.48$ ). This indicates greater variation in species diversity between the results obtained by using Shannon's and Simpson's diversity indices. This is because Simpson's Diversity Index takes into consideration relative abundance which is not the case for Shannon's Diversity Index. The higher diversity in wetlands may be due to high numbers of individuals in some of waterbird species (11 species had above 5 individuals). Many studies have indicated that water depth affects waterbird diversity (Velasquez 1992; Elphick & Oring 1998; Colwell & Taft 2000; Isola et al. 2002; Darnell & Smith 2004; Datta, 2011). In addition, vegetation cover has been reported to have a strong influence on avifauna diversity (Scott Mills et al., 1989; Radford et al., 2005; Soka et al., 2013).

Table 2: Waterbird species composition, abundance and diversity in the wetlands along the National Highway of the Fifth District of Iloilo.

Parameter	Value
Number of Individuals	5,456
Species Abundance	11
Number of Families	6
Shannon's Diversity Index	2.48
Simpson's Diversity Index	0.19

### Bird species dominance

Dominance results when one or several species control the environment and conditions that influence associated species (Soka et al., 2013). A total of 11 species were observed and recorded in the wetlands along the national highway. Table 1 revealed 11 bird species dominated the area in terms of relative abundance. It was revealed that Little Egret (*Egretta garzetta*) was the most dominant (27.69%) followed by Plumed egret (*Ardea intermedia*) 25.40%, Black-Naped Tern (*Sterna sumatrana*) 15.13%, Black-Winged Stilt (*Himantopus himantopus*) 13.48%, Lesser Sand-Plover (*Charadius mongolus*) 11.54%, Javan Pond Heron (*Ardeola speciosa*) 5.99% while the remaining species of bird had less than 1% (Table 1). Simpson's Diversity Index was 0.19. The Simpson's Diversity in Table 2 indicates a dominant composition of a few species of waterbirds.

The dominance of these species could be contributed by the presence favourable habitats in the wetlands. The availability of food makes some birds with a feeding guild of a highly abundant food to dominate the area (Welsh, 1987; Soka et al., 2013).

## Conclusion

The study was conducted to assess the waterbirds species composition, abundance, and species diversity in the wetlands along the National Highway of the fifth district of Iloilo. Family Ardeidae had the highest number of waterbird species followed by Rallidae, Alcedinidae, Charadriidae, Laridae, and Recurvirostridae. *E. garzetta* had the highest relative abundance followed by *A. intermedia*. The high relative abundance of waterbirds could be attributed to the high frequency of occurrence by some of the waterbirds in different sites. *E. garzetta* had the highest species diversity followed by *A. intermedia*. It can be stated that wetlands are very important to bird communities especially waterbirds. Improving ecological diversity benefits species survival and is an important indicator of well-being of humans (Luck et al., 2011). As the national highway is the gateway to beautiful beaches in the north of the Province of Iloilo, it serves as the best place for bird watching while travelling.



## Recommendations

1. Based on the conclusions drawn from the findings of this study, the following are the recommendations:
2. Reduction of activities that displace and threaten the life waterbird species could increase composition, abundance, and diversity.
3. Wetland habitats must be protected from destruction, to maintain the feeding guilds of wetland birds.
4. Parallel studies should be conducted to consider other factors such as time of the year and waterbird activities (nocturnal birds) to generate an updated and comprehensive list of waterbird species diversity.
5. Studies may be conducted on increasing the population of the non-dominant bird species.
6. Introduction of different waterbird species from other regions may increase diversity, subject to proper selection and monitoring.

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**APPENDICES**



1: Collared Kingfisher<sub>1</sub> (*Halcyon chloris*)



2: Purple Heron<sub>2</sub> (*Ardea purpurea*)



3: Javan Pond-Heron<sub>3</sub> (*Ardeola speciosa*)



4: Little Egret<sub>4</sub> (*Egretta garzetta*)





5: Plumed Egret<sup>5</sup> (*Ardea intermedia*)



6: Lesser Sand-Plover<sup>6</sup> (*Charadrius mongolus*)



7: Black-Naped Tern<sup>7</sup> (*Sterna sumatrana*)



8: Common Moorhen<sup>8</sup> (*Gallinula chloropus*)



9: Barred Rail<sup>9</sup> (*Gallirallus torquatus*)



10: Black-Winged Stilt<sup>10</sup> (*Himantopus himantopus*)