

## Comparative Study of Avifaunal Diversity and Conservation in Urban and Rural Wetlands of West Bengal

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### ABSTRACT

The present survey work was done to throw some lights on the occurrence and distribution of the avifauna in one urban (Santragachhi wetland) and one rural (Purbasthali Oxbow Lake) wetlands of West Bengal to ascertain the impact of urbanization, if any, on the diversity of the avian fauna and to find out the factors that threaten birds so as to suggest some conservation strategies. The purpose of the study was to know and improve the avian diversity around us by sustainable development. In the present study, a total of 41 species of birds belonging to 16 families were observed. About twenty-six species of birds were recorded in Santragachhi jheel and thirty-nine species were recorded in the Purbasthali lake during the study period. The highest numbers of recorded species belonged to the families - Anatidae Ardeidae,

Rallidae and Alcedinidae in both the lakes. These extensive studies indicated that urbanization did not reduce bird species richness (i.e., the number of bird species) due to an abundant food supply, rather increased the number of birds in a few dominant bird species. One of the main characteristics of urban areas is the numerical dominance of a few abundant bird species, which means a lower species evenness.

**Keywords** Avifauna, Diversity, Sustainable development, Species richness, Urbanization.

### INTRODUCTION

Wetlands are an important habitat for birds and the occurrence and distribution of birds in turn gives the overall picture of the habitat. A large number of studies have explored the variety of bird diversity in urban and rural areas. The birds use their habitat for various purposes such as feeding, roosting, breeding, shelter. Avifaunal species play a significant role in many food webs of aquatic system through nutrient cycling and as a part of food web, as potential pollinators and bio-indicators (Jorvinen and Vaisenen 1978, Bowden 1990). Avifauna are an important component of biodiversity and their presence in any ecosystem reflects the environmental quality, availability of food and security of that area. Avifaunal diversity has been decreasing due to the destruction of natural habitats and anthropogenic interference. The wetlands are facing tremendous anthropogenic pressure, which can greatly influence the population structure of the bird community (Gupta and Singh 2003, Rottenborn

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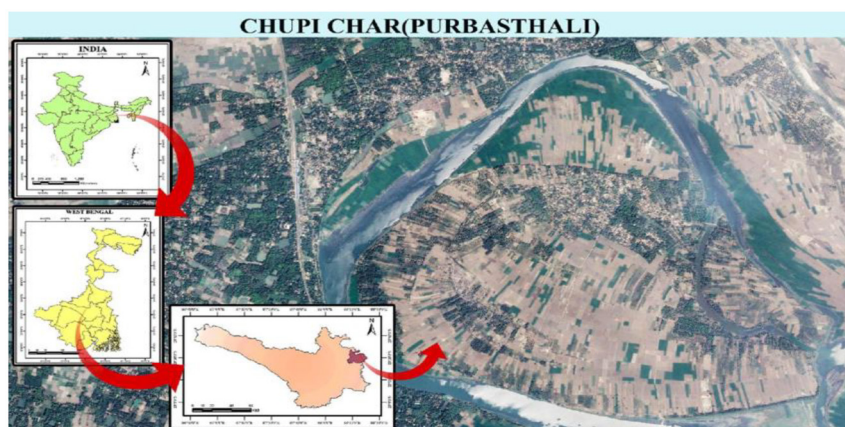


Fig. 1a. Map of the study site (Chupir Char, Purbasthali). Source: Google map.

1999, Mckinney 2002, Czech and Parsons 2002). The study was taken up to assess the occurrence and distribution of the avifauna in one urban and one rural wetlands of West Bengal to ascertain the impact of urbanization, if any, on the diversity of the avian fauna and to find out the factors that threaten birds so as to suggest some conservation strategies.

#### Study site

Two study sites were selected. One is at Purbasthali Oxbow Lake ( $23^{\circ}27'5''N$ ,  $88^{\circ}20'35''E$ ), West Bengal, India, a rural area. Purbasthali Oxbow Lake also known as Chupir Char is created by the Ganges River on its Western bank, in Burdwan district of West

Bengal, India (Fig. 1a).

The Oxbow Lake of Purbasthali (Chupir Char) sprawls over an area  $3.50 \text{ km}^2$  (Fig. 1B). This lake harbors a number of aquatic plants in the submerged as well as floating state, on which thrive a large number of organisms. Due to abundant food available throughout the year in the form of aquatic crustaceans, insects, molluscs, fishes the lake attracts a number of birds throughout year. This beautiful lake harbor large populations of migratory water birds during the winter season. The area is less noisy and less polluted.

The other site is the Santragachi: lake in a more or less urban area. This Santragachi jheel is a roughly

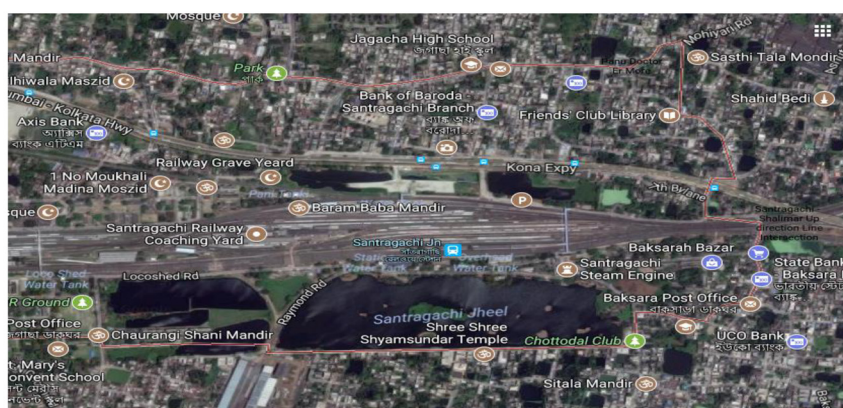


Fig. 1b. map of the study site (Santragachi jheel). Source: Google map.

rectangular area in Howrah district about 8km from Kolkata, India (22° 34'60" N, 88°17'60" E). This lake is surrounded by residential complexes, market areas, small factories and a railway station nearby which is also a source of large amount of noise and vibration due to frequent passing of the trains. Despite under anthropogenic stresses due to its location this jheel is an abode of thousands of migratory birds during winter months (November to February).

### Reasons for selecting study areas

Both the places are famous for rich avifaunal diversities. Lakes are ideal in food for birds and phytoplanktons and algae grow there in abundance so that the birds can successfully complete their nesting, feeding and breeding. Both the areas are less polluted and away from din and bustle.

## MATERIALS AND METHODS

The study was undertaken for three consecutive years from 2018-2020, during early hours in the morning of post monsoon season. The birds were spotted by binoculars, Spotter and telescopes. Observations were made by the help of Olympus binocular while Digital cameras were used for identification and supporting pictures. Care was taken for their proper identification by the help of ornithologists and various books on birds (Ali 2002, Grimmett *et al.* 2007). To determine the local status of different species of birds, they were

placed into 3 categories according to their availability as A=Abundant, M=Moderate and R=rare. Also, they were categorized as resident or migratory according to their month wise presence status.

Two different methods were adapted to study avifaunal diversity. The first method was line transects method and second method was point count method. Following these methods checklist was prepared. The observation was made during the peak activity of birds i.e., 1 to 2 hrs after sunrise or before sunset.

Each of the four sides of the lake was traversed during each survey time. We surveyed each side by walking along a transect and counted all the birds seen. A thorough survey was conducted in the Oxbow lake area in Purbasthali by boating to know the threats to this lake as well as its bird population so that a proper conservation/management plan can be suggested.

## RESULTS AND DISCUSSION

In the present study, a total of 41 species of birds belonging to 16 families (Table 1) were observed. About twenty-six species of birds were recorded in Santragachhi jheel and thirty nine species were recorded in the Purbasthali lake during the study period. The highest numbers of recorded species belonged to the families - Anatidae Ardeidae, Rallidae and

**Table 1.** List of birds available in Purbasthali and Santragachhi wetlands. (T= Threatened, LC= Least Concerned, V= Vulnerable, NT= Near Threatened, R = Resident, RM = Resident Migratory, M = Migratory).

Sl. NO.	Name of the birds (Common name and scientific name with family)	IUCN status	Purbasthali wetland	Santragachi wetland	Seasonal status	Food habit
1.	Family- ANATIDAE Lesser whistling duck <i>Dendrocygna javanica</i>	LC	+	+	R	Omnivorous
2.	Garganey <i>Anas querquedula</i>	LC	+	+	M	Omnivorous
3.	Gadwal <i>Anas strepera</i>	LC	+	+	M	Omnivorous
4.	Common pochard <i>Aythya farina</i>	VU	+	+	R	Omnivorous
5.	Red crested pochard <i>Netta rufina</i>	LC	+	-	M	Herbivorous
6.	Ferruginous pochard <i>Aythya nyroca</i>	VU	+	+	M	Omnivorous

Table 1. Continued.

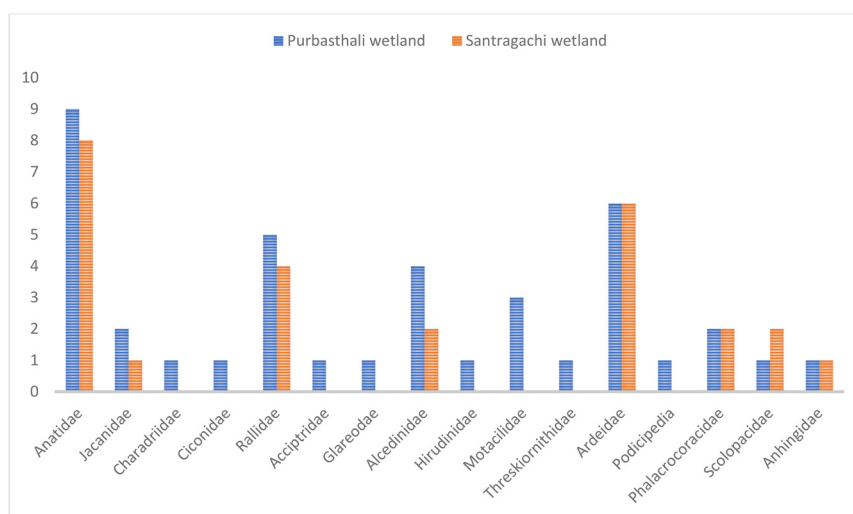
Sl. No.	Name of the birds (Common name and scientific name with family)	IUCN status	Purbasthali wetland	Santragachii wetland	Seasonal status	Food habit
7.	Northern pintail <i>Anas acuta</i>	LC	+	+	M	Omnivorous
8.	Fulvous whistling duck <i>Dendrocygna bicolor</i>	LC	+	+	M	Omnivorous
9.	Cotton pygmy goose <i>Nettapus coromandelianus</i> Family- JACANIDAE	LC	+	+	M	Omnivorous
10.	Bronze winged jacana <i>Metopidius indicus</i>	LC	+	+	R	Omnivorous
11.	Pheasant tailed jacana <i>Hydrophasian u schirurgus</i> Family-CHARADRIIDAE	LC	+	-	R	Herbivorous
12.	Pacific golden plover <i>Pluvialis fulva</i> Family- CICONIDAE	LC	+	-	M	Carnivorous
13.	Asian openbill stork <i>Anastomus oscitans</i> Family-RALLIDAE	LC	+	-	R	Carnivorous (Molluscs)
14.	Common moorhen <i>Gallinula chloropus</i>	LC	+	+	R	Omnivorous
15.	White breasted water hen <i>Amaurornisphoenicurus</i>	LC	+	+	R	Omnivorous
16.	Purple swamp hen <i>Porphyrioporphyrrio</i>	LC	+	+	R	Omnivorous
17.	Eurasian coot <i>Fulicaatra</i>	LC	+	+	M	Omnivorous
18.	Grey headed swamp hen <i>Porphyriopolio cephalus</i>	LC	+	-	R	Omnivorous
Sl. No.	Name of the birds (Common name and scientific name with family)	IUCN status	Purbasthali wetland	Santragachii wetland	Seasonal status	Food habit
19.	Eurasian marsh harrier <i>Circus aeruginosus</i> Family-GLAREOLIDAE	LC	+	-	R	Carnivorous
20.	Small pratincole <i>Glareolalactea</i> Family-ALCEDINIDAE	LC	+	-	M	Carnivorous
21.	Common kingfisher <i>Alcedoatthis</i>	LC	+	+	R	Carnivorous
22.	White breasted kingfisher <i>Halcyon smyrnensis</i>	LC	+	+	R	Carnivorous
23.	Pied kingfisher <i>Cerylerudis</i>	LC	+	-	R	Carnivorous
24.	Stork billed kingfisher <i>Pelargopsis capensis</i> Family-HIRUNDINIDAE	LC	+	-	R	Carnivorous
25.	Barn swallow <i>Hirundo rustica</i> Family-MOTACILLIDAE	LC	+	-	M	Carnivorous
26.	White wagtail <i>Motacilla alba</i>	LC	+	-	M	Carnivorous
27.	Citrine wagtail <i>Motacillacitreola</i>	LC	+	-	M	Carnivorous

28.	Yellow wagtail <i>Motacilla flava</i> Family- THRESKIORNITHIDAE	LC	+	-	M	Carnivorous
29.	Black headed ibis <i>Threskiornis melanocephalus</i> Family-ARDEIDAE	NT	+	-	R	Carnivorous
30.	Purple heron <i>Ardea purpurea</i>	LC	+	+	R	Carnivorous
31.	Indian pond heron <i>Ardeolagrayii</i>	LC	+	+	R	Carnivorous
32.	Cattle egret <i>Bubulcus ibis</i>	LC	+	+	R	Carnivorous
33.	Median Egret <i>Mesophoyx intermedia</i>	LC	+	+	R	Carnivorous
34.	Little egret <i>Egretta garzetta</i>	LC	+	+	R	Carnivorous
35.	Yellow bittern <i>Ixobrychus sinensis</i>	LC	+	+	R	Omnivorous
Sl. No.	Name of the birds (Common name and scientific name with family)	IUCN status	Purbasthali wetland	Santragachii wetland	Seasonal status	Food habit
36.	Little grebe <i>Tachybaptus ruficollis</i> Family- PHALACROCORACIDAE	LC	+	-	R	Carnivorous
37.	Little cormorant <i>Phalacrocorax niger</i>	LC	+	+	R	Carnivorous
38.	Great cormorant <i>Phalacrocorax carbo</i> SCOLOPACIDAE	LC	+	+	R	Carnivorous
39.	Swinhoe's Snipe <i>Gallinagomegala</i>	LC	-	+	M	Omnivorous
40.	Sandpiper <i>Tringastagnatilis</i> ANHINGIDAE	LC	+	+	RM	Omnivorous
41.	Snake Bird <i>Anhinga melanogaster</i>	NT	+	+	RM	Carnivorous

Alcedinidae (Fig. 2) in both the lakes.

In the Santragachii jheel Lesser Whistling Ducks (*Dendrocygna javanica*) mostly dominate the lake. A large number of local non-migratory bird species that include bronzed winged jacana, pond heron and cattle egret also inhabit this lake. The Jheel has large trees along its bank which provides shelter and food for many wetland dependent *Avian* species like kingfishers and drongos. The lake is generally dominated by *Eichhornia crassipes* which covers whole water surface of lake by its rapid propagation in the months of migratory bird non-colonization (i.e., during April–September). Small islands at the center of the lake play an important role as the shelter of many migra-

tory waterbirds like lesser whistling duck, fulvous whistling duck, northern pintail, northern shoveller and gargany. Abundance of different bird species was found to be highest in the month of December and January. The resident (R), resident migratory (RM) and migratory (M) birds like ducks, pochard, gadwall, goose, waterhen, jacanas, cormorants nest in the peripheral vegetation mat of water hyacinth, sedges and grass and in these wetlands. The birds like herons and egrets nest on nearby trees both in urban and rural areas of the wetlands. But the matter of concern is that the number of birds has been found to decrease consistently during the study period. Migratory bird species including Ferruginous Pochard, Common Teal and Fulvous Whistling-Duck was found to be

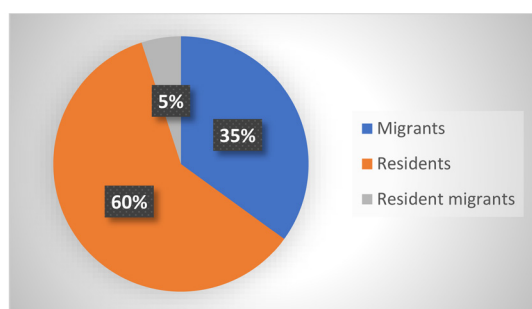


**Fig. 2.** Comparative study of avifaunal diversity in rural and urban wetlands according to family.

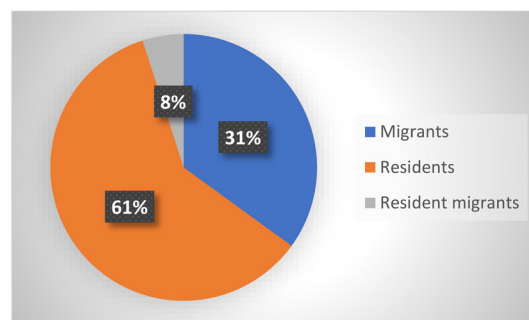
disappearing from the lake in more recent years.

At Purbasthali, among the avifauna, total number of bird species was 39 (Table 1). This indicates that the habitat and weather condition of winter is suitable for the birds more than the summer time which reflects in the extended number of birds in winter in both the water bodies. Though the migration was only in the time of winter, but some species missing the flocks have shown accidentally after the winter months that is from April to September. One of the reasons of this may be the huge availability of resources in this area that bears both the presence of local and migratory birds (Figs. 3a - 3b).

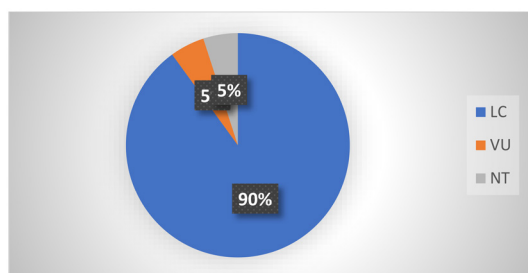
Analyzing the resources it can also be hypothesized that, the increasing resource availability also increases the chance of migratory birds to survive with the local ones concluding a lesser portion of resource compression between local and migratory birds. As shown in the Table 1 most of the birds were omnivorous or carnivorous while very few are herbivorous. After analyzing a few particular year wise data, it is hard to state that whether the resource choice of local birds is a cause of migratory birds to overpopulate the area successfully or the migratory species survivability occurs due to resource segregation of migratory birds. However, any one of the possibilities may happen over here. One of the reasons of reduced number of different migratory birds may



**Fig. 3a.** Proportion of Migrants, Residents and resident Migrants in Purbasthali wetland.



**Fig. 3b.** Proportion of Migrants, Residents and Resident Migrants in Santragachii wetland.

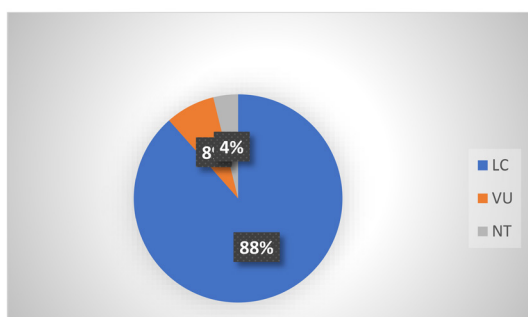


**Fig. 4a.** Percentage of Least Concerned (LC), Vulnerable (VU) and Near Threatened (NT) species available in Purbasthali wetland.

be that the aquatic migrants build nests by the lake side among vegetation and lay eggs but due to human intervention lakeside vegetation is getting reduced and thereby a smaller number of migrants are coming. This also gives an alarming call on the natural habitat alteration which might put severe effect on fluctuating number and behavior of migratory birds.

Most of the species recorded in the lakes were found to be of least concern category as per IUCN (Figs. 4a - 4b). Species such as *Aythya nyroca*, reflected to be of VU category while species like *Threskiornis melanocephalus*, *Anhinga melanogaster*, which belonged to nearly threatened (NT) indicated that its population is suspected to be in moderately rapid decline owing to pollution/anthropogenic activities/hunting.

The reason of gradual reduction of aquatic migrants may be loss of aquatic plants due to human



**Fig. 4b.** Percentage of Least Concerned (LC), Vulnerable (VU) and Near Threatened (NT) species available in Santragachhi wetland.

intervention. Further investigation is needed to find-out exact cause of reduction of winter migrants. Our investigation throws light about presence of enormous resource as food source for migratory birds but less number of migrants may be due to loss of habitat.

A few studies indicated that urbanization did not reduce bird species richness (i.e., the number of bird species) due to an abundant food supply, but rather increased the number of birds in a few dominant bird species (Jokimäki *et al.* 1996, Barth *et al.* 2015) One of the main characteristics of urban areas is the numerical dominance of a few abundant bird species, which means a lower species evenness (Kath *et al.* 2009).

Numerous wastes were found to contaminate the water bodies and its water. Domestic garbage was found to be dumped throughout the entire bank of the lakes. Wastewater from train washing, industries, hotels and households come directly to the Jheel, untreated through inlets of different sizes. The inhabitants were found to use the jheel's water for their daily uses such as bathing, washing clothes and cooking utensils. They also have open toilets, the wastewater was found to flow directly into the Jheel. The vegetation of the jheel was found to be dominated by water hyacinth which covered almost the whole water surface of lake by its rapid propagation. As these plants cover the whole water body the dissolved oxygen and light penetration were found to decrease which altogether hampered the optimum physical condition of the jheel. The mechanisms relating to various habitats and bird diversity with human activity are still not clear (Ortega-Álvarez and MacGregor-Fors 2009).

Local people around the lakes along with several dynamic Non-Government organizations and the State Government holistically have taken a number of notable measures to protect the lakes.

Many steps were taken for effective conservation that include:

Fencing over the entire jheel by iron net. Fishing, bathing, cloth washing and domestic use of water has been declared strictly prohibited. The wetland has been declared to be protected from

contamination of waste water and solid waste.

Plenty of dustbins have been placed throughout the bank of the Jheel/Lake.

The whole area has been proposed as a plastic free zone.

Clearing of water hyacinth is performed every year during winter season for space allocation to water-birds.

Artificial roosting ground has been made for the water birds.

## CONCLUSION

The observational study on avifauna of Purbasthali wetland and Santragachhi wetland is a preliminary and basic effort to bring out the incredible bird fauna. The purpose is to know and improve the avian diversity around us by sustainable development. The maintenance and improvement of flora of the district will also support the residing birds. A further study on the various behavioral aspects of residential and migratory birds will enrich the fauna. Therefore, the study recommends conservational measures with the involvement of Government Organisation, Non-Government Organisations and the local people are needed to impose strict check on land encroachment, pollution control strategy and holistic management planning for the conservation of enriched habitat of these two wetlands in West Bengal.

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