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A Study on Avifaunal Species Diversity of Purbasthali Oxbow Lake, West Bengal, India

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Abstract: ***The present study deals with the diversity, abundance and variations of avian species at Purbasthali Oxbow Lake (23°27'5"N 88°20'35"E), West Bengal, India. A total number of 89 bird species belonging to 15 orders and 36 families were recorded during this study. Among the recorded species 47 were resident, 14 were local migrant and 28 were winter migratory. All the winter migrants such as Northern Pintail, Lesser Whistling Duck, Red crested Pochard, Common Teal, Spot Billed Duck, Garganey, Gadwal etc. were observed in large numbers during winter season. It was found that one near threatened (Black headed Ibis) and one vulnerable (common pochard) species also regularly visited this lake in the winter season.The results of relative diversity (RD) index showed that anatidae (RD value = 16.85) was the dominant family in the area.***

Keywords: Avian, diversity, wetland, Purbasthali oxbow lake, migratory

1. Introduction

Avifaunal species are one of the main indicators which determine the health of the wetlands [1-3]. Bird 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 [4-5]. Wetlands are important bird habitats for feeding, nesting and breeding of aquatic birds [6-8]. Now-a-days, 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 [9-12].

Purbasthali Oxbow Lake also known as Chupi Char is created by the Ganges River on its Western bank, in Burdwan district of West Bengal, India. 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, mollusks, fishes etc. the lake attracts a number of birds throughout year. This beautiful lake harbour large populations of migratory water birds during the winter season. Information on distribution and abundance of water birds is essential to provide guidelines for the management and conservation of wetlands [13-15]. The present study was conducted to analyze the diversity and richness of wetland birds and to identify the consequences of direct and indirect human interferences.

2. Material and Method

Study area

The study area is Purbasthali Oxbow lake ($88^{\circ}19'45''$ to $88^{\circ}22'$ E longitude 23° $26'$ to $23^{\circ}26'45''$ N latitude) also known as Chupi Char **(Fig 1)** created by the Ganges river on its Western bank, in Burdwan district of West Bengal, India. This area is only 8 km from the old and holy town of Nabadwip. The lake was formed by the meandering river, over last 40 years, the area has transformed into a closed loop, allowing emergence of the oxbow lake. This channel of water course feeds the oxbow lake with thin connectivity with the main river with shoals forming at the river mouth. Remote sensing images of the wetland clearly establishes the differences of turbidity between the main river and the wetland which has sandy clay sediment and crystal clear waters because of sedimentation of suspended solid particles in the stagnant stretches. The ongoing sedimentation process threatens to cut off the channel in near future. The oxbow lake of Purbasthali sprawls over an area 3.50 km^2 .The water depth of this lake varies between is 1.0 m to 4.5m.

Figure 1: Map of the study area

Methodology

Avifauna in and around Purbasthali Oxbow Lake was recorded during January 2013 to December 2016. Sampling was carried out for three years to record variation in avifaunal diversity. Regular field trips were made throughout this period. 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. Olympus Binocular 10x50, was used for close observation of birds and for photography Cannon-EOS 550 D camera, with sigma Lens 150-500 mm. The check list of species was prepared following Ali [16], Grimmett and Inskipp [17]. The other most important aspect kept in consideration was to make the observations during the peak activity of birds, which is 1 or 2 hours after sunrise or before sunset. The following formula was used for determining percentage of occurrence or relative diversity (RD) of Families [18].

$$\text{Relative diversity(RD)} = \frac{\text{No of speies of each family}}{\text{Total no of species}} \text{x } 100$$

3. Result and Discussion

The checklist of observed avian species in and around Purbasthali oxbow lake along with their order, family, common name, scientific name and residential status are given in **Table 1**. In total, 89 species of birds belonging to 15 orders and 36 families were observed. Out of total 89 species of birds, 52.8% were Resident, 31.4% were winter Migrant and 15.7% Local Migrant **(Fig 2)**. Order Passeriformes is dominant in the study area, including 13 families and 23 species (25.8%), followed by order Charadriiformes (17.9%) and Anseriformes(16.8%). Family Anatidae (16.8%) are dominant with 15 no of species, followed by Scolopacidae (7.8%) and Ardeidae (6.7%). Avian diversity in terms of different order is given in **Fig.3**. Anatidae was found to be the most dominant family in the area (RD Index value = 16.85) followed by Scolopacidae (RD Index value = 8.98), Rallidae and Sturnidae (RD Index value = 5.61). One near threatened (Black headed ibis) and one vulnerable (Common Pochard) species according to IUCN red data book were found in this area during winter season. Remaining all other species found during this survey are categorized as least concerned according to IUCN red data book. The bird's population changes in this lake in different seasons due to local environmentally dependant factors, agricultural activities, water availability, local & regional habitat changes and climatic conditions [19-20].

Table 1: A classified chart of various bird species in the study area

No	Family	Common Name	Scientific Name	Abundance	Residential Status	IUCN Status
		Order : Charadriiformes				
1	Charadriidae	Red-Wattled Lapwing	*Vanellu sindicus*	C	LM	LC
2		Yellow-Walted Lapwing	*Vanellus malabaricus*	C	LM	LC
3		Grey-headed Lapwing	*Vanellus cinereus*	C	WM	LC
4		Little Ringed Plover	*Charadrius dubius*	R	WM	LC
5	Jacanidae	Bronze winged jacana	*Metopidius indicus*	A	RE	LC
6		Pheasant tailed jacana	*Hydrophasianus chirurgus*	A	RE	LC
7	Scolopacidae	Common redshank	*Tringa totanus*	C	LM	LC
8		Common greenshank	*Tringa nebularia*	C	LM	LC
9		wood sandpiper	*Tringa glareola*	C	LM	LC
10		marsh sandpiper	*Tringa stagnatilis*	C	LM	LC

11		Green sandpiper	*Tringa ochropus*	C	WM	LC
12		Common sandpiper	Actitishypoleucos	A	LM	LC
13		little stint	*Calidrisminuta*	R	WM	LC
14		Common Snipe	*Gallinagogallinago*	C	WM	LC
15	Recurvirostridae	Black-winged stilt	*Himantopus himantopus*	O	WM	LC
16	Glareolidae	Small pratincole	*Glareola lactea*	R	WM	LC
		Order : Suliformes				
17	Phalacrocoracidae	Little Cormorant	*Phalacrocoraxniger*	A	RE	LC
18		Indian Cormorant	*Phalacrocoraxcarbo*	R	LM	LC
		Order: Ciconiiformes				
19	Halcyonidae	White-Breasted Kingfisher	*Halcyon* smyrnensis	A	RE	LC
20		Stork-billed Kingfisher	*Plargopsiscapensis*	C	RE	LC
21	Cerylidae	Pied Kingfisher	*Cerylerudis*	C	RE	LC
22		Common Kingfisher	*Alcedoatthis*	C	RE	LC
23	Meropidae	Green Bee eater	*Meropsorientalis*	C	RE	LC
24	Coraciidae	Indian roller	*Coracias benghalensis*	C	RE	LC
		Order : Gruiformes				
25	Rallidae	White Breasted Waterhen	*Amaurornisphoenicurus*	C	RE	LC
26		Purple moorhen	*Porphyrio porphyrio*	A	RE	LC
27		Common Moorhen	*Gallinulachloropus*	A	RE	LC
28		Eurasian coot	*Fulicaatra*	A	WM	LC
29		Baillon's crake	*Porzana pusilla*	R	WM	LC
		Order : Anseriformes				
30	Anatidae	Ruddy Shelduck	*Tadornaferruginea*	R	WM	LC
31		Eurasian Teal	*Anas crecca*	R	WM	LC
32		Cotton pigmy goose	*Nettapuscoromandelianus*	A	WM	LC
33		Gadwall	*Anasstrepera*	C	WM	LC
34		Garganey	*Anas querquedula*	C	WM	LC
35		Ferruginous duck	*Aythya nyroca*	A	WM	LC
36		Tufted duck	*Aythyafuligula*	C	WM	LC
37		Common Pochard	*Aythya ferina*	C	WM	VU
38		Northern Shoveler	*Anasclypeata*	R	WM	LC
39		Northern Pintail	*Anasacuta*	C	WM	LC
40		Spot billed duck	*Anas poecilorhyncha*	C	WM	LC
41		Red crested pochard	*Netta rufina*	A	WM	LC
42		Lesser Whistling Duck	*Dendrocygnajavanica*	A	WM	LC
43		Knob-billed duck	*Sarkidiornismelanotos*	O	WM	LC
44		Eurasian wigeon	*Anas penelope*	O	WM	LC
		Order : Pelecaniformers				
45	Threskiornithidae	Black headed ibis	*Threskiornismelanocephalus*	C	WM	NT
46		Glossy Ibis	*Plegadis falcinellus*	O	WM	LC
47	Ardeidae	Purple Heron	*Ardeapurpurea*	C	RE	LC
48		yellow bittern	*Ixobrychus sinensis*	R	WM	LC
49		Cattle Egret	*Bubulcus ibis*	A	RE	LC
50		Little Egret	*Egrettagarzetta*	A	RE	LC
51		Great Egret	*Casmerodiusalbus*	C	RE	LC
52		Indian Pond Heron	*Ardeolagrayii*	A	RE	LC
		Order : Podicipediformes				
53	Podicipedidae	Little grebe	*Tachybaptus ruficollis*	A	WM	LC
54		Great crested gerebe	*Podicepscristatus*	O	WM	LC
		Order : Passeriformes				
55	Motacillidae	White Wagtail	*Motacilla alba*	C	RE	LC
56		Citrine Wagtail	*Motacilla citreola*	C	LM	LC
57		yellow wagtail	*Motacilla flava*	C	LM	LC
58		Paddyfield pipit	*Anthusrufulus*	C	RE	LC
59	Ploceidae	Baya Weaver	*Ploceusphilippinus*	C	RE	LC
60	Dicruridae	Black drongo	*Dicrurusmacrocercus*	A	RE	LC
61	Hirundinidae	Barn Swallow	*Hirundorustica*	A	RE	LC
62		Wire-tailed Swallow	Hirundo smithii	C	RE	LC
63	Sturnidae	Bank myna	*Acridotheresginginianus*	C	LM	LC
64		Jungle myna	*Acridotheresfuscus*	A	RE	LC
65		pied myna	*Gracupica contra*	C	RE	LC
66		Brambhany starling	*Sturnusroseus*	A	RE	LC
67		Common Myna	*Acridotherestristis*	A	RE	LC
68	Nectarinidae	Purple Sunbird	*Cinnyris asiaticus*	C	RE	LC
69	Corvidae	House crow	*Corvus splendens*	C	RE	LC
70	Oriolidae	Black hooded oriole	*Oriolusxanthornus*	C	RE	LC

71	Muscicaspidae	Oriental Magpie Robin	*Copsychussaularis*	C	RE	LC
72	Leiothrichidae	Jungle Babbler	*Turdoidesstriata*	A	RE	LC
73	Cisticolidae	Ashy Prinia	*Priniasocialis*	C	RE	LC
74		Zitting cisticola	*Cisticola juncidis*	C	RE	LC
75		Common Tailorbird	*Orthotomus sutorius*	A	RE	LC
76	Pycnonotidae	Red-vented Bulbul	*Pycnonotuscafer*	C	RE	LC
77	Laniidae	Brown shrike	*Laniuscristatus*	C	RE	LC
		Order : Falconiformes				
78	Falconidae	common kestrel	Falco tinnunculus	R	LM	LC
		Order : Accipitriformes				
79	Pandionidae	Osprey	*Pandionhaliaetus*	R	LM	LC
80	Accipitridae	black-shouldered kite	*Elanus axillaris*	C	RE	LC
81		Black kite	*Milvus migrans*	C	RE	LC
		Order : Bucerotiformes				
82	Upupidae	Common Hoopoe	*Upupaepops*	C	RE	LC
		Order: Piciformes				
83	Megalaimidae	Copper smith Barbet	*Megalaimahaemacephala*	C	RE	LC
84		Blue throated Barbet	*Psilopogonasiaticus*	C	RE	LC
		Order : Cuculiformes				
85	Cuculidae	Asian Koel	*Eudynamysscolopaceus*	A	RE	LC
86		Greater Coucal	*Centropus sinensis*	C	RE	LC
87		Indian Cuckoo	*Cuculus micropterus*	C	RE	LC
		Order: Psittaciformes				
88	Psittaculidae	rose-ringed parakeet	*Psittacula krameri*	C	RE	LC
		***Order:* Columbiformes**				
89	Columbidae	Spotted dove	*Spilopelia chinensis*	C	RE	LC

***Note*:** C = Common, A = Abundant, O = Occasional, R = Rare, RE- Resident, LM - Local Migrant, WM - Winter migrant, (IUCN) Categories: LC: Least Concern; VU: Vulnerable; NT : Near threatened

Maximum bird species were recorded during winter season due to presence of various types of migratory birds. The density of water bird was lowest during summer season followed by monsoon. A winter migratory bird generally arrives in the month of november and stayed up to March in every year. Overall Status of bird recorded at Purbasthali Oxbow Lake is given in Table 2. Among the winter migratory birds Lesser whisteling duck, Cotton pygmy goose, Red crested pochard and Ferruginous duck are abundant in this lake. Birds were categorized as Common (C) 49 species, Abundant (A) 24 species, Rare (R) 10 species and Occasional (O) 6 species.

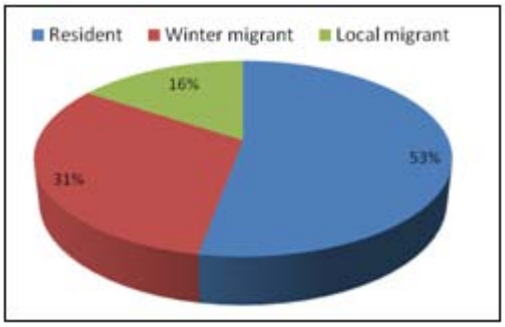

Figure 2: Residential Status of Birds in Purbasthali Oxbow Lake

Table 2: *Status of bird recorded at Purbasthali Oxbow Lake*

Sl.No	Order	No of Families	No of Species	Occurrence				Residential Status		
				C	A	O	R	RE	LM	WM
1	Charadriiformes	5	16	9	3	1	3	2	7	7
2	Suliformes	1	2	0	1	0	1	1	1	0
3	Ciconiiformes	4	6	5	1	0	0	6	0	0
4	Gruiformes	1	5	1	3	1	0	4	0	1
5	Anseriformes	1	15	6	4	2	3	0	0	15
6	Pelecaniformers	2	8	3	3	1	1	4	1	3
7	Podicipediformes	1	2	0	1	1	0	0	0	2
8	Passeriformes	13	23	16	7	0	0	20	3	0
9	Falconiformes	1	1	0	0	0	1	0	1	0
10	Accipitriformes	2	3	2	0	0	1	2	1	0
11	Bucerotiformes	1	1	1	0	0	0	1	0	0
12	Piciformes	1	2	2	0	0	0	2	0	0
13	Cuculiformes	1	3	2	1	0	0	3	0	0
14	Psittaciformes	1	1	1	0	0	0	1	0	0
15	Columbiformes	1	1	1	0	0	0	1	0	0
Total		36	89	49	24	6	10	47	14	28

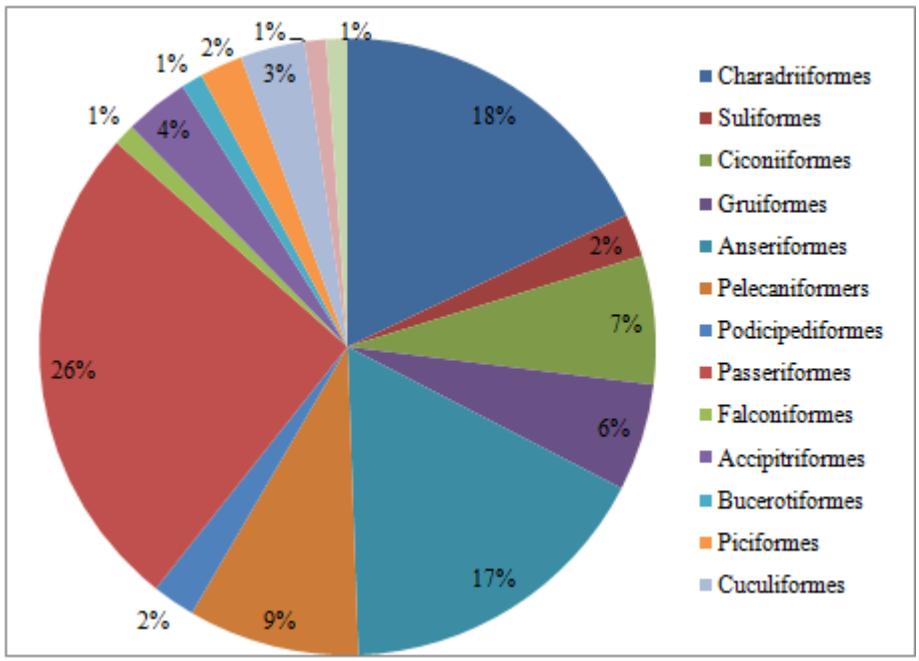

Figure 3: Avian diversity of Purbasthali Oxbow Lake in terms of order

The lake thrives lots of residential bird species like Bronze winged jacana, Pheasant tailed jacana, Purple moorhen, Common Moorhen, Purple Heron, Indian Pond Heron etc. Local migratory species like Red-Wattled Lapwing, Yellow-Walted Lapwing, Common redshank, Green sandpiper, common crestol were also very important to the lake ecosystem. Among the winter migratory birds, Lesser Whistling Duck were the most abundant species. Cotton pigmy goose, Ferruginous Pochard, Red crested Pochard was also found in good number in this area. The species like Knob-billed duck, Glossy Ibis, Great Crested Grebe, Black winged stilt were occasionally visited this area. Some species like Ruddy shelduck, Eurasian teal, little stint etc. are rarely found in the Purbasthali oxbow lake.

4. Conclusion

The present study reveals that the Purbasthali Oxbow Lake is an important habitat for various avifaunal species including winter migratory birds. Most of the avian species found during the winter season due to presence of twenty eight migratory birds species. Now-a-days the lake is undergoing unwanted change in biodiversity due to unplanned management strategies. Expansion of agricultural activities, use of pesticides, livestock grazing and use of submerges fishing net were the main threats to the survival of the birds in and around Purbasthali Oxbow Lake. Activities of the tourists are also causing disturbances to the lake ecosystem. There should be strict management rules for the tourists for the conservation of biodiversity in the lake area. The ecological health of the lake and habitat quality for birds can be improved by initiation of vegetation control program, regulation on the use of pesticides, pollution control strategies, strict check on land encroachment in this area, regulated tourism practices, scientific research and monitoring practices etc. A sustainable and holistic management planning is necessary for conservation of Purbasthali oxbow lake.

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