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Status, guild and diversity of avian fauna from a wetland site and surroundings, in Krishnagar, a City beside tropic of cancer, West Bengal, India

Madhuban Datta**Abstract**

A total of 98 taxa of avifauna belonging to 46 families has been recorded in a survey carried out from November 2012 to March 2016 at a wetland site (Sadhanpara Beel) and surroundings located in Krishnagar Block II, West Bengal, beside tropic of cancer. This is the first report of the avian diversity from the area. The site provided habitat to 59 species of resident, 16 species of winter migratory, 15 species of local migratory and 8 species of summer migratory bird. Among the feeding guilds, insectivores dominate in species strength (31.63%) closely followed by carnivores (25.51%), omnivores (19.38%), frugivore and grainivore (8.16%), piscivore (5.10%) and nectarivores (2.04%). Survey shows that the landscape is visited by one Near threatened (Black headed Ibis), one Vulnerable (Lesser Adjutant stork) and one Critically endangered (Indian vulture) occasionally. The results of relative diversity (RD) index showed that Accipitridae (RD value = 7.14) was the dominant family in the area. This is the first report of avifaunal diversity from the area. The present check list will provide baseline information for the bird diversity in and around the area.

Keywords: Avifaunal diversity, Status, Guild, Krishnagar Block II, West Bengal, India

1. Introduction

Birds can indicate the overall habitat quality and act as bioindicators of inhabited areas [1]. When birds are dependent on the habitat functioning in specific ways, the population trends of birds can tell us about how well the ecosystem is functioning. Indian subcontinent, a part of the vast Oriental Bio-geographic regions, is very rich in biodiversity. There are approximately 9,990 bird species recorded in our planet out of which, the Indian subcontinent is home to 1,313 bird species (over 13%) [2]. Population of bird is a very sensitive indicator of degree of pollution in both terrestrial and aquatic ecosystem [3, 4]. Avifauna are also important for the ecosystem as they play various roles as scavenger, pollinators, seeds dispersal agent and predators of insect pest [5, 6]. Unfortunately global diversity of birds is decreasing due to anthropogenic activities and climate changes [7, 8]. In the latest assessment in IUCN Red List, 2015, 1,375 species of birds are considered to be threatened with extinction globally out of which 84 are from India [9]

As compared to importance of other states as a sanctuary towards very few habitats from West Bengal has been thoroughly and systematically surveyed. Datta [10] reported the avifaunal diversity from two wetlands of Jalpaiguri District, West Bengal, Mukherjee and Gupta [11] recorded a total of 20 species of birds belonging to 8 families from Santragachi wetland. Roy *et al.* [12] studied avifaunal diversity in three different national parks and reserve forest in North Bengal and founded a total of 117 bird species belonging to 42 families. Dubey *et al.* [13] surveyed Jaldapara national park and found 99 taxa of birds in two consecutive years. Ganguly [14] made a comparative study on status of migratory water birds from different wetlands from eastern India. Patra and Chakrabarti [15] observed 86 bird species belonging 10 orders and 35 families in Digha in West Bengal. Pramanik *et al.* [16] studied biodiversity in Kulik Bird Sanctuary in Raigang, West Bengal and observed 29 bird species with 20 families. Some reports of avifaunal diversity from Murshidabad district are also available [17, 18]. However, surprisingly avifaunal diversity reports from district Nadia as a whole are practically nonexistent except one report from Bhattacharya *et al.* [19]. Krishnagar, district headquarters of Nadia, West Bengal, India, due to its unique geographical location beside the tropic of cancer and presence of Bahadurpur and Bethuadahari forest stretch is bound to harbour a rich

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collection of avian fauna. With this frame of mind the present study was conducted in different habitats of the study area viz., wetlands (beel), roadside plantation, forest areas and orchards, located in Krishnagar Block II, to record avian diversity from November, 2012 to March 2016. This communication presents the first detailed account of the avifaunal assemblages from the reported site.

2. Materials and Method

2.1. Study Area

This wetland site (23.500594°N, 88.404089°E) is reported from Krishnagar block II, located 20 km towards North from district head quarters Krishnagar, Nadia (Figure 1 and 2) about 125 km from State capital Kolkata. Krishnagar (23.4°N 88.5°E) is famous for its unique geographical location beside the tropic of cancer (23°26'5"N 88°28'2"E).

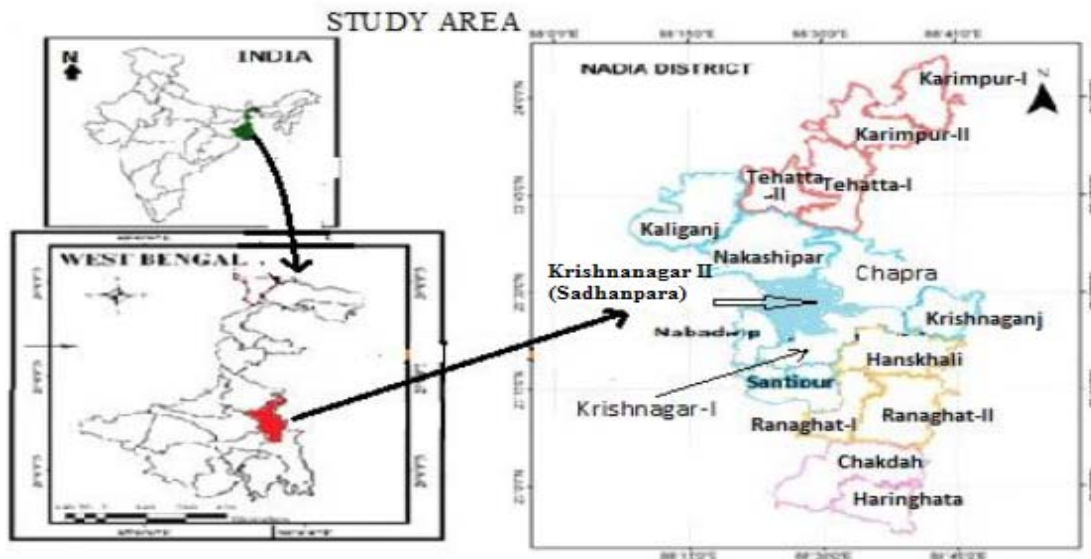


Fig 1: Location map of the study area

The wetland site is locally known as a Sadhanpara beel (a billabong or a lake-like wetland with static water), covering an area of 1.25sqkm (length 2.5km; breadth: 0.5km). The average water depth is 1.6m. The beel has recently been earmarked for intensive aquaculture by Sadhanpara cooperative society of fishermen. It is a completely rural area

with no urban area under it. The study site also included an area of about 3 km east of the beel including roadside plantations, mango and bamboo orchards and a stretch of forest area with the nearest habitation located about 3 km away.



Fig 2: Google earth image of the study site

2.2. Methods

To study the avifauna of Sadhanpur beel and surroundings monthly observations were conducted from November 2012 to March 2016. Fixed radius (20 m) point count method (for the forest patch and orchard), line transect method (for the wetland habitat, agricultural field and road side plantations) and direct observation methods were used [20]. The point count method was used for duration of 5 minutes at randomly selected points at least 100m apart and all observation were performed in the forward direction of movement. In the line transect part, a total of three transects were established along the various flat terrains available within the field areas. Each transect had a total length of 600 m, with 200 m of sub-transects which also served as the sampling sites. For water birds, observation sites were established at the edge of the beel at an interval of 500 meter from one site to another, where by four sites were established for sampling covering distance of 2000m. Monitoring of transects and census of birds were done either in early morning from 6.00 to 8.00 and late evening from 17.00 to 19.00 hours as the bird activities increased during those hours. Surveys were also done a few times at night for owls, thick knees and nightjars. The surveys were only performed during suitable weather (i.e., in the absence of rain or strong wind). Photography was done by making use of Sony DH-7 (8.1 mp with x15 optical zoom lenses) camera. Olympus 10x50 DPS binoculars were used to

observe the birds. Ali [21] Ali and Ripley [22] and Grimmet *et al.* [2], 1999 were referred for the identification of birds. The IUCN status of the birds were established as per Bird Life International, 2015.

Feeding guilds were classified as per direct observations and available literatures [22]. The feeding guilds were determined according to the primary and predominant food type. For example, Ring and Spotted Dove fed predominantly on grains and seeds but also sometimes on fruits. They were classified as grainivorous. This approach is consistent with the classifications used by Canaday [23], Fogden [24] and Wells [25, 26]. Birds were classified as Common (60-80% sighting), uncommon (40-60% sighting), occasional (20-40% sighting) and Rare (< 20% sighting). Resident- Migratory Status of the birds were classified as per available literatures [2]. Species found throughout the year were identified as resident (R), only winter migratory birds as WM-Winter Migrants, summer visitors as SM- Summer Migrants and species found irregularly but resident to India as LM-local Migrants. Breeding birds nest and newly fledged chick(s) were also observed in this study area and subsequently this information was used to assess the status of bird species that are resident to the area. The following formula was used for determining percentage of occurrence of Families [27]. Percentage of occurrence is also stated as Relative diversity.

$$\text{Percentage occurrence/ relative diversity} = \frac{\text{No of species of each family} \times 100}{\text{Total no. of different species seen}}$$

3. Results and Discussion

In the total study area an extensive range of different water, water associated and land birds (a total of 98 species) belonging to 46 families have been identified (Table 1). A comparative chart of the total bird species belonging to different families is given in Table 2. Most of the families are represented by one or two species (33 families), three to four

species (9 families), 5-6 species (3 families) and 7 species were found in only one family. Accipitridae was found to be the most dominant family in the area (RD Index value = 7.14) followed by Ardeidae (RD Index value = 6.12), Anatidae and Corvidae (RD Index value = 5.10) and others. The relative diversity of the families of bird is shown in Figure 3.

Table 1: Diversity, abundance, status, category and feeding guild of the avian fauna from the study site

Species no	Family	Scientific name	Abundance*	Status**	IUCN category***	Feeding Guild****
ANATIDAE						
1	Lesser whistling duck	<i>Dendrocygna javanica</i>	c	LM	LC	O
2	Gadwall	<i>Anas strepera</i>	c	WM	LC	O
3	Eurasian Wigeon	<i>Anas penelope</i>	r	WM	LC	O
4	Cotton pygmy goose	<i>Nettapus coromandelianus</i>	o	WM	LC	O
5	Common teal	<i>Anas crecca</i>	o	WM	LC	O
APODIDAE						
6	Asian Palm swift	<i>Cypsiurus balasiensis</i>	c	R	LC	I
ARDEIDAE						
7	Great egret	<i>Casmerodius albus</i>	o	R	LC	C
8	Cattle egret	<i>Bubulcus ibis</i>	c	R	LC	C
9	Grey heron	<i>Ardea cinerea</i>	o	WM	LC	C
10	Indian pond heron	<i>Ardeola grayii</i>	c	R	LC	C
11	Purple heron	<i>Ardea purpurea</i>	o	R	LC	C
12	Little egret	<i>Egretta garzetta</i>	c	R	LC	C
ALCEDINIDAE						
13	Common kingfisher	<i>Alcedo atthis</i>	r	R	LC	C
ACCIPITRIDAE						
14	Black kite	<i>Milvus migrans</i>	uc	R	LC	C
15	Black shouldered kite	<i>Elanus caeruleus</i>	r	R	LC	O
16	Serpent Eagle	<i>Spilornis cheela</i>	r	LM	LC	C
17	Shikra	<i>Accipiter badius</i>	uc	R	LC	C
18	Common buzzard	<i>Buteo buteo</i>	r	R	LC	O
19	Sparrow Hawk	<i>Accipiter nisus</i>	o	R	LC	C

20	Indian vulture	<i>Gyps indicus</i>	r	R	CR	C
	BURHINIDAE					
21	Indian thick knee	<i>Burhinus indicus</i>	r	LM	LC	I
	CAPRIMULGIDAE					
22	Large tail nightjar	<i>Caprimulgus macrurus</i>	uc	R	LC	I
	CERYLIDAE					
23	Pied kingfisher	<i>Ceryle rudius</i>	uc	R	LC	C
	CICONIDAE					
24	Asian Open billed stork	<i>Anastomus oscitans</i>	uc	LM	LC	C
25	Lesser adjutant stork	<i>Leptoptilos javanicus</i>	r	LM	VU	C
	CISTICOLIDAE					
26	Common tailorbird	<i>Orthotomus sutorius</i>	c	R	LC	I
	CHARADRIIDAE					
27	Red wattled lapwing	<i>Vanellus indicus</i>	uc	R	LC	I
28	Little ringed plover	<i>Charadrius dubius</i>	o	WM	LC	I
	CORACIIDAE					
29	Indian roller	<i>Coracias benghalensis</i>	o	R	LC	C
	CORVIDAE					
30	House crow	<i>Corvus splendens</i>	uc	R	LC	C
31	Rufous treepie	<i>Dendrocitta vagabunda</i>	c	R	LC	F
32	Large billed/jungle crow	<i>Corvus macrorhynchos</i>	uc	R	LC	C
33	Black headed cuckoo	<i>Coracina melanoptera</i>	uc	SM	LC	I
34	Common iora shrike	<i>Aegithina tiphia</i>	uc	R	LC	I
	CUCULIDAE					
35	Asian koel	<i>Eudynamis scolopaceus</i>	c	R	LC	F,I
36	Pied cuckoo	<i>Clamator jacobinus</i>	uc	SM	LC	O
37	Greater Coucal/crow pheasant	<i>Centropus sinensis</i>	c	R	LC	
	COLUMBIDAE					
38	Ring dove	<i>Streptopelia capicola</i>	c	R	LC	G
39	Spotted dove	<i>Spilopelia chinensis</i>	c	R	LC	G
40	Red collared dove	<i>Streptopelia tranquebarica</i>	uc	R	LC	G
41	Yellow footed green pigeon	<i>Treron phoenicoptera</i>	c	R	LC	G
	DICRURIDAE					
42	Black drongo	<i>Dicrurus macrocercus</i>	c	R	LC	C
	ESTRILDIDAE					
43	Silver bill munia (Indian silver bill)	<i>Lonchura malabarica</i>	uc	R	LC	G
44	Spotted/ Scaly Breasted munia	<i>Lonchura punctulata</i>	o	SM	LC	G
	HALCYONIDAE					
45	White breasted Kingfisher	<i>Halcyon smyrnensis</i>	c	R	LC	C
46	Stork billed kingfisher	<i>Pelargopsis capensis</i>	uc	R	LC	C
	HIRUNDINIDAE					
47	Barn swallow	<i>Hirundo rustica</i>	uc	SM	LC	I
	JACANIDAE					
48	Bronze winged Jacana	<i>Metopidius indicus</i>	c	R	LC	C
49	Pheasant tailed jacana	<i>Hydrophasianus chirurgus</i>	uc	R	LC	C
	LARIDAE					
50	Common tern	<i>Sterna hirundo</i>	r	WM	LC	P
	LANIIDAE					
51	Bay backed shrike	<i>Lanius vittatus</i>	r	LM	LC	I
52	Southern gray shrike	<i>Lanius meridionalis</i>	uc	LM	LC	I
53	Long tailed shrike	<i>Lanius schach</i>	uc	SM	LC	I
	LEIOTHRICHIDAE					
54	Jungle babbler	<i>Turdoides striata</i>	c	R	LC	O
	MOTACILLIDAE					
55	Eastern Yellow wagtail	<i>Motacilla tschutschensis</i>	uc	WM	LC	I
56	Pied/white wagtail	<i>Motacilla alba</i>	uc	WM	LC	I
	MEGALAIMIDAE					
57	Lineated barbet	<i>Megalaima lineata</i>	uc	LM	LC	F
58	Blue throated barbet	<i>Megalaima asiatica</i>	c	LM	LC	F
59	Coppersmith barbet	<i>Megalaima haemacephala</i>	uc	LM	LC	F

	MEROPIDAE					
60	Blue-tailed Bee-eater	<i>Merops philippinus</i>	uc	SM	LC	I
61	Green bee eater	<i>Merops orientalis</i>	c	R	LC	I
	MUSCIPIDAE					
62	Oriental magpie robin	<i>Copsychus sauleris</i>	c	R	LC	I
63	Pied bushchat	<i>Saxicola caprata</i>	uc	R	LC	I
64	Humes leaf warbler	<i>Phylloscopus humei</i>	r	WM	LC	I
	NECTARINIDAE					
65	Purple sunbird	<i>Cinnyris asiaticus</i>	c	WM	LC	N
66	Purple rumped sunbird	<i>Leptocoma zeylonica</i>	uc	WM	LC	N
	ORIOLIDAE					
67	Eurasian Golden oriole	<i>Oriolus oriolus</i>	c	R	LC	I
	PARIDAE					
68	Great tit	<i>Parus major</i>	o	SM	LC	I
	PASSERIDAE					
69	House sparrow	<i>Passer domesticus</i>	c	R	LC	G
	PICIDAE					
70	Yellow crowned woodpecker	<i>Dendrocopos mahrattensis</i>	r	R	LC	I
71	Black rumped flameback	<i>Dinopium benghalense</i>	c	R	LC	I
72	Fulvous breasted woodpecker	<i>Dendrocopos macei</i>	c	R	LC	I
73	Streak throated woodpecker	<i>Picus xanthopygaeus</i>	r	R	LC	I
	PHALOCROCRACIDAE					
74	Little cormorant	<i>Phalacrocorax niger</i>	c	R	LC	P
75	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	c	R	LC	P
76	Great cormorant	<i>Phalacrocorax carbo</i>	uc	LM	LC	P
	PHASIANIDAE					
77	Grey francolin	<i>Francolinus pondicerianus</i>	uc	R	LC	O
	PLOCEIDAE					
78	Baya weaver	<i>Ploceus philippinus</i>	uc	R	LC	O
	PODICIPEDIDAE					
79	Little Grebe (Dabchick)	<i>Tachybaptus ruficollis</i>	c	R	LC	P
	PSITTACIDAE					
80	Rose ringed parakeet	<i>Psittacula krameri</i>	c	R	LC	G
	PYCNONOTIDAE					
81	Red vented Bulbul	<i>Pycnotus cafer</i>	c	R	LC	F
82	Red Whiskered Bulbul	<i>Pycnotus jocosus</i>	o	R	LC	F
	RALLIDAE					
83	White breasted Water hen	<i>Amauornis phoenicurus</i>	c	R	LC	O
84	Common coot	<i>Fulica atra</i>	o	LM	LC	O
85	Common Moor hen	<i>Gallinula chloropus</i>	c	LM	LC	O
86	Purple swamp hen	<i>Porphyrio porphyrio</i>	uc	LM	LC	O
	RHIPIDURIDAE					
87	White throated fantail flycatcher	<i>Rhipidura albicollis</i>	r	SM	LC	I
	SCOLOPACIDAE					
88	Pin tailed Snipe	<i>Gallinago stenura</i>	uc	WM	LC	O
89	Marsh sandpiper	<i>Tringa stagnatilis</i>	uc	WM	LC	I
90	Common sandpiper	<i>Actitis hypoleucos</i>	c	WM	LC	I
	STRIGIDAE					
91	Indian eagle-owl	<i>Bubo bengalensis</i>	o	R	LC	C
	STURNIDAE					
92	Common/INDIAN myna	<i>Acridotheres tristis</i>	c	R	LC	O
93	Brahminy myna/starling	<i>Sturnus pagodarum</i>	o	R	LC	O
94	Rosy starling	<i>Pastor roseus</i>	o	WM	LC	F
95	Pied Myna	<i>Sturnus contra</i>	c	R	LC	O
	THRESKIORNITHIDAE					
96	Black headed Ibis	<i>Threskiornis melanocephalus</i>	r	LM	NT BRS	C
	UPUPIDAE					
97	Hoopoe	<i>Upupa epops</i>	uc	R	LC	I

	ZOSTEROPIDAE					
98	Oriental white eye	<i>Zosterops palpebrosus</i>	<i>o</i>	R	LC	I

*Abundance: c-common, uc-uncommon, o-ocasional, r-rare

**Status: R-resident, WM-Winter Migrants, SM- Summer Migrants, LM-local Migrants

***International union for Conservation of nature and natural resources (IUCN) Categories: LC: Least Concern; VU: Vulnerable; CR: Critically endangered, BRS: Biome restricted Species

****Feeding guild: C: Carnivorous, I: Insectivorous, G: Granivorous, F: Frugivorous, O: Omnivorous, P: Piscivorous,

N: Nectarivorous

Table 2: Number of species in different families of bird (found at the study site)

0-2	3-4	5-6	7-8
Alcedinidae (1)	Cuculidae (3)	Anatidae (5)	Accipitridae (7)
Apodidae (1)	Columbidae (4)	Ardeidae (6)	
Burhinidae (1)	Lanidae (3)	Corvidae (5)	
Cisticolidae (1)	Megalaimidae (3)		
Caprimulgidae (1)	Picidae (4)		
Cerylidae (1)	Phalacrocracidae (3)		
Coraciidae (1)	Rallidae (4)		
Charadriidae (2)	Scolopacidae (3)		
Ciconidae (2)	Sturnidae (4)		
Dicuridae (1)			
Estrildridae (2)			
Halcyonidae (1)			
Hirudinidae (1)			
Jacaniidae (2)			
Laridae (1)			
Leiothrichidae (1)			
Motacillidae (2)			
Meropidae (2)			
Muscicapidae (3)			
Nectarinidae (2)			
Oriolidae (1)			
Paridae (1)			
Passeridae (1)			
Phasianidae (1)			
Ploceidae (1)			
Podicipedidae (1)			
Psittacidae (1)			
Pycnonotidae (2)			
Rhipiduridae (1)			
Strigidae (1)			
Threskiornithidae (1)			
Upupidae (1)			
Zosteropidae (1)			

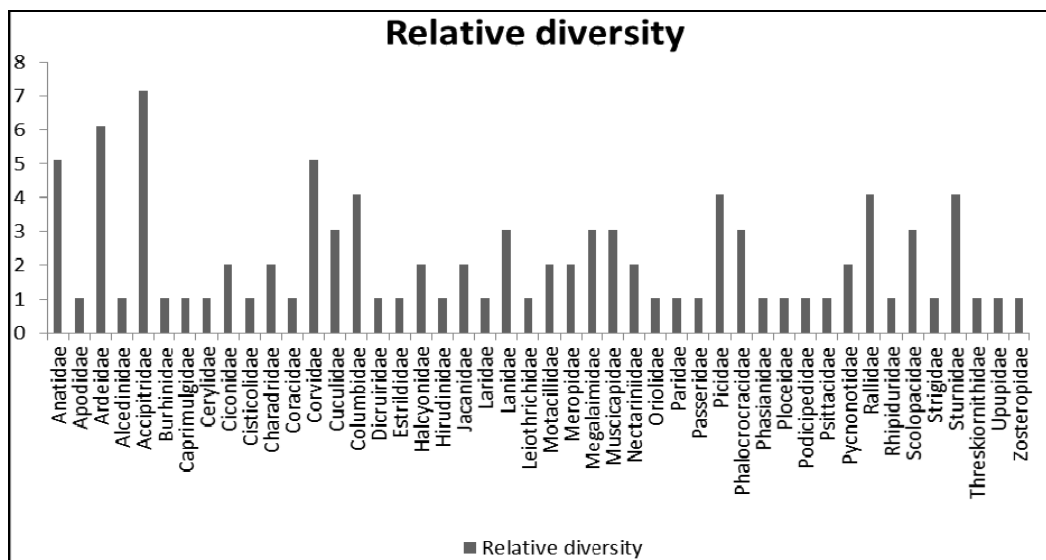


Fig 3: Relative diversity of the bird families found at the study site

The winter migratory birds like Gadwall, Eurasian Wigeon, Common teal, Grey Heron, Wagtails (Eastern yellow and pied), Pin tailed Snipe, Sandpiper (Marsh and Common) displayed a definite pattern specific to species for arrival at and departure from various wetland. They appeared at the area from November and stayed up to March. The peak of winter population of migratory birds was observed during the months of December to February. The basic requirements of migratory birds at their wintering ground are adequate food supply and safe [28], which are fulfilled by Sadhanpur beel, nearby agricultural fields and orchards and the nearby forest area of Bahadurpur.

Out of the 98 species recorded Lesser Adjutant Stork (*Leptoptilos javanicus*) is currently enlisted as Vulnerable (V) in IUCN category, Black headed Ibis (*Threskiornis melanocephalus*) belongs to Near threatened (NT) category, moreover it is also categorized as Biome Restricted Species (BRS) by Bird life International and Indian vulture (*Gyps indicus*) is categorized as Critically endangered (CR). Though these three species were sighted only twice or thrice during the study period but it proves they probably use the site as a stop over site or a potential resting place during their journey. All the other listed species belonged to Least concerned category of IUCN.

The bird composition of a site depends on the vegetation structure. Existences of trees, bushes, creepers are very important to them [29, 30]. More complex vegetation structure is associated with greater diversity. The agricultural fields surrounding the study site, and plantations surrounding the beel probably provided shelter and suitable foraging grounds for the wetland birds. Sadhanpur beel and surrounding muddy area provided different food sources like fish, crustaceans, invertebrates, water plants and plankton which further added to the diversity of birds. The diversity of the land birds could be associated due to the presence of varied types of habitat and microhabitats available in the roadside plantations, bamboo and mango orchards and the narrow forest patch. Among the winter migratory birds Gadwall, Cotton pygmy goose and Pin tailed snipe were the most abundant. Lesser whistling duck (*Dendrocygna javanica*) were encountered throughout the year though there abundance was much higher in winter. Besides the other common water birds were Indian cormorant (*Phalacrocorax fuscicollis*), Cattle egret (*Bubulcus ibis*), Common Moor hen (*Gallinula chloropus*) and Bronze winged Jacana (*Metopidius indicus*). White-Breasted Kingfisher (*Halcyon smyrnensis*), the State Birds in West Bengal in family Halcyonidae was found in the beel and surrounding agricultural field. The most common land birds found in the study site were Red vented Bulbul (*Pycnotus cafer*), Black Drongo (*Dicrurus macrocercus*), Indian Myna (*Acridotheres tristis*), Rosy starling (*Pastor roseus*), Ring Dove (*Streptopelia capicola*), Spotted Dove (*Spilopelia chinensis*), Jungle Babbler (*Turdoides striata*) and Rufous Treepie (*Dendrocitta vagabunda*).

Based on the abundance (frequency of sightings), 15 species were identified as rare, 32 uncommon, 35 common and 16 occasional. The residential status of the birds were identified as Residential (60.20%), winter migratory (16.32%), summer migratory (8.16%) and local migratory (15.30%) (Figure 4). The composition of birds in major feeding guilds in the study area showed that the insectivore guild was the most common with 31.63% species followed by carnivore (25.51%), omnivore (19.38%), frugivore and grainivore (8.16%),

piscivore (5.10%) and nectarivore (2.04%) (Figure 5).

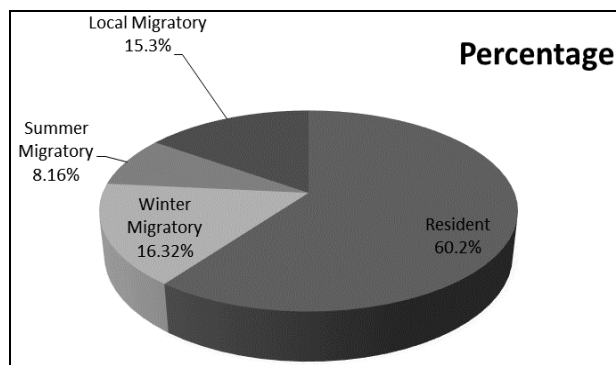


Fig 4: Residential status of the avian fauna at the study site

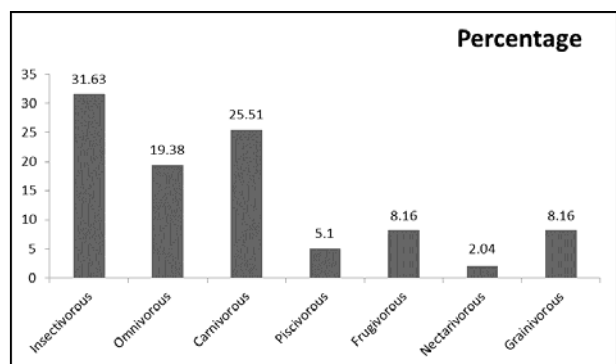


Fig 5: Guild wise percentage of the bird species found at the study site

4. Conclusion

The place is situated 8-9 km North-west from Purbasthali oxbow lake (Chupi char), Burdwan which is known to be a rich abode for avian fauna [31]. The famous Bethuadahari wildlife sanctuary is located about 15 km north and Bahadurpur forest range and Hansadanga beel is located 15 km towards South. Above all the site is located very near the tropic of cancer. Thus the place is expected to show a rich avian diversity as is evident from the present study. The present check list will provide baseline information for the bird diversity in and around the area. However, due to increasing anthropogenic activities all wetlands are under threat [10, 32] and it is therefore important to earmark this area as a rich abode of avian fauna and necessary action to preserve the biodiversity should be adopted by the state government immediately. The site also holds an immense potential to be developed as a tourist spot with few improvisations as it is located within 30km from Mayapur, the head quarter of International Society for Krishna Consciousness (ISKCON) and world famous Vaishnav pilgrim place. This report provides the first extensive study of the bird fauna of this region and its potential to be developed as a haven for bird watchers and a tourist spot.

5. Acknowledgements

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