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Studies on Biodiversity of Nycticorax Nycticorax- Linnaeus, 1758 At Manchar Lake, Sindh, Pakistan

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Abstract

The lake manchar is considered as one of the largest freshwater lakes in Pakistan, it's located in district of Jamshoro. This wetland plays a substantial role in providing habitats to variety of resident and migratory birds. It provides shelter to the vast biodiversity that has daily and seasonal dependencies for all the life-support systems. Birds use this lake for drinking water, breeding, rearing young ones and social interactions. Meanwhile, birds play important role in balancing the ecosystem and food web of the ecosystem by conserving maintainable population levels of prey and predator species, and after death provide food to scavengers as well as decomposers. Birds are best pollinators, help in plant production through their services as pollinators or seed dispersers and increase forest growth, also help in environmental conservation. Considering the valuable role of wetlands and importance of avifaunal species in agriculture, food chains, ecosystem and pharmaceutics, a comprehensive study is carried out to evaluate diversity of socio-economically valuable avifaunal species at Manchar Lake. Monthly field surveys were conducted from January 2024 to October 2024, resulting in the collection of 80 specimens of ***Nycticorax nycticorax***. Minor variation was recorded in body parameters including body weight, size of beak, body length, wingspan, limbs length, length of tail feathers, and width of web. ***Nycticorax nycticorax*** Weight of body 302±1.53 Length of beak 72± 1.20 Length of Wingspan 190±3.22 Length of limbs 787±140.5 Length of tail feathers 314±3.12 limbs Length of body 21.5±0.95. ***Nycticorax nycticorax*** was recorded to be the predatory bird, and their occurrence was abundant in the lake premises. The highest prevalence of recorded species occurred in January, February, and March, with the lowest richness observed in June and July. The study concluded that Manchar Lake is experiencing significant pollution due to runoff from agricultural fields, residential areas, and other sources. This pollution, combined with factors such as massive hunting, climatic changes, seasonal fluctuations, and decreasing food resources, has led to a decline in bird populations at the lake

Keywords: Avifauna, diversity, fluctuation, species, declining, shorelines.

Introduction

The sum of functions that profit people, known as ecosystem services which include water storage, flood protection, water quality improvement, shoreline erosion control, natural products, recreation, and aesthetics are contributed by wetlands. [1] Wetlands play a substantial role in providing habitats to variety of resident and migratory birds; therefore, their ecological processes have always been a matter

of great concern. Increasing human exploitation of eco-biological resources is causing degradation of wetlands resulting in fast decline and disappearance of avifaunal species. [2] Almost 70 percent of migratory birds enter Pakistan; find their way to the wetlands of Sindh. [3] Manchar is the largest freshwater lake in Pakistan and located in Jamshoro district. It is one of the largest freshwater lakes in Asia and spreads over an area of about 200 sq. km. Its surface area varies from about 19,000 acres in dry season to 63,000 acres in rainy season. Since 1980s the lake is being degraded and is now a threatened wetland, dying from pollution, toxic effluents and mismanagement. The main Nara Valley Drain (MNVD) brings agricultural, municipal, industrial as well as saline water and drains into the lake. This is the main source of polluting the lake, so the water quality of the lake has changed and deteriorated. Birds are best pollinators, help in plant production through their services as pollinators or seed dispersers, help to increase forest growth, and environmental conservation, they not only help in reducing current insect pest populations but also help in minimizing future outbreaks. Throughout the world, birds are being consumed for food, medicines, timber, ornamentals and recreation purposes. [6] There's valuable role of wetlands and importance of avifaunal species in agriculture, food chains, ecosystem, and pharmaceutics as well. [6-7] *Nycticorax nycticorax* (The night heron) has a stocky body, with a comparatively short neck and legs, females averaging slightly smaller than the males. [8] The adult has distinctive coloring, with black cap, upper back and scapulars; gray wings, rump and tail; and white to pale gray under parts. The bill is stout and black, and the eyes are red, the legs of the adult are yellowish-green. The juvenile has a brown head, neck, chest and belly streaked with buff and white. The wings and back are darker brown, though the tips of the feathers have large white spots. These spots are particularly large on the secondary coverts. [9-10]

Methods

Study Area: Manchar Lake, located in the district of Jamshoro, Sindh, Pakistan, is one of South Asia's largest freshwater lakes. The geographic coordinates of the lake are 26.41º N and 67.68º E. It has a maximum length of 23.5 km and a maximum width of 12.08 km.

Sampling Period: The study on the diversity of avifaunal species at Manchar Lake was conducted over a one-year period, from April 2023 to March 2024. Sample collection occurred at different intervals during this period, both at dawn (from 5:30 AM to 8:30 AM) and at dusk (from 5:00 PM to 6:30 PM).

Identification: Identification keys were prepared using international literature, which were then compared with scientific data to accurately identify the bird species observed and captured during the study.

Results

The study at Manchar Lake assessed the diversity of *Nycticorax nycticorax* (The night heron), their ecology, feeding habits, habitats, and status as migratory or resident bird. The study on biodiversity and conservation status of *Nycticorax nycticorax* at Manchar Lake likely involved several methodologies based on common practices in ornithological and ecological studies. Systematic surveys were conducted to count the population of *Nycticorax nycticorax* and other water birds at Manchar Lake. This involved point counts, transect surveys, or aerial surveys to estimate bird populations and distribution. Evaluations of habitat quality, including water levels, vegetation cover, and food availability, were conducted to understand the environmental conditions affecting pelican populations. Studies on the white pelican birds at Manchar Lake, conducted from January 2024 to October 2024, utilized direct field

observations based on the methodology of Howes and Backwell-1989. The huge occurrence of *Nycticorax nycticorax* (The night heron) at Manchar Lake highlights the importance of this habitat not only as a permanent residence but also as a migratory refuge (Figure 2), By combining the keys—size and shape, bill characteristics, plumage and habitat you can effectively identified the night herons and distinguish between them as different species within the genus *Nycticorax.* Let's use our sample data (1 species, 80 total individuals) and calculate D i.e. to calculate the Shannon-Weaver Diversity Index (H') for the winter count of *Ncticorax nycticorax,* need to follow these steps:

- **Determine the proportion (pi) of each species**: Since we have only one species, the proportion (pi) will be 1.
- **Calculate the natural logarithm (ln) of each proportion (pi)**: Again, since pi is 1, ln (pi) will be 0.
- **Multiply each pi by its ln (pi):** This will result in 0 for each species as ln (1) is 0.
- **Sum the results**: The sum of pi * ln (pi) will be the Shannon index (H').

$H' = -\sum (pi \times \ln (pi)$ H′=−∑ (pi×ln (pi)

Since we have only one species (*Nycticorax nycticorax*) and pi is 1, the Shannon index H' for this single-species count is: $H' = -(1 \times 0) = 0$ H′=− (1×0) =0 Therefore, the Shannon-Weaver Diversity Index (H') for the winter count of *Nycticorax nycticorax* is 0. This result is expected because the Shannon index is higher when there is greater species diversity, and in this case, there is only one species present. In table 1, of Shannon Diversity Index, *ni* refers to the number of individuals of species.

Table 1: Shannon Index (Bird Diversity) For Winter Count

Species	***ni* (population size)**	**Pi**	**ln(pi)**	**pi * ln(pi)**
Nycticorax nycticorax (The night heron)	80	1	0	0

(Figure1)

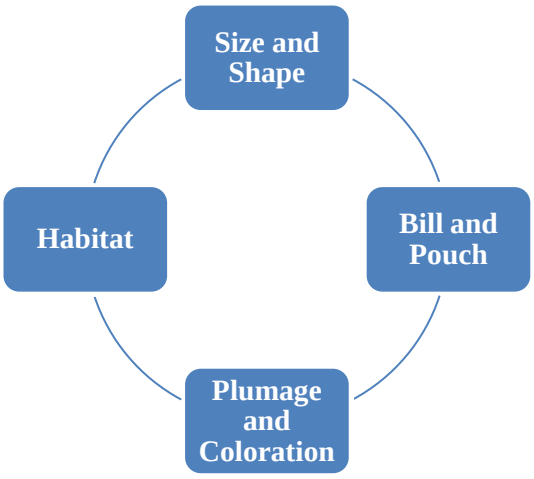

Table 2: Number of specimens collected during summer and winter season.

Pelecaniformes						
S.no	English name	Scientific name	Status	Occurrence	Count Summer/winter	
1.	The night heron	*Nycticorax nycticorx*	Resident	Average	40	40

The prevalence of collected specimens in graphical form, In Table 3, information on the night heron is presented (Figure 2).

Figure 2: occurrence of *Nycticorax nycticorax* at Manchar Lake

Table 3: Body parameters of the night heron

PARAMETERS	MIN/MAX (mm) ♂♀	Mean /S.D
Weight of body	300-304g	302±1.53
Length of beak	71-73.0	72±90.5
Length of neck	177-203	190±3.22
Length of Wingspan	508-1066	787±140.5
Length of body	228-400	314±3.12
Length of tail feathers	11-32.0	21.5±0.95

Table: 4 status of of *Nycticorax nycticorax*

Geographical distribution	IUCN status	Migratory /resident	Occurrence (Rare/ abundant)	Preferred habitat	Feeding habit
Cosmopolitan	Least concern (population decreasing)	Resident	Abundant in Pakistan	Freshwater and saltwater wetlands	Predator

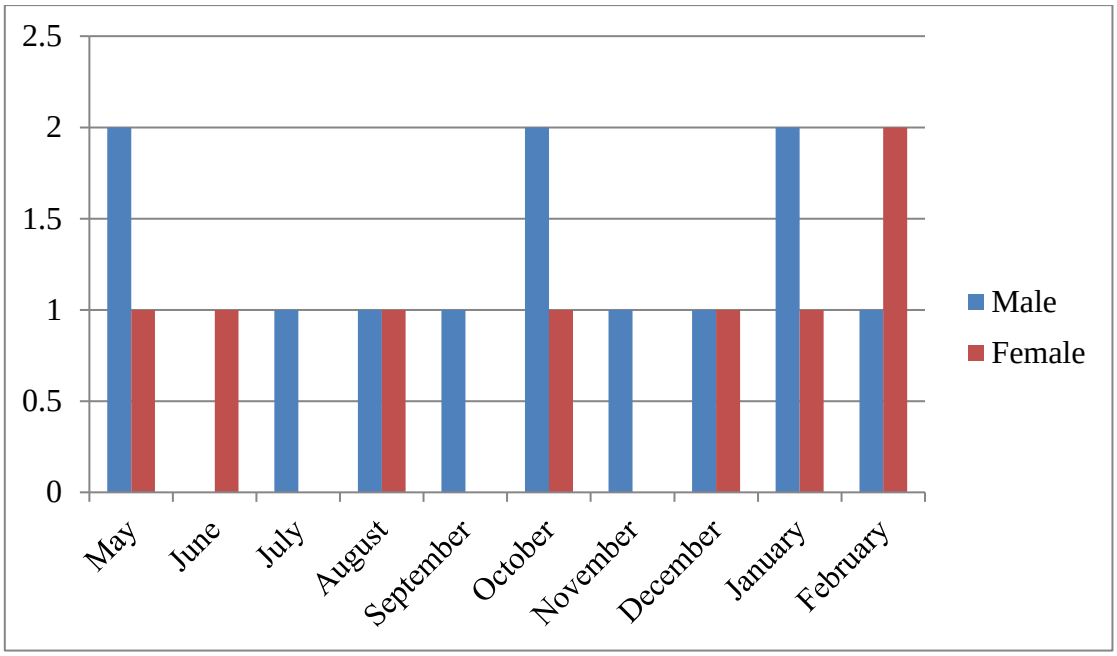

Figure: 3 Showing variations of *Nycticorax nycticorax (n=80)* in different months

Discussion

The study at Manchar Lake assessed the diversity of *Nycticorax nycticorax* (The night heron), their ecology, feeding habits, habitats, and status as migratory or resident bird. Results of the study on the conservation status and biodiversity of *Nycticorax nycticorax* at Manchar Lake likely involved several methodologies based on common practices in ecological and ornithological studies. Systematic surveys were conducted to count the population of *Nycticorax nycticorax* and other water birds at Manchar Lake. This involved point counts, transect surveys, or aerial surveys to estimate bird populations and distribution. Evaluations of habitat quality, including water levels, vegetation cover, and food availability, were conducted to understand the environmental conditions affecting pelican populations. Studies on the white pelican birds at Manchar Lake, conducted from January 2024 to October 2024, utilized direct field observations ***Nycticorax nycticorax*** (Black-crowned heron) a medium-sized wading bird found in various parts of the world. Its distinctive features include its black crown and back, gray wings and under parts, and red eyes. These herons are primarily nocturnal hunters, feeding on fish, insects, amphibians, and small mammals. An adult black-crowned night heron typically has a length ranging from about 58 to 66 centimeters (23 to 26 inches) from beak to tail. Their wingspan can extend from approximately 101 to 112 centimeters (40 to 44 inches). These measurements may differ slightly between males and females, with males often being slightly larger than females.

CONCLUSIONS

This comprehensive and rigorous approach ensured that the birds were thoroughly studied, with meticulous attention to detail in measuring and identifying morphological characteristics. The use of established international literature provided a robust framework for accurate species identification and furthered the scientific understanding of the white pelican population at Manchar Lake. It is a significant habitat for a wide variety of resident and migratory birds including the night heron, which is an economically important species for the region. The liver oil of the white pelican is utilized for treating joint pain, and its flesh is highly valued for its medicinal properties, commanding high prices in the

market. Despite these uses, the white pelican is classified as Least Concern (LC) according to conservation status. The lake supports a rich diversity of avifaunal species, encompassing both carnivorous and omnivorous birds.

Authors Contribution

Conceptualization: QM
Methodology: QM, KS
Formal analysis: QM, KS
Writing-review and editing: QM, KS
All authors have read and agreed to the published version of the manuscript

Conflict of Interest

All the authors declare no conflict of interest.

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