

Studies on Avifaunal Diversity of Santragachi Wetland, West Bengal, India

S. Biswas and A. Banerjee^{1*}

Dept of Environmental Studies, Rabindra Bharati University, Kolkata

¹Department of Environmental Sciences, Sarguja Vishwavidyalaya, Ambikapur, Chattisgarh – 497001

✉ arnabenvsc@yahoo.co.in

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Abstract: The present investigation reports the avifaunal diversity of Santragachi Jheel, which is a 12.75 ha wetland situated beside the Santragachi Railway Station (S.E. Rly), on the west bank of River Ganga, in the vicinity of Kolkata city. The period of investigation is between November 2009 and March 2010. The study site was found to be surrounded by dense human habitations, railway yards and small-scale industrial complexes. A total of 38 species of birds belonging to 23 families under 12 orders in which family Anatidae showed maximum density of 38 individuals. Order Passeriformes showed maximum family diversity of 10. Higher level of species diversity and richness reflects that further intensive studies are needed to make the complete checklist of the bird species of the Santragachi wetland as well as proper management of the area is essential for conservation of avifaunal diversity of the concerned study site.

Key words: Avifauna, Santragachi wetland, survey, diversity.

Introduction

Wetlands constitute a treasury of biodiversity. The social demand and dependence on the wetlands provide an unaccountable economic value to such habitats. They are complex water and land interactive systems and are supposed to be the most fertile and productive sites in the world. Saxena (1975) reported the flora and fauna of Bharatpur Bird Sanctuary supported by the avifaunal diversity. Hussain et al. (1984) has studied the profile of Chilka Lake in Orissa. Singh and Roy (1990) studied the ecology of birds of Kowar Lake in Bihar. Sanjay (1993) studied the ecology of birds at Kokkare-Bellur. Hosetti et al. (2001) studied the ornitho-ecological aspects on Gudavi Bird Sanctuary, Shimoga. Uttangi (2001) has studied the conservation and management for the waterfowls of minor irrigation tanks and their importance as stopover sites in Dharwad district. Shanbhag et al. (2001) reported the impact of Konkan

Railway Project on the avifauna of Carambolim Lake in Goa. Inac et al. (2008) studied the bird species of Kumasir Lake, Turkey and the role of environmental ethics on sustainable wet land management. Mazumdar et al. (2002-2004) studied on the diversity and behaviour of waterfowl in Santragachi Jheel, West Bengal, India. In the year 2009, Nanda Kumar et al. studied on the vertical gradient and resource partitioning of migratory birds on Barringtonia Tree in Nelapattu Bird Sanctuary. Wetland supports congregation of large number of migratory and resident species of birds as it has high nutritional value as well as productivity (Whittaker and Likens, 1973; Gibbs, 1993; Paracuellos, 2006). As per Ali and Ripley (1983), 273 species of birds in India can be considered as waterfowls, the birds that depend on wetland ecosystem.

The most noticeable threats to the wetland include industrial effluent from railway yards and industries, and domestic sewage from surrounding houses and

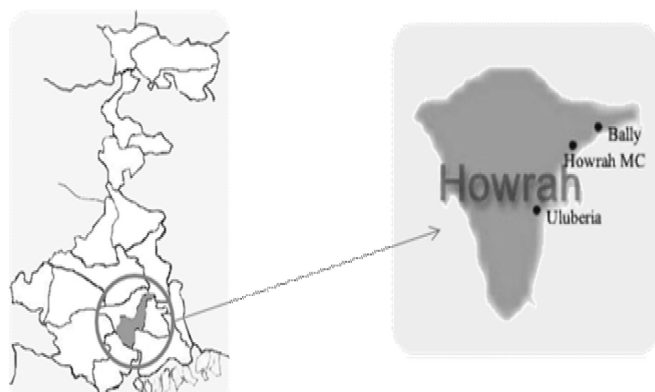
*Corresponding Author

nearby shops. The excessive growth of emergent and floating vegetation during certain seasons also affects the population dynamics of water birds. The Santragachi wetland, spread over an area of approximately 12 ha, plays host to more than 5000 migratory and resident birds now. Nearly 5000 birds of various types like Lesser Whistling Teal, Gadwall, Pintail, and Little Cormorant were identified. The number was much less than what used to be five years back, a lesser number of birds, like whistling duck teals, gargenys, shovlers, pin tail ducks, cotton teals and also local species like moor hens, were found.

Under these circumstances, the present investigation were carried out to assess the avifaunal diversity of Santragachi wetlands along with special emphasis on resident and migratory birds.

Materials and Methods

Study Area



Study area

The above avifaunal studies impress upon the need for the inventory of avifaunal diversity of other such habitats. Santragachi Jheel is a 12.75 ha wetland situated beside the Santragachi Railway Station (S.E. Rly), on the west bank of River Ganga, in the vicinity of Kolkata city. It is surrounded by dense human habitations, railway yards and small-scale industrial complexes. In the centre of the water body there are several small islands. The maximum depth of water is 2 m. The jheel has large trees along its banks, which provide shelter and food for many species of birds. Water hyacinth (*Eichhornia crassipes*) proliferates in the jheel.

Methodology Adopted

The pond was demarcated into three sites i.e., Site I (West), Site II (West) and Site III (East), for the study

purpose. Fortnight visit to the wetland was made for five months and an average of two fortnights was accounted for a month. The line transect method was used to record species richness and abundance (Hutto et al., 1986; Bibby et al., 1992; Buckland et al., 1993). An efficient protocol has been adopted (Turner, 2003). Bird sampling was made by walking at a slow pace (about 1-1.5 km/h) along the bank of the lake (as the aquatic birds are usually found around or in the lake) as followed by Gaston (1975) and Bibby et al. (2000). However, wherever necessary, point count of birds was also made within the visible radius by stopping briefly for 2-3 mins as followed by other workers (Froneman et al., 2001; Kaul and Howman, 1992; Urfi et al., 2005). Birds were counted at their point of first detection and care was taken to ensure that same birds were not counted again. The numbers of aquatic birds of various species were recorded in a data sheet at each sampling lake on each census day. Birds flying over the habitat were recorded separately from those using the habitat.

For a more robust estimate of the populations, random hand-frame and binocular-frame counts (Gopal, 1995) of the birds were also made in three selected distance-ranges, viz., 50 m, 100 m and 150 m. Areas of both hand-frame and binocular-frame were standardized by the average of three measurements, working out the ground cover on land at the pre-set distances. Such frame-counts encompass all the avian species, either resting on the bank or islands, or wandering on the water surface. Three individual counts at three time intervals were averaged to get the representative data of a particular month (Gibbons et al., 1996). Inskipp et al. (1996) were followed for identification and nomenclature of avian species. The birds are classified on the basis of "The Book of Indian Birds" (Ali, 1996).

Results

Monthly variation in the avifauna and the relative abundance of the species in the study area was recorded. A checklist of 38 species along with their distribution during November 2009-March 2010 is presented in Table 1. It was observed that the avifaunal diversity was more in January and February. Data in Table 1 further reveals the bird density more in January and February in comparison to November, December and March during the present investigation. Similar observation was made by Bhatt et al. (2009) on avifauna of Ankere wetland of Udupi district, Karnataka, India. A total of 38 species of birds belonging to 22 families under 12 orders were identified in the present investigation. Khan (2010)

Table 1: Monthly fluctuation in the diversity of Avifauna in Santragachhi Jheel

<i>Sl. No.</i>	<i>Common name</i>	<i>Scientific names</i>	<i>Family</i>	<i>Order</i>	<i>Density</i>	<i>Nov</i>	<i>Dec</i>	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>
1.	Baikal Teal	Anas formosa	Anatidae	Anseriformes	4002	0	500	2000	1500	2
2.	Black Drongo	Dicrurus aeneus	Dicruridae	Passeriformes	14	5	6	1	2	0
3.	Black Hooded oriole	Oriolus xanthornus	Oriolidae	Passeriformes	1	0	0	0	1	0
4.	Bronze-winged Jacana	Metopidius indicus	Jacanidae	Charadriiformes	31	4	5	10	9	3
5.	Cattle Egret	Bubulcus ibis	Ardeidae	Ciconiiformes	39	12	5	8	8	6
6.	Common Kingfisher	Alcedo atthis	Alcedinidae	Coraciiformes	15	4	3	3	4	1
7.	Common Moorhen	Gallinula chloropus	Rallidae	Gruiformes	50	0	10	20	10	10
8.	Common Tailor Bird	Orthotomus sutorius	Cisticolidae	Passeriformes	10	2	3	1	1	3
9.	Common Teal	Anas crecca	Anatidae	Anseriformes	10	0	0	5	5	0
10.	Copper Smith	Megalaima haemacephala	Megalaimidae	Piciformes	12	1	1	5	5	0
11.	Cormorant	Phalacrocorax niger	Phalacrocoracidae	Pelecaniformes	150	15	25	40	60	10
12.	Cotton Pigmy—Goose	Nettapus coromandelianus	Anatidae	Anseriformes	42	0	0	0	10	32
13.	Coucal	Centropus bengalensis	Centropodinae	Cuculiformes	3	0	0	0	1	2
14.	Dove	Spilopelia chinensis	Columbidae	Columbiformes	11	3	2	2	2	2
15.	Ferruginous Pochard	Aythya nyroca	Anatidae	Anseriformes	2	0	0	1	1	0
16.	Fulvous Whistling Duck	Dendrocygna bicolor	Anatidae	Anseriformes	4970	90	250	550	4000	80
17.	Gadwal	Anas strepera	Anatidae	Anseriformes	65	5	15	20	20	5
18.	Gargany	Anas querquedula	Anatidae	Anseriformes	11	0	0	2	6	3
19.	House Crow	Corvus splendens	Corbidae	Passeriformes	100	25	10	15	25	25
20.	House Sparrow	Passer domesticus	Passeridae	Passeriformes	35	7	8	6	6	8
21.	Indian Pond Heron	Ardeola grayii	Ardeidae	Pelecaniformes	38	1	3	7	20	7
22.	Lesser Whistling Duck	Dendrocygna javanica	Anatidae	Anseriformes	4700	550	1000	2000	800	350
23.	Little egret	Egretta garzetta	Ardeidae	Ciconiiformes	16	4	2	2	2	6
24.	Long-tailed Shrike	Lanius schach	Laniidae	Passeriformes	2	0	0	1	1	0
25.	Magpie robin	Copsychus saularis	Muscicapidae	Passeriformes	10	2	2	2	2	2
26.	Northern Pintail	Anas acuta	Anatidae	Anseriformes	65	0	0	40	20	5
27.	Northern Shoveller	Anas clypeata	Anatidae	Anseriformes	15	0	2	4	8	1
28.	Pariah Kite	Milvus migrans	Accipitridae	Falconiformes	8	1	2	1	1	3
29.	Purple Heron	Ardea purpurea	Ardeidae	Ciconiiformes	2	0	1	1	0	0

(Contd.)

(Table 1: Contd.)

<i>Sl. No.</i>	<i>Common name</i>	<i>Scientific names</i>	<i>Family</i>	<i>Order</i>	<i>Density</i>	<i>Nov</i>	<i>Dec</i>	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>
30.	Red Vented Bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	Passeriformes	18	3	4	4	6	1
31.	Rock Pigeon	<i>Columba livia</i>	Columbidae	Columbiformes	40	15	10	5	4	6
32.	Rose Ring Parakeet	<i>Psittacula krameri</i>	Psittaculidae	Psittaciformes	30	7	3	4	10	6
33.	Swinhoe's Snipe	<i>Gallinago megala</i>	<i>Scolopacidae</i>	Charadriiformes	1	0	0	1	0	0
34.	White Breasted Water Hen	<i>Amaurornis phoenicurus</i>	<i>Rallidae</i>	Gruiformes	2	0	1	1	0	0
35.	White Wagtail	<i>Motacilla alba ocularis</i>	<i>Motacillidae</i>	Passeriformes	9	0	3	5	1	0
36.	White-breasted Kingfisher	<i>Halecyon smyrnensis</i>	Halcyonidae	Coraciiformes	22	5	4	6	3	4
37.	Yellow Wagtail	<i>Motacilla citreola citreola</i>	<i>Motacillidae</i>	Passeriformes	2	0	1	1	0	0
38.	Yellow Bittern	<i>Lxobrychus sinensis</i>	<i>Ardeidae</i>	Ciconiiformes	2	1	0	0	1	0

Table 2: Distribution of species under different orders and families of Santragachi wetlands

<i>Orders</i>	<i>No. of Species</i>	<i>No. of Families</i>
Anseriformes	10	1
Charadriiformes	2	2
Ciconiiformes	4	1
Columbiformes	2	1
Coraciiformes	2	2
Cuculiformes	1	1
Falconiformes	1	1
Gruiformes	2	1
Passeriformes	10	9
Pelecaniformes	2	2
Piciformes	1	1
Psittaciformes	1	1
Total	38	23

similarly reported presence of 15 species of migratory birds for wetlands of Bangladesh, of which during present investigation nine species are present. In this study family Anatidae showed maximum diversity of 10 species and families Ardeidae with five, Columbidae, Motacillidae and Rallidae with two species each and rest of the families with one species each (Table 1). Order Ciconiformes showed maximum family diversity of nine followed by Charadriiformes, Coraciiformes and Pelecaniformes with two families each and rest of the orders showing family diversity of one each (Table 2). Data in Table 3 reflects higher level of species diversity and richness in the respective study sites as the Shannon's index value is high. Simpson's index value (0.7033) which is almost nearer to 1 and therefore statistically significant (5% level) further supports the Shannon's index value. From the evenness index value it is clear that the species distribution throughout the study is irregular and uneven.

During the present investigation, higher frequency of occurrence were recorded by Baikal Teal, Fulvous Whistling Duck (34.15%) and Lesser Whistling Duck (32.29%) (Table 4). Based on percent frequency of occurrence of waterbirds in the Santragachi Wetland Area, Black hooded Oriole, Ferruginous Pochard, Long tailed Shrike, Purple Heron, Swinhoe's Snipe, White breasted water hen, Yellow Wagtail and Yellow Bittern were considered as rare in occurrence. White throated Kingfisher, White wagtail, Common Teal, Gargany, Northern Shoveller and Little Eget were less common; Cattle Egret, Bronze winged Jacana, Pond Heron, Cotton Pigmy Goose, Common Moorhen, Gadwall and Northern Pintail were common; and Lesser Whistling Duck and Fulvous Whistling Duck were very common. The percent frequency of occurrence

Table 4: Frequency of occurrence of avifauna of Santragachi area during Nov 2009 to March 2010

<i>Name of the species</i>	<i>Frequency (%)</i>
Baikal Teal	27.49
Black Drongo	0.09
Black Hoodedoriole	0.007
Bronze-winged Jacana	0.21
Cattle Egret	0.27
Common Kingfisher	0.10
Common Moorhen	0.34
Common Tailor Bird	0.07
Common Teal	0.07
Copper Smith	0.08
Cormorant	1.03
Cotton Pigmy—Goose	0.29
Coucal	0.02
Dove	0.08
Ferruginous Pochard	0.01
Fulvous Whistling Duck	34.15
Gadwal	0.44
Gargany	0.08
House Crow	0.69
House Sparrow	0.24
Indian Pond Heron	0.26
Lesser Whistling Duck	32.29
Little Egret	0.11
Long-tailed Shrike	0.01
Magpie Robin	0.07
Northern Pintail	0.44
Northern Shoveller	0.10
Pariah Kite	0.05
Purple Heron	0.01
Red Vented Bulbul	0.12
Rock Pigeon	0.27
Rose Ring Parakeet	0.21
Swinhoe's Snipe	0.007
White Breasted Water Hen	0.01
White Wagtail	0.06
White Breasted Kingfisher	0.15
Yellow Wagtail	0.01
Yellow Bittern	0.01

Table 3: Species diversity indices of avifauna observed at Santragachi wetland area

Taxa_S	38
Individuals	14555
Dominance_D	0.2967
Shannon_H	1.438
Simpson_1-D	0.7033
Evenness_e^H/S	0.1109
Menhinick	0.315
Margalef	3.86
Equitability_J	0.3954
Fisher_alpha	4.731
Berger-Parker	0.3415

of water bird species is given in Table 4. The number of waterbird species observed in pre winter was 2643 (18.16%), which increased upto 11,329 (77.84%) in winter and then decreased upto 583 (4%) in post winter. Figures 1 and 2 depict the monthly variation of the families and orders during the study period respectively. Figure 3 represents monthly variation of birds under family Anseriformes. Higher values of individuals were reported during the winter season in comparison to other seasons. Hierarchical cluster analyses of the observed data revealed three distinct clusters of the avian populations during the study period. Two distinct clusters were found during the present investigation which includes month of November and March and January and February respectively

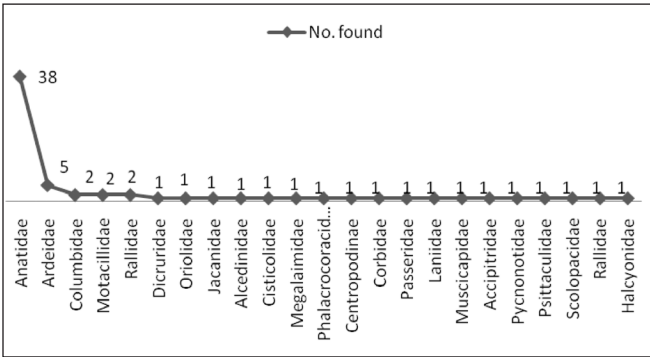


Figure 1: Distribution of bird density in Santragachi Wetland.

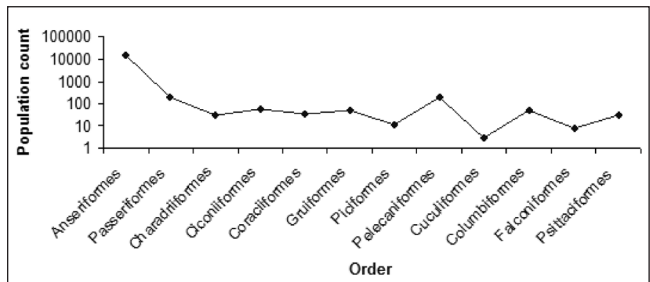


Figure 2: Variability of distribution of different orders of Avifauna in Santragachi Wetland area.

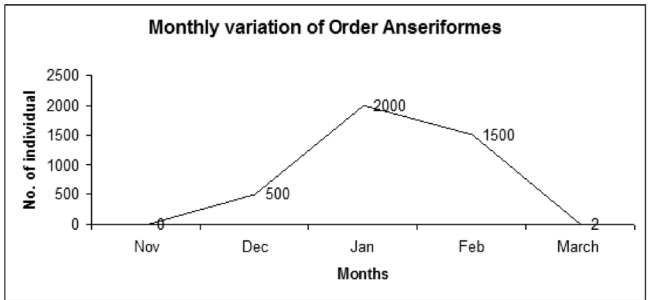


Figure 3: Monthly variation of order Anseriformes.

followed by November, March and December indicating significant positive affinity with respect to distribution and abundance of avifauna in Santragachi wetland area during the present investigation (Figure 4).

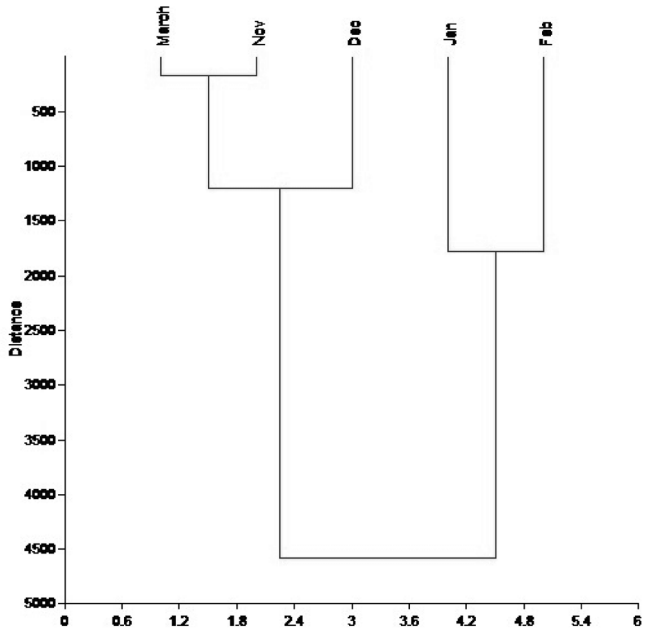


Figure 4: Cluster Representation of diversity of avifauna on monthly basis.

Discussion

Fresh water ecosystems are among the most significantly human alter systems in the world (Inskipp, 1985) and Santragachi wetland well exemplified this. Monthly variation in the diversity of aquatic and water birds revealed that avifaunal diversity was more in December, January and February, as there was optimum water storage, availability of abundant food and increased vegetation. The minimum diversity was recorded in November due to non-availability of food and fluctuation of ambient temperature. The bird density or the number of individuals was more in December, January and February due to ambient food supply (Bhat et al., 2009).

The number of water bird species was highest in winter, compared to the other season, due to the arrival of migratory birds. The more number of birds were recorded when lakes were full during winter periods, while in post winter with gradual drying of lakes, abundance of water birds started decreasing. Similar kind of varying water bird population in relation to water level and season has been reported in lakes of Dudwa National Park, India (Maheshwaram and Rahmani, 2001). During the present investigation it was

found that endemic and endangered bird species were totally absent which might be due to their prevalency in the forests.

The highest population of Fulvous Whistling Duck (*Dendrocygna bicolor*) was found in the study area with a composition 34.15% of total avifauna. The Fulvous Whistling Duck population was found to be maximum during winter months and subsequent decrease in summer may be due to non-availability of food. Little Egret (*Egretta garzetta*) was a resident bird found throughout the year. They are more heard than seen because they disappear quickly on sighting a danger. Similar opinion was expressed by Fredrickson and Reid (1986) about Indian Moorhen.

Common Moorhen (*Gallinula chloropus*), Bronze Winged Jacana (*Metopidius indicus*) and Cattle Egret (*Bubulcus ibis*) were also found as residence species in the study area. Both feeding and breeding activities of the respective species were observed in the pond. However, their number is more in late winter as it was their post breeding season and due to abundance of food.

Conclusion

From the aforesaid results it could be made out that the availability of water, save habitat and food sources in and around the lake are important for the occurrence and abundance; and community composition is not well understood at present. This lack of knowledge will certainly limit the options for implementing management strategies aiming at optimizing biodiversity, and should be addressed in future studies of wetland communities. The present study suggests that proper and regular maintenance of Santragachi wetland is essential to increase and maintain the avifaunal diversity.

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