

Waterbirds in the Wetlands of Casiguran, Aurora, Philippines

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Abstract

The wetlands of Casiguran, Aurora, Philippines are primarily the source of livelihood for most of the coastal communities of the area. However, this also serves as a feeding ground for many of the migratory and resident waterbirds. There are waterbird species occurring in the area that need protection but only a few studies of these species exist. This study was conducted from February to March 2019 to census and identify the water birds present in the study site, determine the conservation status and index of abundance of identified waterbirds, and describe their habitat association. Based on the result, 18 waterbird species in five families were present in the area. Family Ardeidae had six representative species, Family Charadriidae had five representative species, Family Scolopacidae had five representative species while only one species represents the Family Anatidae and Family Rallidae. Two waterbird species observed (*Anas luzonica* and *Egretta eulophotes*) were listed by the International Union for Conservation of Nature (IUCN) as vulnerable and another species (*Numerius madagascariensis*) was listed as endangered. In terms of abundance, Intermediate Egret (*Egretta intermedia*) was revealed as the most abundant (94.68%) among waterbirds. Different waterbird species prefer specific habitats. Some usually frequent freshwater and saltwater habitats, including mangroves, open sea, and watercourses inside forests while some were observed in mudflats, and rice fields during the survey.

Keywords

Waterbirds, Wetlands, Conservation Status, Abundance, Habitat Association

1. Introduction

Waterbirds live on or around water. Some of these birds are more terrestrial while others are more aquatic. Their adaptations will vary depending on their environment. Waterbirds play key functional roles in many aquatic ecosystems,

including predators, herbivores, vectors of seeds, invertebrates, and nutrients, although these roles have often been overlooked. Waterbirds can maintain the diversity of other organisms, control pests, be effective bioindicators of ecological conditions, and act as sentinels of potential disease outbreaks. They also provide important provisioning (meat, feather, egg, etc.) and cultural services to both indigenous and Westernized societies [1].

For the purposes of the International Waterbird Census (IWC), all species in the following thirty-three (33) families are considered by Wetlands International to be waterbirds: *Gaviidae*, *Podicipedidae*, *Pelecanidae*, *Phalacrocoracidae*, *Anhingidae*, *Ardeidae*, *Scopidae*, *Ciconiidae*, *Balaenicipitidae*, *Threskiornithidae*, *Phoenicopteridae*, *Anhimidae*, *Anatidae*, *Gruidae*, *Aramidae*, *Rallidae*, *Helionithidae*, *Eurypygidae*, *Jacanidae*, *Rostratulidae*, *Dromadidae*, *Haematopodidae*, *Recurvirostridae*, *Burhinidae*, *Glareolidae*, *Charadriidae*, *Scolopacidae*, *Pedionomidae*, *Thinocoridae*, *Laridae*, *Sternidae*, and *Rynchopidae*. Only a few wetland birds are excluded by considering entire families in this way. Conversely, the inclusion of whole families results in the waterbird list containing a few non-wetland species such as some coursers and thick knees. These rather minor anomalies are thought to be outweighed by the convenience of a whole-family approach to the definition of the term “waterbird” and considering the complications that arise from applying the definition rigidly to every species. The Ramsar Convention on Wetlands recently widened its approach to include more families traditionally regarded as seabirds, as well as certain raptors and passerines, and it is possible that a small number of additions will be made in the coming years to the families and species included in the IEC [2].

The wetlands of Casiguran are primarily the source of livelihood for most of the coastal communities of the area, however, this also serves as a feeding ground for many of the migratory and resident waterbirds. There are waterbird species occurring in the area that need protection but only a few studies of these species exist. This study would therefore provide a database for the future management regimes of the waterbirds in the wetlands. This paper, therefore, is aimed to census and identify the waterbirds present in the study site, determine the conservation status and index of abundance of identified waterbirds, and describe their habitat association.

2. Materials and Methods

2.1. Data Gathering Instruments

The following instruments were used for the conduct of the study: guide/reference books for proper identification of the waterbirds, a digital single-lense reflex (DLSR) camera with a 600 mm zoom lens used to capture good photographs of the waterbirds for the identification process, tripod as a base of the camera and binoculars to avoid blurring of the photos, binoculars to locate the waterbirds in the areas, a global positioning system (GPS) to record the coordinates of the waterbirds for mapping purposes, and record book to list down relevant informa-

tion in the conduct of the study.

2.2. Location of the Study Site

The study was conducted from February to March 2019 at the wetlands of the following barangays: Cozo, Calanguasan, Lual, Marikit, and Tinib, Casiguran, Aurora as seen in **Figure 1**. The study site was selected by the researcher considering the area of the wetlands, size of the mudflats and presence of waterbirds in the mentioned Barangays. Furthermore, there are few numbers of study with regard to the waterbirds of these barangays.

2.3. Data Gathering Procedure

Before the conduct of this study, a courtesy call to the barangay Chairperson was done. Upon approval, the researcher hired four residents as guides and porters. The person who is knowledgeable enough about the areas with more knowledge where the birds are found was considered. The identification of the waterbirds was done twice a day, during the early morning (6:00-9:00) and late afternoon (3:00-6:00). The waterbirds were documented using the DSLR camera and binoculars for the later identification process. Waterbirds were identified using

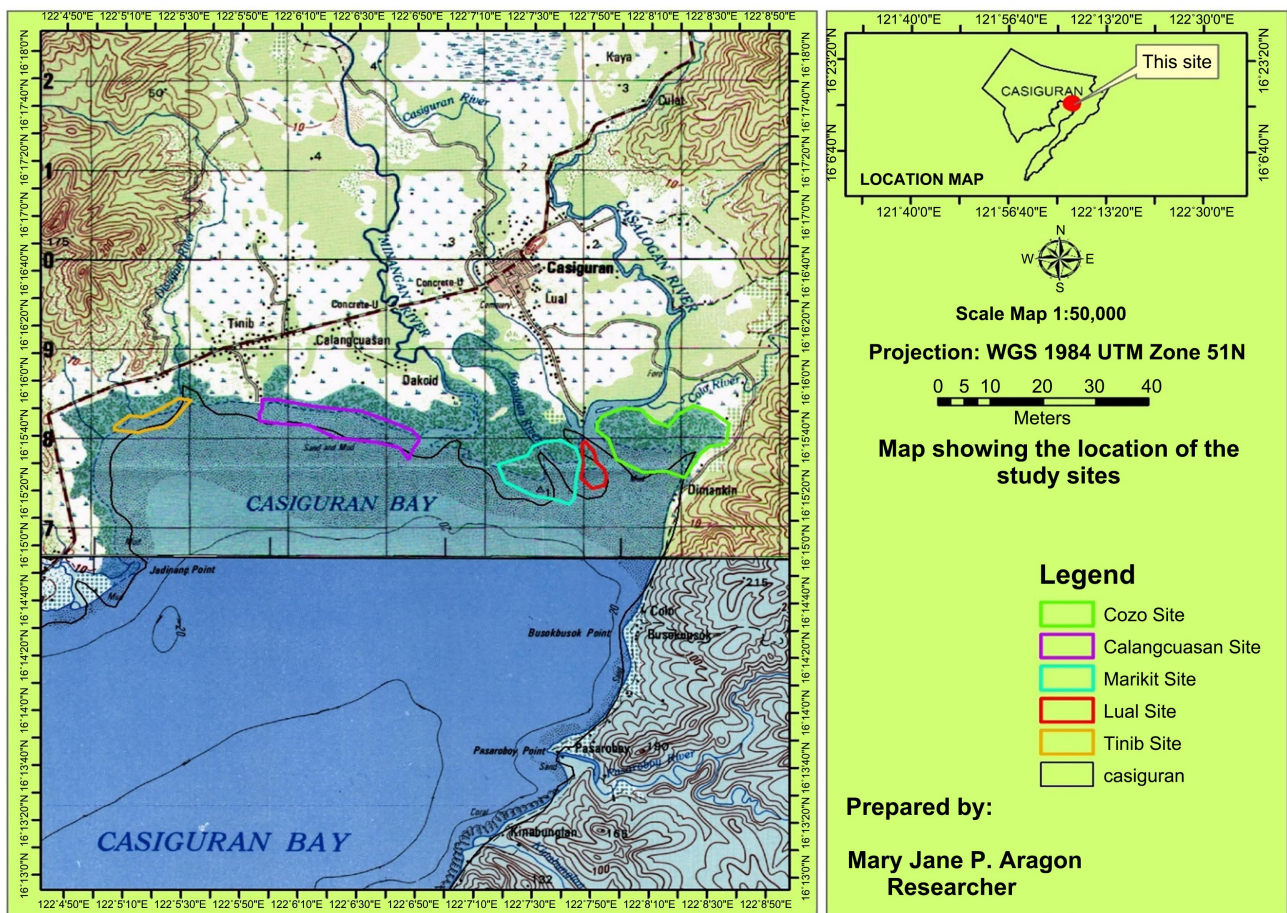


Figure 1. Location of the study site.

guidebooks and for the unfamiliar birds, proper consultation with the experts was done. The researcher conducted reconnaissance in the area where the birds are located to identify the habitat association of each species. Coordinates using GPS were recorded for the mapping of waterbirds distributions.

A complete census of the waterbirds was conducted by means of manual counting. Egrets were counted using the block method. This method involves counting or estimating a “block” of birds within a flock. Depending on the overall flock size, a “block” can be 10, 20, or 50 birds. The “block” is then used as a model to measure the remainder of the flock.

Three members of the team were tasked to count specific species of birds to avoid duplication of counts. Using binoculars, all waterbirds seen within the point of observation (location of the researchers) were documented using DLSR camera with zoom lens to produce a good image for later identification.

The data gathered in this study include the identification of waterbirds in terms of local name, common name, scientific name, and family name; habitat description, threats; and map of their distribution. Complete census of the waterbirds was employed to obtain unbiased estimate of abundance of the species.

2.4. Data Analysis

A total enumeration of the species was gathered within the barangays of Cozo, Calanguasan, Lual, Marikit, and Tinib, Casiguran, Aurora. Relative abundance per species was computed using the formula:

$$\%Ab = \frac{D}{\sum D} \quad (1)$$

where:

D = population density per species;

$\sum D$ = the sum total of all population densities of all species.

3. Results

3.1. Waterbird Species and Their Conservation Status

A total of 18 waterbird species in five families were recorded in Casiguran wetlands (Table 1). Family Ardeidae had six representative species: Chinese Egret (*Egretta eulophotes*), Great Egret (*Egretta alba*), Intermediate Egret (*Egretta intermedia*), Little Egret (*Egretta garzetta*), Grey Heron (*Ardea cinerea*), and Purple Heron (*Ardea purpurea*). The Family Charadriidae had five representative species: Pacific Golden Plover (*Pluvialis fulva*), Greater Sand Plover (*Charadrius leschenaultia*), Grey Plover (*Pluvialis squatarola*), Kentish Plover (*Charadrius alexandrinus*), and Lesser Sand Plover (*Charadrius mongolus*). The Family Scolopacidae had five representative species: Bristle-thighed Curlew (*Numerius tahitiensis*), Common Redshank (*Tringa tetanus*), Common Sandpiper (*Actitis hypoleucos*), Far Eastern Curlew (*Numerius madagacariensis*), and Ruddy Turnstone (*Arenaria interpres*). Only one species represents the Family Anatidae,

Table 1. Waterbird species in Casiguran Wetlands and their conservation status.

Family Name	Common Name	Scientific Name	AM	PM	IUCN Status
Anatidae	Philippine Duck	<i>Anas luzonica</i>	33		VU
Ardeidae	Chinese Egret	<i>Egretta eulophotes</i>	3	3	VU
Ardeidae	Great Egret	<i>Egretta alba</i>	11	4	LC
Ardeidae	Intermediate Egret	<i>Egretta intermedia</i>	14,944	14,904	LC
Ardeidae	Little Egret	<i>Egretta garzetta</i>	260	250	LC
Ardeidae	Grey Heron	<i>Ardea cinerea</i>	1		LC
Ardeidae	Purple Heron	<i>Ardea purpurea</i>	1		LC
Charadriidae	Pacific Golden Plover	<i>Pluvialis fulva</i>	40	33	LC
Charadriidae	Greater Sand Plover	<i>Charandrius leschenaultii</i>	57	48	LC
Charadriidae	Grey Plover	<i>Pluvialis squatarola</i>	31	37	LC
Charadriidae	Kentish Plover	<i>Charandrius alexandrinus</i>	236	131	LC
Charadriidae	Lesser Sand Plover	<i>Charandrius mongolus</i>	192	166	LC
Rallidae	White-Browed Crake	<i>Porzana cinerea</i>	1		LC
Scolopacidae	Bristle-thighed Curlew	<i>Numerius tahitiensis</i>	22	10	LC
Scolopacidae	Common Redshank	<i>Tringa totanus</i>	5		LC
Scolopacidae	Common Sandpiper	<i>Actitis hypoleucos</i>	41	47	LC
Scolopacidae	Far Eastern Curlew	<i>Numerius madagascariensis</i>	8		EN
Scolopacidae	Ruddy Turnstone	<i>Arenaria interpres</i>	5		LC

The standard IUCN Red List Categories (2017) are used as follows: Extinct (EX), Ex-tinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD), and Not Evaluated (NE).

the Philippine Duck (*Anas luzonica*). Similarly, Family Rallidae is also represented by a single species which is the White-Browed Crake (*Porzana cinerea*).

3.2. Species Relative Abundance

Table 2 revealed Intermediate Egret (*Egretta intermedia*) to be the most abundant (94.68%) waterbirds. This was followed by Little Egret (*Egretta garzetta*), Kentish Plover (*Charandrius alexandrinus*), Lesser Sand Plover (*Charandrius mongolus*), Greater Sand Plover (*Charandrius leschenaultia*) with a relative abundance of 1.62%, 1.16%, 1.14%, and 0.33%, respectively.

3.3. Habitat Description of Waterbirds

Table 3 showed the habitat description of identified waterbirds in the study site. Philippine Duck (*Anas luzonica*) and White-Browed Crake (*Porzana cinerea*) were observed in coastal marshes. The Chinese Egret (*Egretta eulophotes*), Great Egret (*Egretta alba*), Intermediate Egret (*Egretta intermedia*), Little Egret (*Egretta garzetta*), and Grey Heron (*Ardea cinerea*) were observed in mangrove forest, mudflats, and rice fields during the survey. These migratory birds usually forage

Table 2. Species relative abundance.

Common Name	Scientific Name	Relative Abundance
Philippine Duck	<i>Anas luzonica</i>	0.104682147
Chinese Egret	<i>Egretta eulophotes</i>	0.019033118
Great Egret	<i>Egretta alba</i>	0.047582794
Intermediate Egret	<i>Egretta intermedia</i>	94.68341581
Little Egret	<i>Egretta garzetta</i>	1.617814998
Grey Heron	<i>Ardea cinerea</i>	0.003172186
Purple Heron	<i>Ardea purpurea</i>	0.003172186
Asian Golden Plover	<i>Pluvialis fulva</i>	0.231569598
Greater Sand Plover	<i>Charandrius leschenaultii</i>	0.333079558
Grey Plover	<i>Pluvialis squatarola</i>	0.215708666
Kentish Plover	<i>Charandrius alexandrinus</i>	1.164192361
Lesser Sand Plover	<i>Charandrius mongolus</i>	1.135642685
White-Browed Crake	<i>Porzana cinerea</i>	0.003172186
Bristle-thighed Curlew	<i>Numerius tahitiensis</i>	0.101509961
Common Redshank	<i>Tringa totanus</i>	0.101509961
Common Sandpiper	<i>Actitis hypoleucos</i>	0.279152392
Far Eastern Curlew	<i>Numerius madagascariensis</i>	0.02537749
Ruddy Turnstone	<i>Arenaria interpres</i>	0.015860931
Total		100

Table 3. Habitat description of waterbirds.

Common Name	Scientific Name	Habitat Description
Philippine Duck	<i>Anas luzonica</i>	This bird species was observed in two sites (Marikit and Cozo). In Marikit, the area is a shallow coastal mangrove with a large sandy to a muddy substrate. The middle part has deep mud and silt. This area is dominated by <i>Scyphiphora hydrophyllacea</i> . In Cozo, the mangrove forest is located near the foot of Cozo mountain. The principal vegetation is <i>Avicennia marina</i> in the seaward most associated with <i>Rhizophora apiculata</i> , <i>Bruguiera parviflora</i> , and <i>Bruguiera gymnorrhiza</i> .
Chinese Egret	<i>Egretta eulophotes</i>	The site where these bird species were observed was muddy to sandy mudflat. Mangrove plants are scattered on the edge of the river extending to the foreshore of Casiguran Bay. Some parts of the mangrove area have been converted to artificial fishponds.
Great Egret	<i>Egretta alba</i>	
Intermediate Egret	<i>Egretta intermedia</i>	
Little Egret	<i>Egretta garzetta</i>	
Grey Heron	<i>Ardea cinerea</i>	
Purple Heron	<i>Ardea purpurea</i>	
Pacific Golden Plover	<i>Pluvialis fulva</i>	The area is generally an estuarine mangrove where a small deep mudflat occurs on both sides of the river. The coastal mangrove has an extensive muddy, sandy, and rocky substrate. The muddy mangrove emerges during low tide which favors the waterbirds.
Greater Sand Plover	<i>Charandrius leschenaultii</i>	
Grey Plover	<i>Pluvialis squatarola</i>	

Continued

Kentish Plover	<i>Charandrius alexandrinus</i>	
Lesser Sand Plover	<i>Charandrius mongolus</i>	
Bristle-thighed Curlew	<i>Numerius minutus</i>	The area is generally an estuarine mangrove where a small deep mudflat occurs on both sides of the river. Associated mangrove species and plant associates are distributed from the mouth of the river extending to the upper reaches of the river. Muddy to sandy flats can be found that favor the occurrence of <i>Avicennia marina</i> , <i>A. lanata</i> , and <i>Sonneratia alba</i> .
Common Sandpiper	<i>Actitis hypoleucos</i>	
Ruddy Turnstone	<i>Arenaria interpres</i>	

in open situations in marshes, ponds, shores, and mudflats. The Pacific Golden Plover (*Pluvialis fulva*), Greater Sand Plover (*Charandrius leschenaultia*), Grey Plover (*Pluvialis squatarola*), Kentish Plover (*Charandrius alexandrinus*), Lesser Sand Plover (*Charandrius mongolus*), Bristle-Thighed Curlew (*Numerius tahitiensis*), Common Redshank (*Tringa tetanus*), Common Sandpiper (*Actitis hypoleucos*), Far Eastern Curlew (*Numerius madagascariensis*), and Ruddy Turnstone (*Arenaria interpres*) were observed in exposed mudflats in all study sites.

4. Discussion

In this study, two waterbird species observed (*Anas luzonica* and *Egretta eulophotes*) were listed by the International Union for Conservation of Nature (IUCN) as vulnerable [3]. This species, *Egretta eulophotes*, was first recorded in mainland northern Luzon [4] in 2002 in the wetlands of Cagayan Valley. Another species, *Numerius madagascariensis*, was listed as endangered. These results are not uncommon since even in Manila Bay, the 90 species of waterbirds present in that area include species threatened with global extinction [5]. In addition, although the rest of the waterbird species observed in the study site were classified by IUCN as of least concern, this still means that these species need conservation efforts to protect their habitat and yet, there is no official protected status of Casiguran wetlands. According to BirdLife International in their publication titled “Philippine Wetlands” [6], large areas of natural freshwater wetland in the Philippines have been converted for cultivation, either through drainage or wet agriculture. The coastal wetlands have been greatly affected by conversion for aquaculture and cutting of mangroves for firewood, with the area of mangroves estimated to have declined by 67% in the past 60 years. This loss of habitat is one of the main reasons for the decline and extinction of waterbird populations, but hunting and human disturbance are also likely to have been important factors.

In terms of habitat, the White-Browed Crake (*Porzana cinerea*) species usually frequents freshwater and saltwater habitats, including mangroves, open sea, and watercourses inside forests [6]. The presence of waterbirds in this study could be attributed to the abundance of food availability in the area. Waterbirds are known to feed on bivalves and gastropods, aside from fish, which are abundant in the study sites [7] [8] [9]. Similarly, in Talabong Mangrove Forest in Bais City, Negros Oriental, Philippines, migratory birds showed a higher presence in the intertidal area since most of them are waders [10]. It is also noted that many

of the waterbirds occurring in the ASEAN region are migratory [2]. A resident waterbird species, Purple Heron (*Ardea purpurea*) was observed in mudflats and rice fields where egrets were found. The presence of waterbirds in specific habitats in this study is related to a study that used canonical correspondence analysis (CCA) where waterbirds were divided into four categories based on their habitat preference: synanthropic (wintering gulls), special habitat (shorebirds), semi-natural (wintering coots and ducks and disturbance-tolerant (resident) species [11].

5. Conclusion

Based on the results, the following conclusions are drawn: Casiguran wetlands are home to 18 waterbird species in five families: Family Ardeidae had six representative species, Family Charadriidae had five representative species, Family Scolopacidae had five representative species, only a single species represents the Family Anatidae and Family Rallidae; two waterbird species, *Anas luzonica*, and *Egretta eulophotes* were listed by the International Union for Conservation of Nature (IUCN) as vulnerable while *Numerius madagascariensis* was listed as endangered indicating that these species need conservation effort by protecting their habitat; and as habitat, *Anas luzonica* and *Porzana cinerea* can be observed in coastal marshes, *Egretta eulophotes*, *Egretta alba*, *Egretta intermedia*, *Egretta garzetta*, and *Ardea cinerea* can be observed in mangrove forest, mudflats, and rice fields while a resident waterbird species, *Ardea purpurea* can also be observed in mudflats and rice fields.

Recommendations

Based on the result of the study, the following are recommended: Casiguran wetlands as a home to a variety of waterbirds may be given conservation priority action through the formulation of a conservation management plan while considering the resource utilization of mangrove forest for agricultural purposes as well as the livelihood of the people in need; habitat conservation could be prioritized in areas where vulnerable and endangered species were observed since these habitats are considered as a temporary home and breeding grounds for the waterbirds species during migration; a management zonation with strict protection and multiple use zones can be designated in the wetland areas where different waterbirds were found so that these areas will remain to serve as their habitats, and a year round census and observation could be done to cover all species in the area

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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