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Diversity, abundance and migration pattern of avian species in Chupi Char, Purbasthali, Purba Burdwan, West Bengal, India

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Abstract
Winter migration pattern of avian community was studied in Oxbow lake, Chupi char, Purbasthali, Purba Burdwan. The area supports life of a good number of avian communities, mostly migratory in nature, belonging to 13 orders and 36 families. The habitat was dominated by 14 different bird species mainly from order Anseriformes and Charadriiformes. Though the dominant order was Passeriformes with 27 different species but abundance of birds was more in Anseriformes and Charadriiformes. The diversity indices indicate the habitat as a high species richness area with low species evenness. The study shows that meteorological factors such as day length and temperature exert negative effects upon bird population. Interspecific competition for resource utilization also puts a pressure upon the community. The habitat faces great threat due to the anthropogenic activity. During winter the area is used for recreational purposes which ultimately causes fall in number of these winged beauties, the winter guests of our country.

Keywords: Chupi char, avian diversity, migratory birds, rank abundance curve, Trans- Himalayan migrant

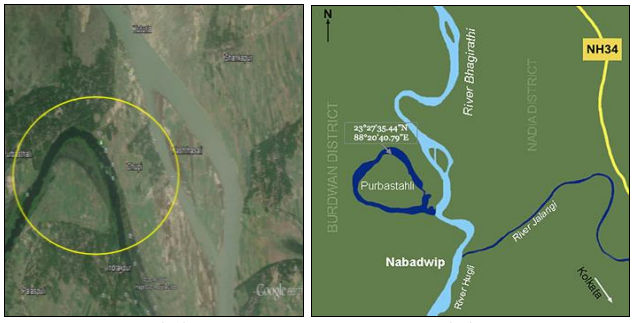
Introduction
Migration is a regular seasonal movement of animals to ensure the best possible living conditions for their survival. As a rule, it is an innate response of an animal population to several periodic changes in the environmental conditions. Among all the animals, avian migration is interesting and best studied. The birds' habitat can be roughly divided into forests, scrub, wetlands, marine, grasslands, and agricultural land. Many bird species require mixed habitat.

Wetlands are one of the most productive ecosystems on earth that support a rich array of waterbird communities [1, 2, 3] on account of their high nutritional value as well as productivity [4]. Selection of wetlands by waterfowl is influenced by a complex of characteristics including water chemistry, aquatic vegetation, physical features and availability of food [5].

During winter, several species of birds migrate annually from Trans-Himalayan regions to the wetlands of India. They spend the entire winter at these wetlands and return with the onset of spring. Others migrate locally, southwards from the Himalayan foothills for search of warmer climate [6]. Birds play an important role in ecosystem by being as a part of the food web. They are potential pollinators and bio-indicators [7]. Birds inhabit in wetlands and use the area for feeding, roosting, nesting and rearing young [8, 9]. There is growing interest in diversity of avifauna in different wetlands [10, 11, 12, 13, 14, 15, 16, 17, 18, 19].

This study is based upon the total count of avian species (resident, resident migrant and trans-Himalayan migrant) in Purbasthali, Purba Burdwan, West Bengal, spanning 5 months of winter season, from October-2021 to February-2025. Lots of work has been conducted elsewhere yet, no comprehensive ecological studies have been taken up and consequently, no concise report on field characteristics, status, distribution of avifauna and notes on the general ecology of this particular area is available other than scanty sporadic literature [20]. The lake has large trees along its banks, which provides shelter and food for many species of birds. Water Hyacinth (*Eichhornia crassipes*) proliferates in the lake. Objectives were first to determine the nature of avian populations throughout the winter season, second inter specific relationships among Trans-Himalayan migrants if any, third, situation of the lake regarding conservational aspect of avian species.

Materials and Methods
Study area
Oxbow lake, purbasthali, purba burdwan- On the Tropic of Cancer lies the quaint town of Purbasthali, in Purba Burdwan, West Bengal. It is 120 kms north from Kolkata. Also known as Chupi Char, Purbasthali lies on the banks of a large oxbow lake created by the river Ganges (Fig 1).



(A) (B)

Fig 1: A. Satellite image and B. Schematic Presentation of Oxbow Lake, Purbasthali, Burdwan

The lake itself is a narrow strip with clear blue water. In most parts it is not deep and is remarkable for the heavy growth of aquatic sweet water plants. The Latitude and Longitude of Chupi Char is as follows, 23˚27˙35.44 N and 88˚20˙40.79 E at an elevation of 16 Meter.

Methodology followed
In Southern West Bengal, Migration is usually complete by the end of December. Migratory waterbird populations

peaking during last week of December and the first week of January [17]. Therefore, the present survey was conducted from October 2021 to February 2025 covering both the ends of migratory birds' entry and exit. A total of 10 days and 48 hours were spent on the lake for data collection. Line transact [21, 22, 23, 24, 25], point count [24] and block count methods [26] were used for the bird survey. Line transact proved to be the most efficient in terms of data collection per unit effort. The length of line transact was 1 km from the west to east of study area. Field works were carried out on boat at an average speed of 1.5 to 2 km/hour. The visiting hours were from 7.30 a.m. to 12.30 p.m. This large lake was divided into few imaginary blocks and the waterbirds in each block were counted in succession. For this purpose, two pairs of binoculars (PORO Prism) (8X40 and 10X50 magnification) made by Olympus, and one digital SLR camera, Model D80, CANON, (with 400 mm prime lens), and other relevant materials like pen, paper were used. During bird counting all the birds were photographed maximum possible times to identify them exactly. Whenever a bird's call, or flight, or any movements were observed, photographs were taken whereever possible. All the bird's species which are presented in this report were photographed during the study period. The birds flying from behind were also noted. The recorded bird species were identified, followed nomenclature using the books of 'The Birds of Indian Subcontinent, By Grimmett *et al*; [27] and 'The book of Indian birds' by Salim Ali and Ripley [28].
Statistical analysis All sorts of statistical analysis were performed using Microsoft Excel Mac 2011 software.

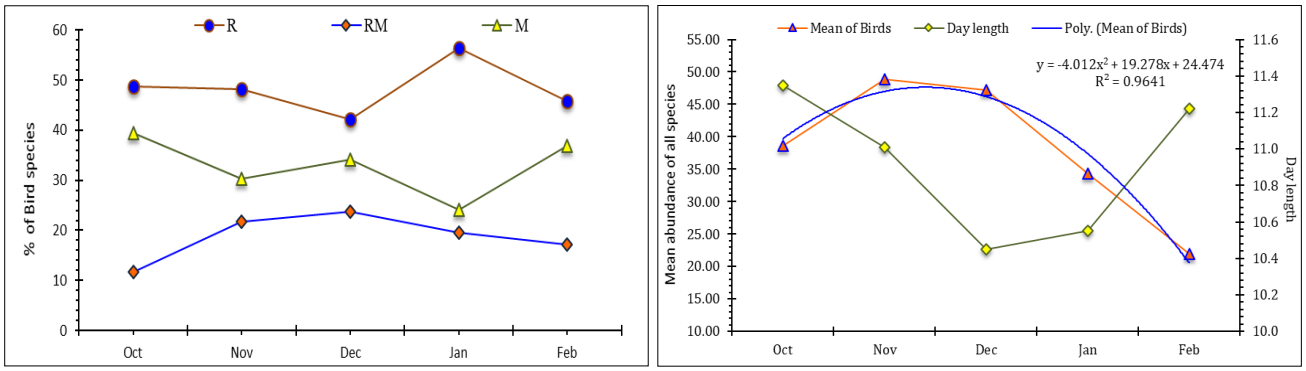
Measurement of Species Richness
Margalef's index was used as a simple measure of species richness [29].
Margalef's index = (S-1)/ln(N), where, S= total number of species. N= total number of individuals in the sample, and ln= natural logarithm.

Measurement of Species Evenness (Evar)
The Evar (Smith and Wilson's evenness) index is evaluated by [30]:
Evar = 1 – 2 / (π × arctan (∑I {log(ni) - ∑j {log(nj)} }2 / S))
Where n_i and n_j are the number of individuals in species i and j respectively, and S is the total number of species.

Species Diversity
Species diversity was calculated using the Shannon index [31].
Dominance Indices Two separate dominance index were used to calculate the diversity of birds, one is Berger-Parker index and the other is Simpson index. Berger-Parker index was calculated using the following formula, $D_{BP}=N_{Max}/N$, where, N_{max} is the total number of individuals in the most common species and N is the total number of individuals in the community [32]. To express greater diversity with numerically increasing value $D_{BP}=1/D$ was used. Simpson's index was calculated using the protocol given by Simpson 1964 [33]. Simpson's index is expressed here as $1/D_s$ in order to obtain increasing values of the index with increasing diversity.

Rank-abundance curve and Lorenz curve
The rank-abundance curve was constructed using formula provided by McGill B.J [34]**.** Lorenz curves are used widely in socio-economics to demonstrate phenomena such as disproportionate distribution of wealth [35]. This curve can also be used to demonstrate the degree of inequality in a given area among birds' species observed.

Results
A total of 16819 individuals were counted during the study period. All the 16819 individuals were from 96 different species. When the data obtained from study period were pooled it was found that more than 45% of the birds counted were belonging to Resident status (R), more than 27% and 28% of total birds fell under the category of Resident Migratory (RM) and Trans-Himalayan Migratory (M) segment, respectively.
When the percentages of birds observed in each month were plotted it was found that the resident-migratory birds showed a classical pattern, the bird count increased till end of December and then declined from January onwards (Fig. 2A). Percentage of Resident and Trans-Himalayan birds were showed somewhat unusual pattern, where percentage of occurrence of Trans-Himalayan birds declined considerably in January than the bird count in February. Conversely, the occurrence of Resident birds increased dramatically in January than February (Fig. 2A).



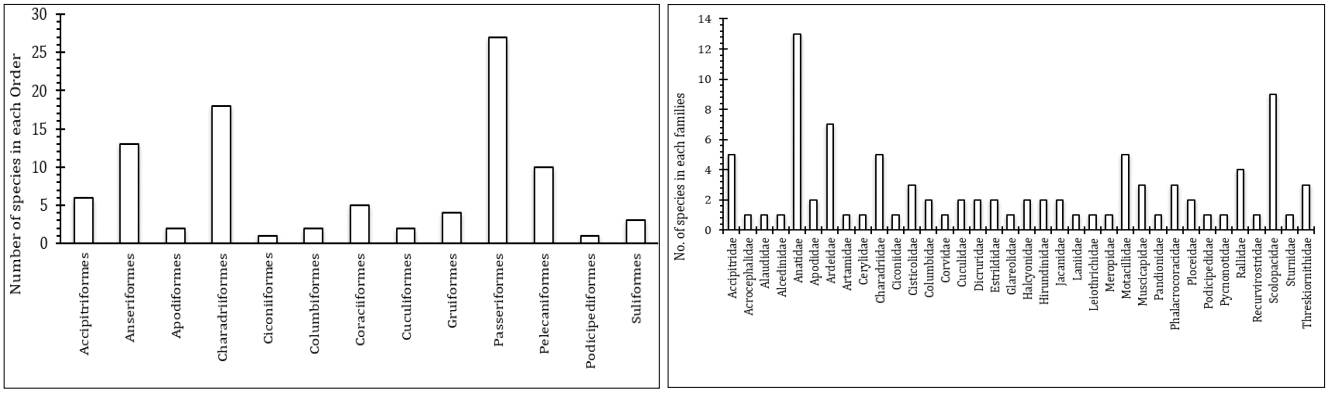
(A) (B)

Fig 2: A.Month wise presence of three different categories of avian speciesduring the study period.B. Relationships between day length and mean values of total bird observed in each month.R= Resident, RM= Resident-migratory and M= Trans-Himalayan Migratory species

Mean values of total abundance of birds in each month revealed that the abundance of birds increased in a steady manner from October to December, then it turned declining in a regular manner from January to February (Fig. 2B). The polynomial trend line and regression value (0.96) clearly substantiate the observation. We found negative

correlations of mean abundance of bird species with temperature and day length (data of temperature not shown in the figure) (Fig. 2B).

The 96 different bird species fell under 13 different Orders, of which Order Passeriformes was the dominant one (Fig. 3A) with 27 species, followed by Charadriiformes having 18 different species. The third dominant Order was Anseriformes with 13 species count.

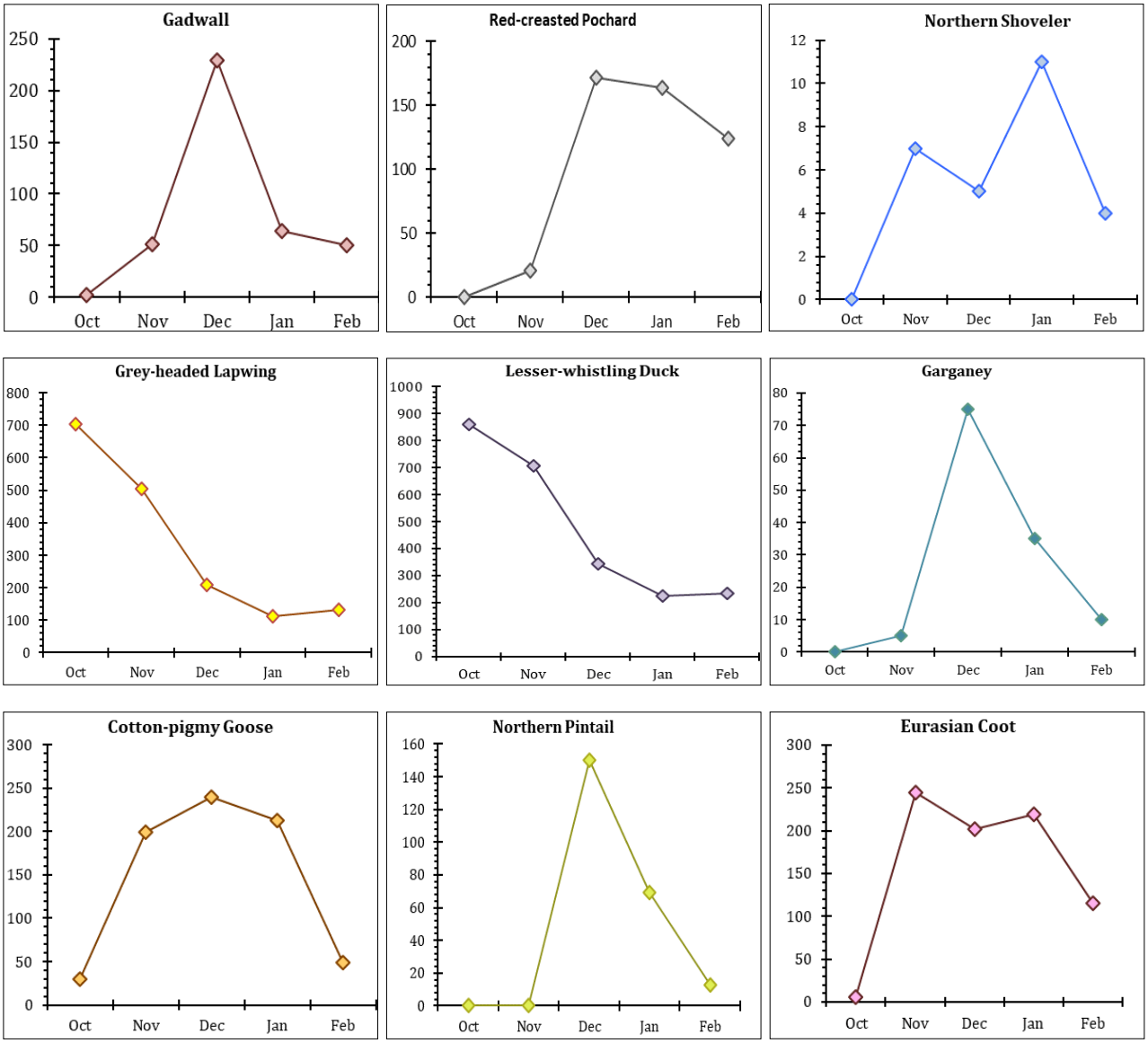


(A) (B)

Fig 3: Number of bird species, A. Composition based on Orders B. Composition based on families

The 13 different Order distributed in 36 different families of which family Anatidae was the major one comprising 13 different bird species, mostly Trans-Himalayan Migratory ones.

The second largest family was Scolopacidae with 9 species of Waders (sandpipers, godwit, stints, ruff etc). The third largest family was Ardeidae (Egrets and Herons) with 7 different avian species (Fig. 3B).



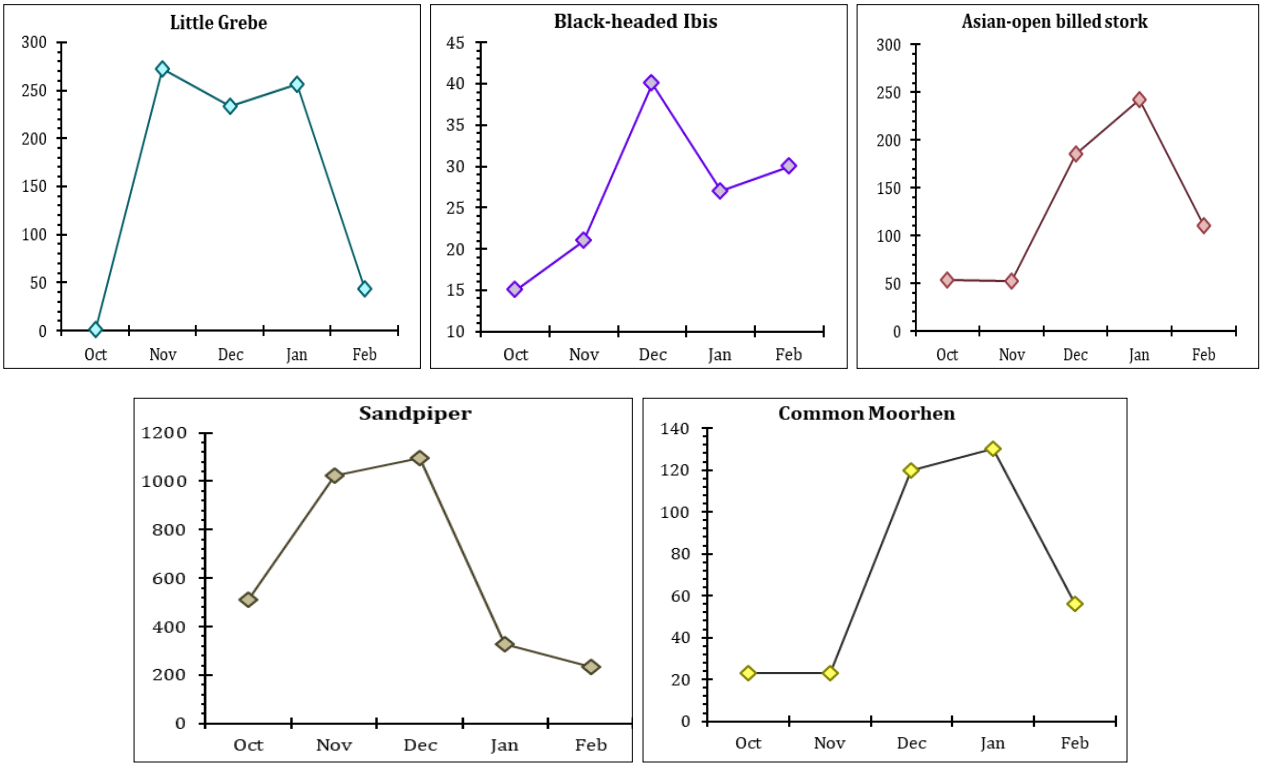


Fig 4: Month wise abundance patterns of different avian species

Monthwise pattern of 14 dominant birds were plotted (Fig. 4). From the figure it was found that 2 bird species namely, Lesser-whistling Duck (*Dendrocygna javanica*) and Grey-headed Lapwing (*Vanellus cinereus*) showed almost identical pattern where number of birds were most in October, then decreased gradually till January and then again increased slightly in February. Of the remaining 12 species, 6 Trans-Himalayan species namely, Gadwall (*Anas strepera*), Garganey (*Anas querquedula*), Red-crested Pochard (*Netta rufina)*, Northern Shoveler (*Anas clypeata*), Northern Pintail (*Anasa cuta*), and Black-headed Ibis (*Threskiornis melanocephalus*) followed almost similar month wise distribution pattern, with highest abundance in the month of December.

The two species Little Grebe and Eurasian Coot counts very little during early winter months, i.e., October. Then their number increased dramatically till December and again from January, their number decreased heavily (Fig. 4). The abundance of Cotton-Pigmy Goose followed a typical bell-shaped pattern, peaked in December and then nearly come to its October count in February.

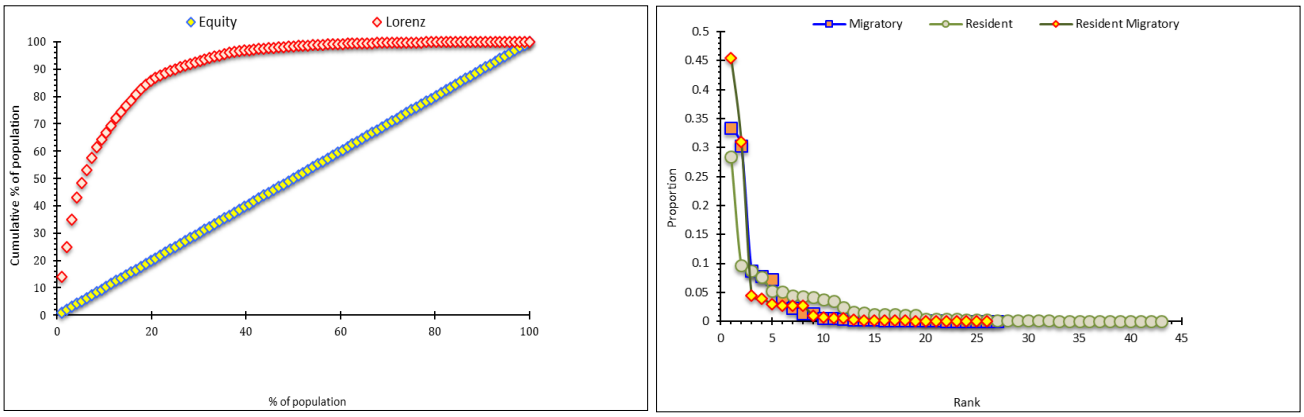
The time wise distribution pattern of Common Moorhen and Asian Open-billed Stork was almost identical, both increased in number steadily till January and then their number declined in a drastic manner (Fig 4). Both these species have comparable regression value ranges between 0.62 to 0.64. When the data obtained for both the sandpipers (common and wood) were plotted it also appeared bell shaped, increased till December and then their number fell well below their initial individual count of October (Fig 4). The regression value (0.72) clearly supports for this particular type of pattern formation.

Table 1: Species Diversity, Evenness and Richness to indicate biodiversity pattern in the study area during study period

Parameters	Values
Berger-Parker Dominance Index (1/D)	7.097
Simpson's Index of Diversity (1-D)	0.937
Shannon-Wiener Diversity Index	3.22
Evenness	0.13
Margalef's Richness Index	9.87

The Berger-Parker and Simpson's index of diversity clearly indicate high avian diversity in the study area during study period. The Berger-Parker index stands 7.097 and Simpson's diversity index comes with a value of 0.937 (Table-1). To substantiate the data further, we calculate another information statistic index, that is Shannon-Wiener diversity index. The value of this index is 3.22, which is fairly high.

For better understanding the nature of diversity of the study area Evenness of the species observed was calculated and it was 0.13, which is being reflected in the rank-abundance curve, by its steep slope (Fig. 5B). Another contributor of diversity, species richness when calculated using Margalef's index calculation, the data of 9.87 was obtained, which is fairly high and get support from the Rank-Abundance curve by its long tail (Fig. 5B). For calculation of probability distribution and analysis of inequality, we constructed Lorenz curve (Fig. 5A). From this figure it is clear that only 11 dominant species represented 70% of cumulative population and the rest 30% is being contributed by 85 species. For better representation of the data gathered, qualifying abundance, richness and evenness, constituting biodiversity, the rank-abundance curve was generated (Fig.5B).



(A) (B)

Fig 5: A. Lorenz curve showing the distribution of different speciesfrom equity.B.Rank-abundance curve showing comparison of proportion of Migratory, Resident and Resident Migratory community structure in the study area

During this study period 11 species of birds were found active in and around the water body (Fig 6). Lesser Whistling Duck followed by Cotton Pigmy Goose, Red-crested Pochard, Gadwall, Northern Pintail, Northern Shoveler, and Garganey were the most common duck species. During this study period, Tufted Duck, Common Pochard, Spot-billed Duck, Ferruginous Pochard, and Eurasian Wigeon were also observed in small numbers.

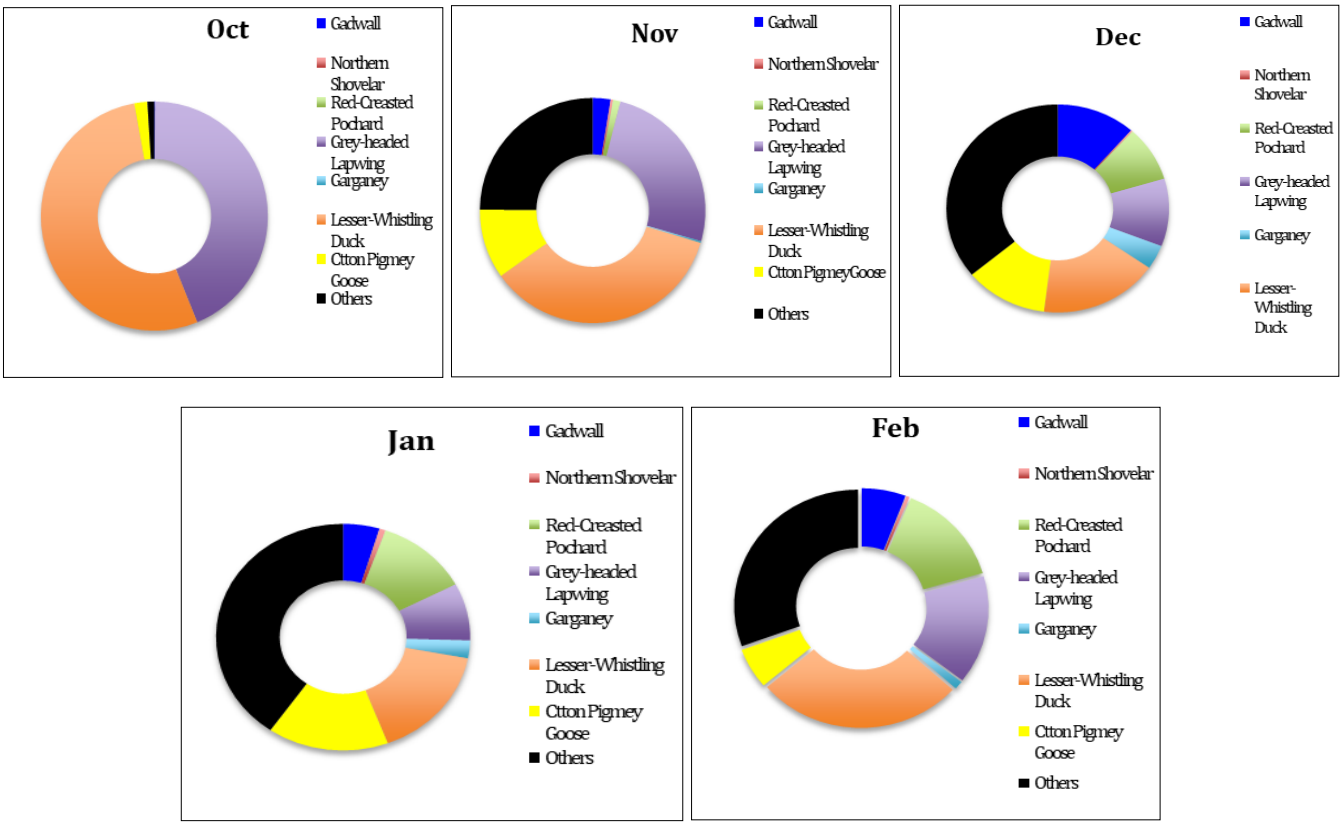


Fig 6: Changes in the number and occupancy of habitat by dominant waterbirds during study period

From figure 6 it is clear that Tufted Duck, and Cotton Pigmy Goose were the early comer for winter along with Lesser whistling Duck and Grey-headed Lapwing. In successive months as the number of other Trans-Himalayan Migrants increased the number of Lesser Whistling Duck and Grey-headed Lapwing decreased considerably. From November onwards, the dominated birds were Eurasian Coot, Little Grebe, Common Moorhen (pooled in 'others' segment in Doughnut chart). In December and in January one of the major winter migrant plotted in the other section of the Doughnut chart was the Northern Pintail (*Anas acuta*).

Discussion

The bird species observed during this study period were categorized in three distinct groups,

Resident birds: 42% of the total birds counted were under this category. These bird's species are regularly observed in the study area for feeding as well as breeding in this wetland.

Resident- Migrant: 32% of the total bird species are categorized as resident-migrant. Their local movements are restricted to small distances either for feeding or for breeding. This migration can be latitidunal or even altitudinal.

Trans-Himalayan Migrant: these birds occupied 26% of the total count. They come to visit India somewhere mainly from the upper part of Asia and some part of Europe. The birds of the families Anatidae, Scolopacidae, Charadriidae, Gruidae and some Passerine birds mainly constitute this segment [36]. From the data it can be concluded that all the birds of the above said families were winter migrant.

The number of all three categories of birds varied considerably spanning the study period. The resident-migrant birds followed traditional pattern [16, 17], their number increased from October to December and then their number declined till end of February. The individual count of migratory waterbirds varied greatly without following any definite pattern unlike any previous report [16, 17]. We noticed that during winter season anthropogenic activities increased heavily in and around the lake, peoples used the lake for their recreational purposes; loud music's were played. These activities possibly thrash the Trans-Himalayan migrants out of the lake to some nearby quite places. They again returned the lake in February. As resident birds are somewhat accustomed to anthropogenic activities their number actually increased in January.

Total bird count data clearly showed that the number of birds increased steadily from October till December and then the number started declining till end of February. The regression value of more than 90% endorses the statement.

In this study we have encountered 96 different species of birds from 13 Orders and 36 Families. This data showed that the birds favour this place more than some other well-known places of our country [14, 18, 19, 37, 38]. The availability of profuse green belt in and around this site may have facilitated easy means of roosting and perching to waterbirds, which may account for the higher diversity of avifauna observed at this site. Our data clearly substantiates the observations made by [39], according to them the sites that maintained moderate water depth with more aquatic macrophytes and more associated grasslands are preferred by birds. Waterbirds, being generally at or near the top of most wetland food chains are highly susceptible to habitat disturbances and are therefore good indicators of general condition of aquatic habitats. The rich diversity of wetland birds documented during this present study may be because of availability of varied sources of feed as well as foraging.

Interestingly, our data differs from the data obtained by Abdar MR, 2014 [14], where they found Order Ciconiiformes as the most prevalent one followed by Anseriformes. But, we found Passeriformes as the most dominant one followed by Charadriiformes and Anseriformes. Ciconiiformes was not so dominant order here in Chupi Char, Purbasthali. The data clearly indicates that in the Western part of our country the nature of winter migrant ducks (Family Anatidae) is clearly distinct from our observation. Our data also differs slightly from the data obtained from Santragachi Jheel by Mazumdar S, 2005 [17]. They did not observe any Red-crested Pochard or Cotton Pigmy Goose there, but these two species were abundant in our study area almost throughout the winter season. The birds of Family Scolopacidae and Charadriidae were more in number in our study area than Santragachi Jheel [16]. We also differ from the data provided by Chavhan PR [37], who recognized Accipitridae as the largest family in and around Chaprala Wild Life Sanctuary, Maharashtra. But the only difference was that they took the data of a whole year rather than the data from only winter months.

The bird count of two dominant species namely, Lesser-whistling Duck and Grey-headed Lapwing decreased regularly from October, though these two birds were first to arrive along with Cotton-pigmy Goose. The regression value of 0.95 and 0 .97 respectively supports the observation. It was noted in previous year also (unpublished data) that these two species of birds were the first comer and then after arrival of other dominant bird species of family Anatidae their number decreases steadily. There may some kind of inter-specific competition taking place, which demands more year's data.

Most of the dominant migrant ducks of this area, Gadwall, Red-crested Pochard, Northern Pintail, Garganey peaked in late December, and their number declined in either side of that month. The regression values of those birds fell mainly in the range of 0.55- 0.70, which indicates their somewhat uneven distribution spanning the study period; again, to us the most noticeable cause was the human interferences. Fletcher *et al*, 2005 [40], found in their study that avian species richness changed dramatically as a function of recreational activity. Although the data presented above clearly is in tune with the previous records [16, 17]. Northern Shoveler, followed the same path as the other Anatidae family members with a regression value of 0.65, but this bird peaked in January than in December.

When the dominant indices of the community were calculated it was observed that Berger-Parker index and Simpson's index, who are highly weighted towards the dominant species, a considerably high index value, 7.07 and 0.937 respectively were obtained indicating a diverse habitat. To give emphasis to rare species, Shannon Wiener index was calculated and again the index value of 3.22 indicates a good healthy diverse community. Species richness is very much vulnerable to both the sampling size as well as presence of different species. Margalef's species richness score of 9.87 indicates a rich biodiversity area, which is substantiated by the Rank-Abundance Plot contributed mostly by the resident birds. The steep slope of rank-abundance curve indicates poor evenness, where only few species dominate, and statistically this scenario is being proved by Smith and Wilson's evenness index which came 0.13 in a scale of 0-1 where greater the number means more even a community.

From the data of diversity indices, abundance curve and Lorenz curve, it can be hypothesized that this particular community is dominated by some 11 dominant bird species, who are mostly Trans-Himalayan migrant or Resident Migrant in nature. On the contrary the habitat is bestowed with a good number of rare bird species with fewer number of individuals. It can be said that the particular community is low in evenness but rich in species richness at least during the winter season.

This study provides a baseline data about the avian diversity of Chupi Char, Purbasthali, Purba Burdwan and therefore emphasizing a better management of the habitat and conservation of its rich avifaunal diversity. The unabated and unplanned change incurred upon water resources due to anthropogenic pressure is causing a decline in the water quality. Waterbird species with restricted foraging niches are under threats from pressure such as loss and modification of habitat via changes in macrophytic composition and structure as well as macroinvertebrate availability. It is already established that the migratory birds' populations are either increasing or stable in some

part of South Bengal over the last many years [41]. In this regard, further study on species richness with habitat preferences of species and additional observations at this site at other times of the year, and several years are needed to provide for deeper insight, better orientation and implementation of legislation and management policies.

Appendix: List of Avian fauna documented during the study

Sl.No	Species of Birds	Order	Family	Scientific Name	Status
1	Black Kite	Accipitriformes	Accipitridae	*Milvus migrans*	R
2	Black-Shouldered Kite		Accipitridae	*Elanus axillaris*	R
3	Marsh Harrier		Accipitridae	*Circus aeruginosus*	M
4	Oriental Honey Buzzard		Accipitridae	*Pernis ptilorhyncus*	RM
5	Osprey		Pandionidae	*Pandion haliaetus*	M
6	Pallas's Fish Eagle		Accipitridae	*Haliaeetus leucoryphus*	M
7	Common Pochard	Anseriformes	Anatidae	*Aythya ferina*	M
8	Cotton Pigmy Goose		Anatidae	*Nettapus coromandelianus*	R
9	Eurasian Wigeon		Anatidae	*Anas penelope*	M
10	Common Teal		Anatidae	*Anas crecca*	M
11	Ferruginous pochard		Anatidae	*Aythya nyroca*	RM
12	Gadwall		Anatidae	*Anas strepera*	M
13	Garganey		Anatidae	*Anas querquedula*	M
14	Lesser Whistling Duck		Anatidae	*Dendrocygna javanica*	R
15	Mallard		Anatidae	*Anas platyrhynchos*	M
16	Northern Pintail		Anatidae	*Anas acuta*	M
17	Northern Shoveler		Anatidae	*Anas clypeata*	M
18	Red-crested Pochard		Anatidae	*Netta rufina*	M
19	Spot-billed Duck		Anatidae	*Anas poecilorhyncha*	RM
20	Tufted Duck		Anatidae	*Aythya fuligula*	M
21	Asian Palm Swift	Apodiformes	Apodidae	*Cypsiurus balasiensis*	R
22	Black-tailed Godwit	Charadriiformes	Scolopacidae	*Limosa limosa*	M
23	Black-winged Stilt		Recurvirostridae	*Himantopus himantopus*	M
24	Bronze-winged Jacana		Jacanidae	*Metopidius indicus*	R
25	Common Greenshank		Scolopacidae	*Tringa nebularia*	M
26	Common Redshank		Scolopacidae	*Tringa totanus*	M
27	Common Sandpiper		Scolopacidae	*Actitis hypoleucos*	RM
28	Common Snipe		Scolopacidae	*Gallinago gallinago*	M
29	Green Sandpiper		Scolopacidae	*Tringa ochropus*	M
30	Grey-headed Lapwing		Charadriidae	*Vanellus cinereus*	M
31	Kentish Plover		Charadriidae	*Charadrius alexandrinus*	RM
32	Little Ringed Plover		Charadriidae	*Charadrius dubius*	RM
33	Little Stint		Scolopacidae	*Calidris minuta*	RM
34	Temmninck's Stint		Scolopacidae	*Calidris temminckii*	RM
35	Pacific Golden Plover		Charadriidae	*Pluvialis fulva*	RM
36	Phesant-tailed Jacana		Jacanidae	*Hydrophasianus chirurgus*	R
37	Red-wattled Lapwing		Charadriidae	*Vanellus indicus*	R
38	Ruff		Scolopacidae	*Philomachus pugnax*	M
39	Small Pratincole		Glareolidae	*Glareola lactea*	RM
40	Wood Sandpiper		Scolopacidae	*Tringa glareola*	M
41	Asian Open Billed Stork	Ciconiiformes	Ciconiidae	*Anastomus oscitans*	R
42	Eurasian Collared Dove	Columbiformes	Columbidae	*Streptopelia decaocto*	R
43	Spotted Dove		Columbidae	*Spilopelia chinensis*	R
44	Common Kingfisher	Coraciiformes	Alcedinidae	*Alcedo atthis*	RM
45	Green Bee-eater		Meropidae	*Merops orientalis*	R
46	Pied Kingfisher		Cerylidae	*Ceryle rudis*	RM
47	Stork-billed Kingfisher		Halcyonidae	*Pelargopsis capensis*	R
48	White Breasted Kingfisher		Halcyonidae	*Halcyon smyrnensis*	R
49	Great Coucal	Cuculiformes	Cuculidae	*Centropus sinensis*	R
50	Asian Koel		Cuculidae	*Eudynamys scolopaceus*	RM
51	Common Coot	Gruiformes	Rallidae	*Fulica atra*	RM
52	Common Moorhen		Rallidae	*Gallinula chloropus*	R
53	Grey-headed Swamphen		Rallidae	*Porphyrio poliocephalus*	R
54	White Breasted waterhen		Rallidae	*Amaurornis phoenicurus*	R
55	Ashy wood Swallow	Passeriformes	Artamidae	*Artamus fuscus*	RM
56	Barn Swallow		Hirundinidae	*Hirundo rustica*	M
57	Grey-throated Martin		Hirundinidae	*Riparia chinensis*	R
58	Baya Weaver		Ploceidae	*Ploceus philippinus*	RM
59	Bengal Bushlark		Alaudidae	*Mirafra assamica*	R
60	Black Drongo		Dicruridae	*Dicrurus macrocercus*	R

61	Black-breasted Weaver		Ploceidae	*Ploceus benghalensis*	RM
62	Bluethroat		Muscicapidae	*Luscinia svecica*	M
63	Bronze Drongo		Dicruridae	*Dicrurus aeneus*	R
64	Brown Shrike		Laniidae	*Lanius cristatus*	RM
65	Long-tailed Shrike		Laniidae	*Lanius schach*	R
66	Citrine Wagtail		Motacillidae	*Motacilla citreola*	RM
67	Common Stonechat		Muscicapidae	*Saxicola maurus*	RM
68	Blyth's Reed Wrablar		Acrocephalidae	*Acrocephalus dumetorum*	RM
69	Jungle Babbler		Leiothrichidae	*Turdoides striata*	R
70	Jungle Prinia		Cisticolidae	*Prinia sylvatica*	RM
71	Olive-backed Pipit	Passeriformes	Motacillidae	*Anthus hodgsoni*	R
72	Paddy-field Pipit		Motacillidae	*Anthus rufulus*	R
73	Pied Sterling		Sturnidae	*Spreo bicolor*	R
74	Grey-throated Martin		Hirundinidae	*Riparia chinensis*	R
75	Plain Prinia		Cisticolidae	*Prinia inornata*	R
76	Red-vented Bulbul		Pycnonotidae	*Pycnonotus cafer*	R
77	Rufous Treepie		Corvidae	*Dendrocitta vagabunda*	R
78	Scaly-breasted munia		Estrildidae	*Lonchura punctulata*	R
79	Taiga Flycatcher		Muscicapidae	*Ficedula albicilla*	RM
80	Tailor Bird		Cisticolidae	*Orthotomus sutorius*	R
81	Tri-coloured Munia		Estrildidae	*Lonchura malacca*	R
82	White Wagtail		Motacillidae	*Motacilla alba*	RM
83	White-browed Wagtail		Motacillidae	*Motacilla maderaspatensis*	RM
84	Black-headed Ibis	Pelecaniformes	Threskiornithidae	*Threskiornis melanocephalus*	RM
85	Cattle Egret		Ardeidae	*Bubulcus ibis*	R
86	Eurasian Spoonbill		Threskiornithidae	*Platalea leucorodia*	M
87	Glossy Ibis		Threskiornithidae	*Plegadis falcinellus*	M
88	Great Egret		Ardeidae	*Ardea alba*	R
89	Indian Pond Heron		Ardeidae	*Ardeola grayii*	R
90	Intermediate Egret		Ardeidae	*Mesophoyx intermedia*	R
91	Little Egret		Ardeidae	*Egretta garzetta*	R
92	Purple Heron		Ardeidae	*Ardea purpurea*	RM
93	Little Grebe	Podicipediformes	Podicipedidae	*Tachybaptus ruficollis*	R
94	Great Cormorant	Suliformes	Phalacrocoracidae	*Phalacrocorax carbo*	RM
95	Indian Cormorant		Phalacrocoracidae	*Phalacrocorax fuscicollis*	RM
96	Little Cormorant		Phalacrocoracidae	*Microcarbo niger*	RM

Conclusion

Present study illustrates the importance of the area as a good habitat for avifauna. 96 species of birds belonging to 13 Orders and 36 Families were recorded during this study. The total number of birds suggests a good healthy condition in the study area. This is the only site spanning three districts, (Howrah, Hooghly and Burdwan), where Red-crested Pochard used to come in winter in large numbers. Proper awareness class regarding the importance of birds and vital role in daily life to the local peoples will ultimately help the protection of birds of this region. Control of habitat destruction, exploitation of its wilderness, human interference and pollution by visitors and recreational parties can be helpful in conservation of these winged beauties.

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