



## Research article

### Avifauna of Noakhali Science and Technology University premises and adjacent areas

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#### ABSTRACT

A study was carried out from September 2021 to September 2023 to estimate the diversity, seasonal variation, and relative abundance of avifauna of Noakhali Science and Technology University and its adjacent areas. One hundred fourteen bird species were recorded from the study site belonging to 18 different orders. Of these, one species, Grey-headed Fish Eagle *Haliaeetus ichthyaeetus*, has been rated globally as Near Threatened (BirdLife International 2021). The distribution of birds among habitat types was significantly different ( $f=7.153$ ,  $p<0.05$ ,  $df=2$ ). The walking trail was inhabited with the highest species diversity ( $H'=3.45$ ) with the highest evenness ( $J=0.84$ ), while grassland was recorded with the lowest species diversity ( $H'=2.69$ ) but had almost similar evenness index ( $J=0.84$ ); it could have a relation to the food availability. Considering the richness of bird species, the existing habitats will be restored.

#### Introduction

Across all seven continents, birds live and breed in almost all types of habitats ranging from the northern extreme of the North Pole to the southern extreme up to 440 kilometers inland in Antarctica (Welty, 1988; Brooke, 2004; Weir and Schluter, 2007). The highest bird diversity occurs in the tropical rain belt, *i.e.*, the area between 23.5° N latitude and 23.5° S latitude (Welty, 1988; Weir and Schluter, 2007). Previously, people thought that speciation rates had become higher in the tropics due to the high diversity. However, some recent studies revealed that greater extinction rates offset the higher speciation rates in the high latitudes than in the tropics (Schreiber and Joanna, 2001; Weir and Schluter, 2007).

Because of the geographical position of the Tropic of Cancer and the Ganges Delta, Bangladesh is profoundly rich in avian diversity or bird diversity (Khan, 1982, 1988). To assess the quality and condition of the environment, the diversity of birds is one of the most significant benchmarks in terms of ecology (Bilgrami, 1995). But nowadays, the

diversity of birds has gone downhill due to the destruction of natural habitats and different types of anthropogenic activities. To meet the massive demand of fast-growing civilization and unplanned urbanization, randomly cutting down many trees for commercial purposes is the main factor responsible for squeezing birds' foraging and nesting sites. As a result, many bird species that are supposed to be adapted to rural environments are now forced to be urban dwellers and have evolved new strategies of survival (Vickery et al., 1995; Shochat et al., 2006).

Under the present circumstances, it can be observed that despite the dignified and regularly updated checklists of the birds of Bangladesh, renovated work on the birds of the Noakhali region was highly demanding. Apart from the random studies on several adjacent areas of Noakhali, no profound work mentions a complete account of the birds of the Noakhali region. The study was designed to

- know the avian diversity and their relative abundance in different habitat types in

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Noakhali Science and Technology premises and its adjacent areas;

- find the seasonal variation and then determine their resident status in the study area;

suggest conservation initiatives to compose a sustainable ecosystem. Consequently, the outcome of this study is valuable for area-specific management planners, conservationists, and ecologists. It comes out with baseline information for different scientific communities for further studies of this area and the whole Noakhali district and to create awareness for their conservation.

## Materials and Methods

### Study area

Historically, Noakhali is known as Bhulua, a district in southeastern Bangladesh. It is located in the Chittagong Division and bordered by the Cumilla district to the north, the Meghna estuary and the Bay of Bengal to the south, Feni and Chittagong districts

to the east and Lakshmipur and Bhola districts to the west. The Noakhali Science and Technology University (NSTU) is located about 8 km southwest of Noakhali Sadar. The total land area of NSTU is 101 acres. The research survey was conducted on the entire campus of NSTU and its adjacent areas, which are positioned between the coordinates of North latitude: 22°47'31" and East longitude: 91°06'07". Being in the tropics, Noakhali, as well as Noakhali Science and Technology University, is used to possess a high rate of humidity varying high rate of humidity from 4% to 92%.

### Data collection

Data were collected for twenty-four months (September 2021 - September 2023) by direct observations in the field, mainly in the early mornings and afternoons, the most active periods for avian species. Based on the rainfall distribution of the area, October to March was considered the dry season, while April to September was considered the wet season.

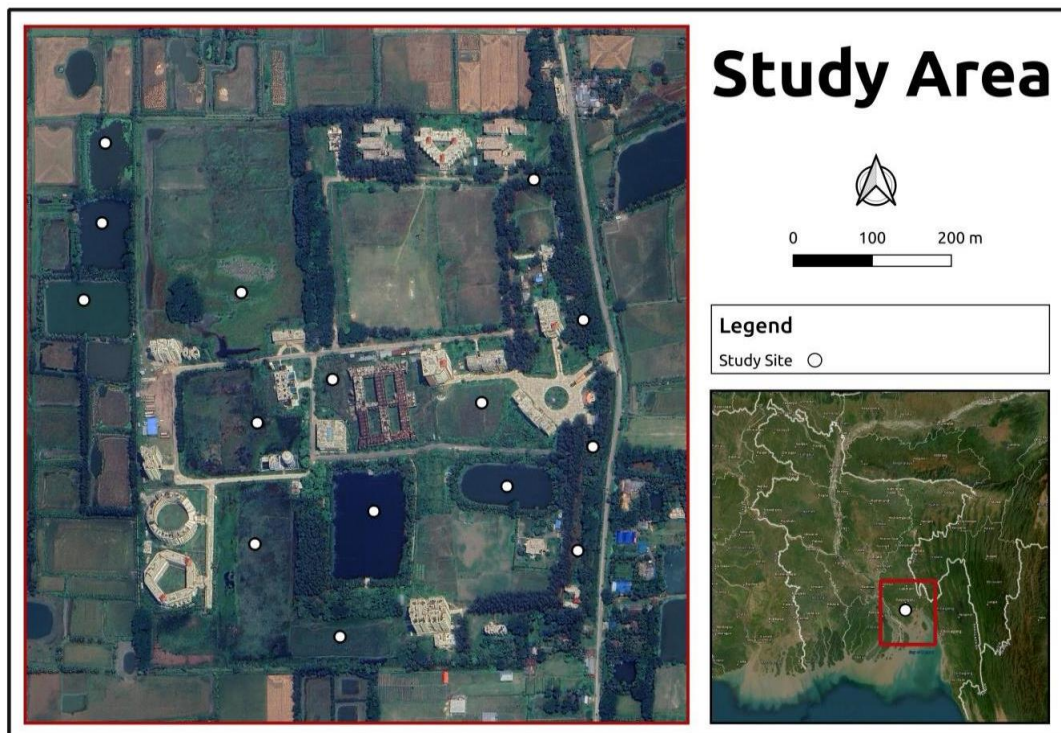


Fig. 1. Map of study sites.

Four days in a month and ninety-six days during this whole study period were spent on our field observations. Only the species with confirmed identification have been enlisted. The relative abundance of the birds was assessed as "Common" (seen in almost each visit) and "Uncommon" (seen only in one or two visits). For winter and summer migrants, the abundance was assessed only during the months when they were present in this area.

### ***Study design and data collection method***

Based on land cover features, the whole study site was stratified into three habitat types for this study: waterbody (including all water bodies surrounding the area), walking trail (including all walkways in the study site), and grassland (including all grassy areas in the study site). To assess the diversity and abundance of bird species in this area, a stratified random sampling design was used.

Binoculars were used to observe and identify birds. For some species, distinctive calls were recorded, and in many cases, for further identification, observed birds were photographed by using a Canon 60 D camera with Canon EF-S 55- 250 mm f/4.0-5.6 IS II telephoto zoom lens. For the observations of birds, the point transect method was used, and it was done by standing in the middle of the transect and observing gently up to a distance of 30 m radius. At each point, the observation lasted for 15 minutes (Girma et al., 2017).

Bird survey was conducted from 6:00 a.m. to 11:00 a.m. and 3:00 p.m. to 5:30 p.m. in the early evening (Brower et al., 1990; Pomeroy, 1992). A presence-absence approach and replicated point counts were used for bird censuses. All bird species that were observed during the field survey were recorded with a prepared datasheet.

### ***Data analysis***

Collected survey data were encapsulated per habitat type in the table during the study period. Shannon

diversity index (Magurran, 1988; Jarvis and Robertson, 1999), evenness, relative abundance, and encounter rate (Bibby et al., 1992) were calculated to evaluate the diversity and abundance of birds. By dividing the diversity indices by the natural log of species richness, we have calculated the evenness and relative abundance (RA) of different bird species as the percentage of dividing the total number of contacts of the species by the total number of contacts of all species. One-way ANOVA has been conducted to assess the variation among the habitats.

## **Results and Discussion**

### ***Species richness and abundance of birds***

All the 114 species recorded during the study period belonged to 18 different orders. The highest number (58) comes under the order Passeriformes, and the lowest number (one) comes from six orders: Falconiformes, Podicipediformes, Psittaciformes, Strigiformes, Suliformes, and Bucerotiformes.

Twelve categories of birds were observed in the study area according to feeding habits. Of these, 41.0% were insectivores, considered the highest number and 2.0% were nectarinivores, nectarinivore+insectivores, and insectivore+graminivore, considered the lowest number of the observed species during the study period.

Based on the occurrence rate during the study period, the highest number was considered rare, representing 56.0%, and the lowest number was considered common, representing 7.0% of the total species.

Of those identified species, 78.5% were found to be residents, and 21.5% were migratory species of Bangladesh. Among all those resident species, most were common residents. Of those migrants, the largest part was winter migrants, and very few were summer migrants.

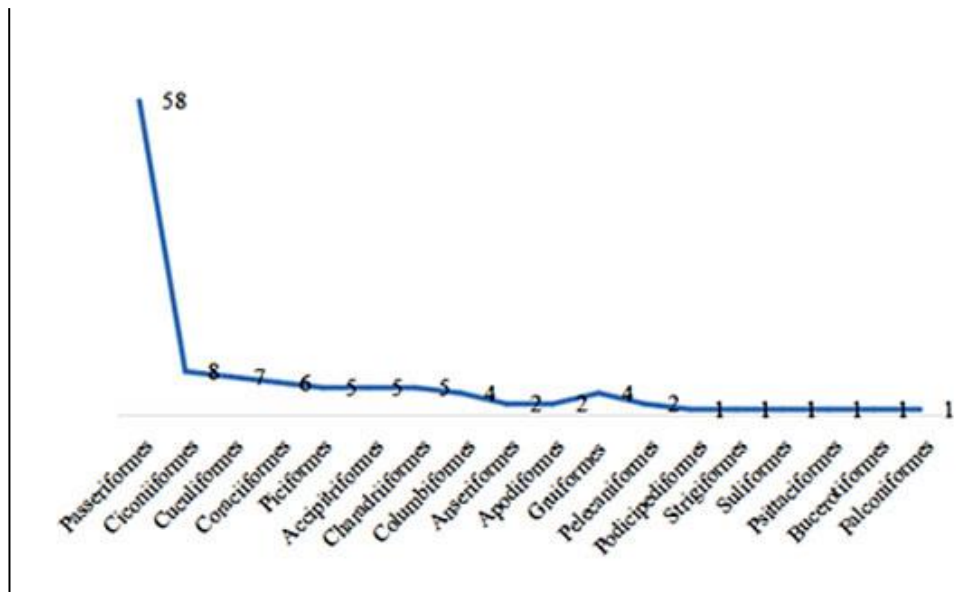


Fig. 2. Proportion of different orders of birds.

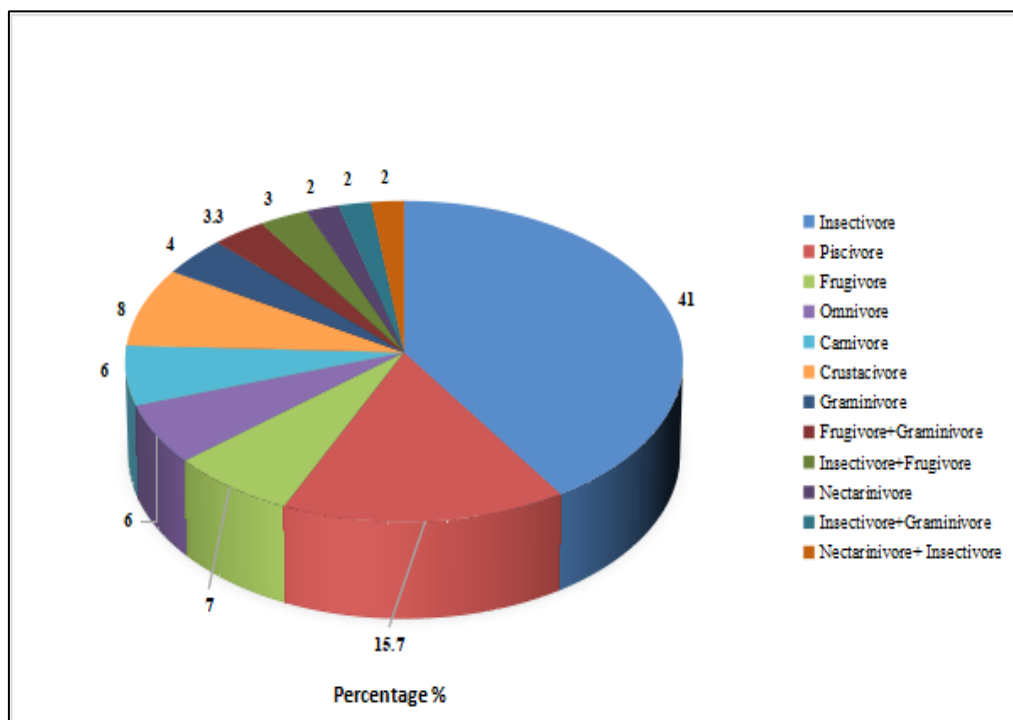


Fig. 3. The Composition of birds in the study area has different feeding habits.

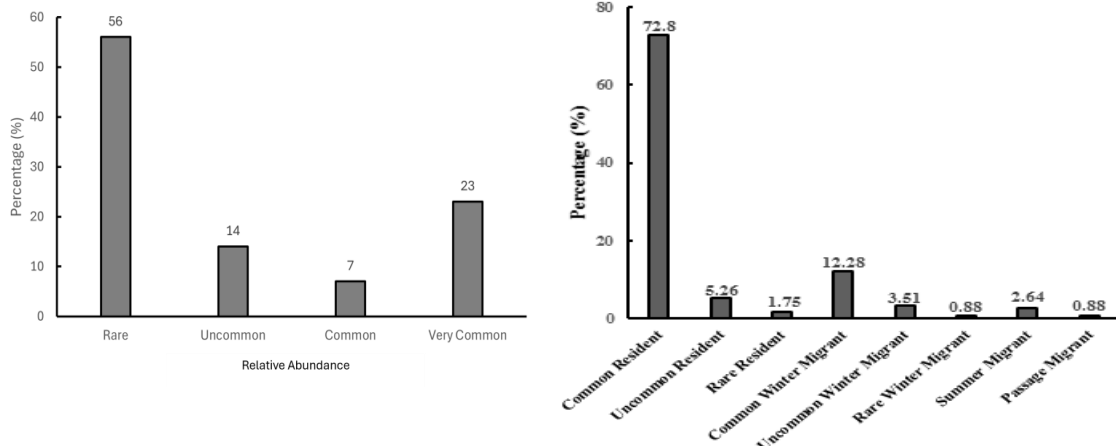


Fig. 4. Encounter rate (General and Seasonal).

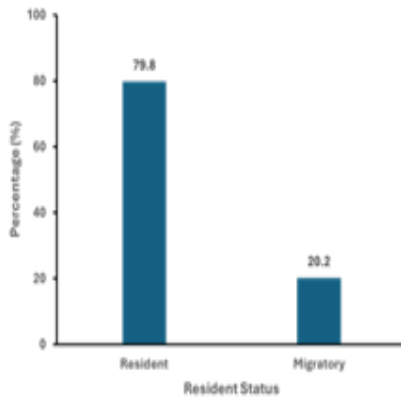


Fig. 5. Inhabitant status of birds found in the study area.

On a global scale, one was considered as Near Threatened, Grey-headed Fish Eagle *Haliaeetus ichthyaetus*. The remaining 113 recorded species were categorized as Least Concern (BirdLife International, 2021).

**Diversity and distribution of Bird species**

The abundance of bird species was significantly different among all those different habitat types ( $f=7.153, p = 9.06E-04, df=2$ ). The highest distribution

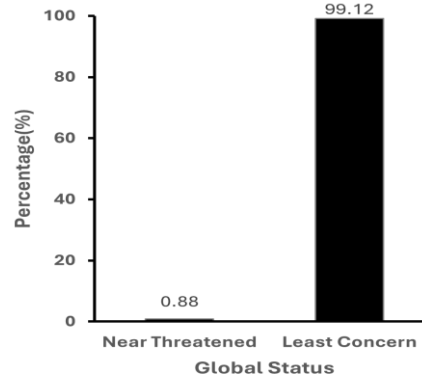


Fig. 6. Global status of birds found in the study

( $30.32 \pm 58.31$ ) was recorded on the walking trail, while the lowest distribution ( $9.53 \pm 29.89$ ) was recorded in the grassland. The walking trail was inhabited with the highest species richness, and grassland harbored the lowest species richness in the study area (Table 1).

We have enlisted the highest species diversity of birds ( $H' = 3.45$ ) with the highest evenness ( $J = 0.84$ ) in the walking trail, followed by Waterbody ( $H' = 2.81$ ). In the case of grassland, we have documented the lowest species diversity ( $H' = 2.69$ ) but an almost similar evenness index ( $J = 0.84$ ) of the walking trail from the study area.

Table 1. Distribution of different bird species across habitat types (ANOVA: Single Factor).

Summary Groups	Count	Sum	Average	Variance	std.dev	
Waterbody	110	1532	13.927	1513.518	38.904	
Walking trail	110	3453	31.391	3491.561	59.089	
Grassland	110	1006	9.145	906.419	30.107	
Anova						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	30165.836	2	15082.918	7.654	0.000563	3.023
Within Groups	644353.282	327	1970.499			
Total	674519.118	329				

**Table 2. Bird species diversity index along habitat types.**

Habitat types	No. of species	Diversity (H')	Evenness (J)
Walking trail	60	3.451	0.842
Waterbody	30	2.809	0.826
Grassland	24	2.696	0.848

We have high bird diversity around the walking trail. It might be due to the abundance of food items besides the trail, the accessibility of these three bird-watching habitats, or the lower number of the other two habitats (water body and grassland). Through this study, we tried to compare three types of habitats and unveil which habitat harbors more bird species. From a conservation perspective, long-term multidisciplinary study is required to understand the ecology of this area's bird community.

### Conclusion

As the university area is crowded, thousands of people visit it daily. They create so much noise, consciously or unconsciously disturbing the avifauna of this area. Besides, some typical anthropological threats were identified as the cause for the declining of the avifaunal diversity. The increase and the ever-spreading situation of these activities are harmonizing the decline of the places suitable for avian feeding, foraging, roosting, and breeding activities.

Though it is a public place with frequent anthropogenic movements, the walking trail still contains a rich diversity of birds.

This could happen due to the availability of food items besides the walking trail, the difference in visibility among those three habitats, or the lower number of the other two habitats (waterbody and grassland). However, this present study found a good number of birds. Some crucial species recorded during the survey are threatened at

different levels and rare in Bangladesh. The compelling presence of wintering species justifies that this area is used as a part of the East Asian-Australasian Flyways. It requires more in-depth study studies.

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### Author contributions

**Humayra Mahmud:** Methodology, Data collection, Formal Analysis, Writing - Original Draft, Review & Editing; **Sadia Sultana:** Data collection, Visualization, Review & Editing; **Nasrin Akter:** Data collection, Review & Editing. **Rasel Talukder:** Data collection & Editing.

### Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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