

Foraging Guild, Status and Diversity of avian fauna in the Upper Lake, Bhopal, India

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ABSTRACT

The Upper Lake which is also known as Bhoj Wetland is situated in Bhopal, having rich sea-going vegetation and harbors a few sorts of birds. From October 2019 to March 2020, the occurrence of birds was observed. During the study period, 43 avian species were recorded belonging to 3 different orders and 3 families. Out of 43 recorded species, 14 species were winter migrant; three species summer migrants; eight species resident migratory; and 18 species were resident. The present study revealed that, out of the 43 species, the Upper Lake of Bhopal supported 32% of the species as winter migrant, 19% of the species as Resident Migratory, 7% of the species as summer migrant and 42% of the species as resident. Also, one near-threatened species and two common species were recorded. Based on the Foraging guild, 30% of birds were insectivorous, followed by herbivorous (27%), carnivorous (25%), omnivorous (16%) and frugivorous (2%). The highest number (30%) of bird species feed mostly on insects while the least rate was demonstrated by Frugivorous (2%). Results of Relative Diversity Index showed that the Anatidae family has a high diversity of species (RD index value = 48.84), which was dominant family, followed by Muscicapidae (RD Index value= 30.23), and Ardeidae (RD Index value= 20.93).

Key Words: Foraging Guild, Avian Diversity, Relative Diversity Index, IUCN status, wetland.

INTRODUCTION

Wetlands are shallow water regions which go about as momentary zones among earthbound and sea-going frameworks (Mitsch and Gosselink, 1986). Birds which are biologically reliant upon wetlands are known as waterbirds. Birds likewise use wetlands as a wellspring of drinking water and for feeding, dozing, housing, and social relations (Steward, 2007). They assume a critical part in living souls socially, socially, experimentally and as a food asset (Kumar *et al.*, 2003). Water birds generally involve the place of high-level buyers in oceanic pecking order and accordingly any progressions in the territory and food accessibility straightforwardly

influences them. Water birds are accordingly estimated as signs of wetland territory conditions (Kushlan, 1978). India has wide-going wetland natural surroundings that help various water birds, a significant number of which are transient visiting the subcontinent from their favorable places in the northern districts (Veerwal *et al.*, 2014). In focal India, the Upper Lake of Bhopal is an important waterbody living space for occupant species just as a similarly noticeable organizing and wintering site for quite some time species. It is assigned as a Ramsar site and IBA status in worry to the way that it upholds a particular and plentiful populace of water birds consistently. A variety of water birds like cormorants, egrets and herons, storks and ibises, crane, ducks, jacanas, lapwings, braces, sandpipers, gulls and terns, kingfishers and so on are found in this lake (Vyas, 1992) underscoring the general significance of this water body. The avian species extravagance upheld by Upper Lake is to a great extent because of the presence of high food accessibility which draws in avifauna to settle here (Vyas *et al.*, 2010). Accordingly, the current work has been done to check the searching organizations of birds dwelling and visiting the Upper Lake of Bhopal.

MATERIAL AND METHODS

Description of Study area: The Upper Lake is an east-westerly lengthened metropolitan lake which gets water from the stream Kolans and from the immediate downpours, both during precipitation months which is the primary wellspring of drinking water for the inhabitants of Bhopal. This lake was framed by developing an earthen dam across the Kolans waterway in the eleventh century by Raja Bhoj of Dhar. The catchment space of the lake is 361 sq. km and the water spread region is 30.72 km at FTL, its mean profundity is 3.16 m while most extreme profundity is 11.64 m. The abundance water from Upper Lake streams into Kaliasot River which further meets Betwa River lastly gets depleted into the Yamuna waterway. The height of Upper Lake is around 503 m above mean ocean level and it is arranged at 23° 16' N latitude and 77° 25' E longitude. It is an east westerly lengthened shallow lake lined by human settlements on the eastern and northern limits while its western edges are seriously utilized for horticulture, on the southern edge lies Van Vihar National Park. It has sporadic edges that help thick development of macrophytes and supports very much enhanced amphibian vegetation (Figure -1).



Figure-1: Map showing study area.

Detailed Methodology: The survey was conducted in early hours in the morning from 6.00 am to 10.00 am hours and evening 4.00 pm to 6.30 pm hours last week of each month during October 2019 to March 2020. Bird diversity and identities were done by Line Transect and Point Count methods for gathering the information on bird (Bibi and Ali, 2013). The birds were identified and counted with the help of Binoculars (Nikon Action 8X40), photographed by using Camera (Canon D-60) at different spots at every location and field guides such as a Pictorial Guide to the Birds of the Indian Subcontinent (Ali, 2006). and Water birds of Northern India (Alfred *et al.*, 2001), were used for identifying the birds. The birds were identified up to order level and check list was prepared using the standardized common and scientific names of the birds of the Indian subcontinent by (Manakkadan and Pittie, 2001) and searching on internet. The residential status of the birds was reported and categorized as “winter migrant”, “summer migrant”, “resident”, and “resident migratory”. The birds that were seen regularly in the study area were placed under the category “residential”; birds encountered only in winter and summer seasons were placed, respectively, under “winter migrant” and “summer migrant”; and birds that were encountered only once or twice during the study period were considered “resident migratory.” The encounter rate was measured as the relative abundance of the bird species and calculated as the number of bird species observed. Relative diversity index (RDi) was calculated using the following formula by (Torre-Cuadros *et al.*, 2007):

$$RD = \frac{\text{Number of bird species in a family}}{\text{Total number of species}} \times 100$$

RESULTS AND DISCUSSION

Table 1 shows 43 species of birds were seen in Upper Lake of Bhopal during study period. Of these, according to the International Union of Conservation of Nature and Natural Resources IUCN, one species “critically endangered”; two species “common”; thirteen species “Uncommon” and the remaining 27 species “Least concern”. The present study revealed that, of the 43 species, the Upper Lake of Bhopal supported 32% of the species as winter migrant, 19% of the species as Resident Migratory, 7% of the species as summer migrant and 42% of the species as resident (Figure 2). These migrants include Common Pochard, Northern Shoveler, Gadwall, Knob-billed Duck, Reddy Shelduck, Red-crested Pochard, Eurasian Wigeon, Mute swans, Comb Duck, Northern Pintail, Whistling duck sp., Greylag Goose, Mallard, Common Teal, Tufted Duck, Ferruginous Duck, Pied Bush Chat, Siberian Stonechat, Blue Rock Thrush, Verditer Flycatcher, Oriental Magpie-Robin, Ultramarine Flycatcher, Black Redstart, Bluethroat, Variable Wheatear, Blue Rock Thrush and Lesser Whistling-Duck. However, the results of the present study revealed that one species from family Anatidae Ferruginous Duck (*Aythya nyroca*) is Near threatened and the study will provide a baseline for making efforts to conserve the species. Total 43 species of birds belonging to 3 families and orders were noticed during the study period. Anatidae was the most dominant family with 21 species, followed by Muscicapidae with 13 species and Ardeidae with 9 species. Authors reported 54 residents, 9 local migrants and 13 winter migrants among total observed 76 water bird species in and around the Koradi lake of Nagpur (Chinchkhede and Kedar, 2012). Researchers reported 70 species, of birds belonging to 16 orders and 35 families from Bhoj Wetland Bhopal, Madhya Pradesh, India (Rather and Shrivastava, 2021). Researchers while working on Upper Lake of Bhopal recorded 43 species, belonging to 14 families and 8 orders. Family Anatidae was found to be the most dominant family represented by ten species followed by family Ardeidae represented by 8 species (Vyas *et al.*, 2010).

Results of relative diversity show that the Anatidae family has a high diversity of species (RD index value=48.84), followed by Muscicapidae (RD Index value= 30.23), and Ardeidae (RD Index value=20.93) (Figure 3). The guild-wise analysis of the 43 bird species showed that (30%) of birds are insectivorous, followed by Herbivorous (27%), Carnivorous (25%), Omnivorous (16%) and Frugivorous (2%) during the study period. The highest number (30%)

of species feed on insects while the lowest percentage was indicated by Frugivorous (2%) (Figure 4). A fact which was detected during the sampling was that most of the species have more than one feeding type. Mostly species that feed on insects also feed randomly on barks and leaves of plants. Likewise, authors also reported 41.58% of birds were insectivorous, followed by omnivorous (26.73%), carnivorous (15.84%), frugivorous (2.97%), granivorous (11.88%) and nectarivores (0.99%) from Guild, status, and diversity of avian fauna in the Jhunjhunu district, Rajasthan, India (Shekhawat and Bhatnagar, 2014).

Table-1: Shows Guild, status, and diversity of avian fauna observed in Upper Lake, Bhopal.

Species no.	Scientific Name	Common Name	IUCN*	Status	Guild
Order Anseriformes					
Family Anatidae					
1	<i>Dendrocygna javanica</i>	Lesser Whistling-Duck	UC	SM	Omnivorous
2	<i>Aythya ferina</i>	Common Pochard	UC	WM	Omnivorous
3	<i>Spatula clypeata</i>	Northern Shoveler	UC	WM	Herbivorous
4	<i>Mareca strepera</i>	Gadwall	UC	WM	Herbivorous
5	<i>Sarkidiornis melanotos</i>	Knob-billed Duck	UC	WM	Omnivorous
6	<i>Tadorna ferruginea</i>	Ruddy Shelduck	UC	WM	Herbivorous
7	<i>Anser indicus</i>	Bar-headed Goose	LC	RM	Herbivorous
8	<i>Spatula querquedula</i>	Garganey	LC	RM	Insectivorous
9	<i>Anas poecilorhyncha</i>	Indian Spot-billed Duck	LC	R	Herbivorous
10	<i>Nettapus coromandelianus</i>	Cotton Pygmy- Goose	LC	RM	Herbivorous
11	<i>Netta rufina</i>	Red-crested Pochard	UC	WM	Herbivorous
12	<i>Mareca penelope</i>	Eurasian Wigeon	UC	WM	Herbivorous
13	<i>Cygnus olor</i>	Mute swans	LC	R	Carnivorous
14	<i>Sarkidiornis melonotos</i>	Comb Duck	LC	R	Omnivorous
15	<i>Anas acuta</i>	Northern Pintail	LC	WM	Herbivorous
16	<i>Anas arcuata</i>	Whistling duck sp.	LC	R	Herbivorous
17	<i>Anser anser</i>	Greylag Goose	LC	RM	Herbivorous
18	<i>Anas platyrhynchos</i>	Mallard	LC	RM	Carnivorous
19	<i>Anas crecca</i>	Common Teal	LC	R	Omnivorous
20	<i>Aythya fuligula</i>	Tufted Duck	LC	WM	Omnivorous
21	<i>Aythya nyroca</i>	Ferruginous Duck	NT	RM	Omnivorous
Order Passeriformes					
Family Muscicapidae					

22	<i>Saxicola caprata</i>	Pied Bush Chat	UC	WM	Insectivorous
23	<i>Saxicola maurus</i>	Siberian Stonechat	UC	WM	Insectivorous
24	<i>Monticola solitarius</i>	Blue Rock Thrush	LC	SM	Insectivorous
25	<i>Eumyias thalassinus</i>	Verditer Flycatcher	UC	WM	Insectivorous
26	<i>Copsychus saularis</i>	Oriental Magpie-Robin	LC	R	Insectivorous
27	<i>Ficedula supercilialis</i>	Ultramarine Flycatcher	UC	R	Insectivorous
28	<i>Phoenicurus ochruros</i>	Black Redstart	LC	WM	Insectivorous
29	<i>Luscinia svecica</i>	Bluethroat	LC	WM	Insectivorous
30	<i>Copsychus fulicatus</i>	Indian Robbin	C	R	Insectivorous
31	<i>Oenanthe picata</i>	Variable Wheatear	UC	SM	Insectivorous
32	<i>Oenanthe fusca</i>	Brown Rock Chat	LC	R	Insectivorous
33	<i>Cyornis tickelliae</i>	Tickell's Blue Flycatcher	LC	R	Insectivorous
34	<i>Muscicapa dauurica</i>	Asian Brown Flycatcher	LC	R	Frugivorous
Order Pelicaniformes					
Family Ardeidae					
35	<i>Ardea alba</i>	Great White Egret	LC	R	Carnivorous
36	<i>Ardea intermedia</i>	Intermediate Egret	LC	RM	Carnivorous
37	<i>Egretta garzetta</i>	Little Egret	LC	R	Carnivorous
38	<i>Ardeola garyii</i>	Indian Pond Heron	LC	R	Carnivorous
39	<i>Bubulcus ibis</i>	Cattle Egret	LC	R	Carnivorous
40	<i>Ardea purpurea</i>	Purple Heron	LC	R	Carnivorous
41	<i>Ardea cinerea</i>	Grey Heron	LC	R	Carnivorous
42	<i>Pycnonotus cafer</i>	Red-vented Bulbul	C	R	Herbivorous
43	<i>Ixobrychus cinnamomeus</i>	Cinnamon Bittern	LC	RM	Carnivorous

Status: WM = winter migrant; SM = summer migrant; RM=resident migratory and R= resident.

International Union for Conservation of Nature and Natural Resources (IUCN) categories: LC = least concern; C= common; UC= uncommon and NT = near-threatened.

* The information is based on the IUCN Red List [15].

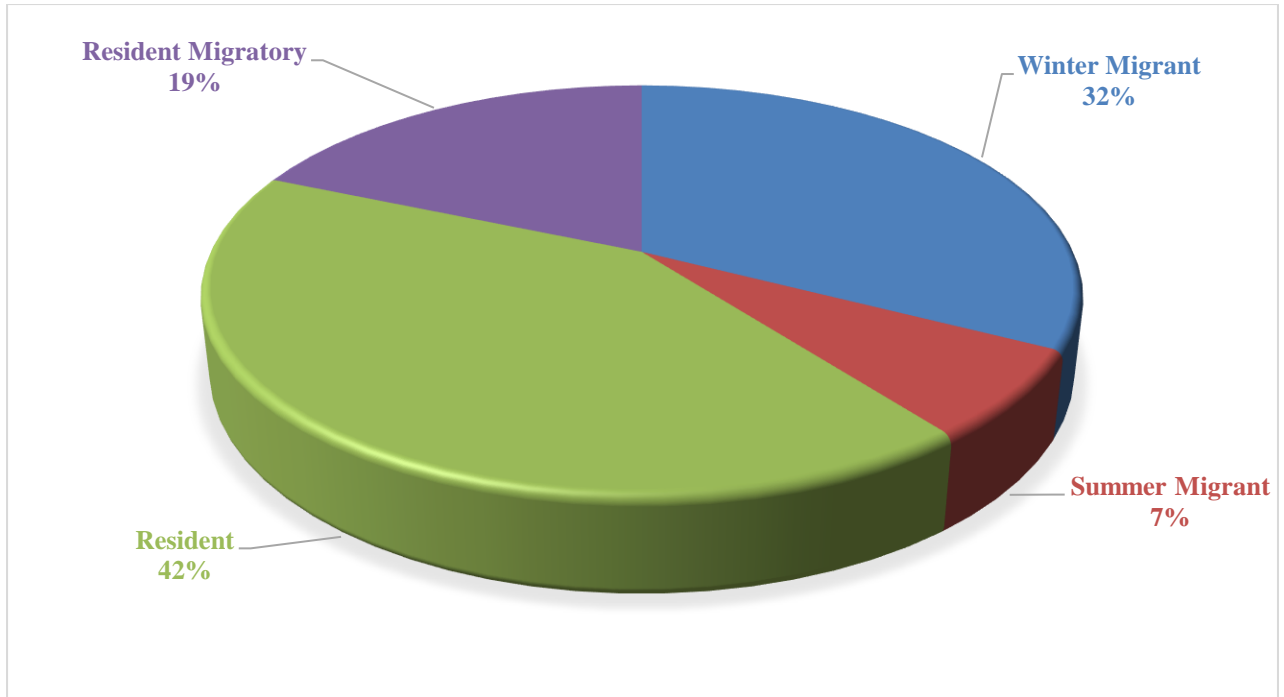


Figure- 2. The residential status of avian fauna in the Upper Lake, Bhopal.

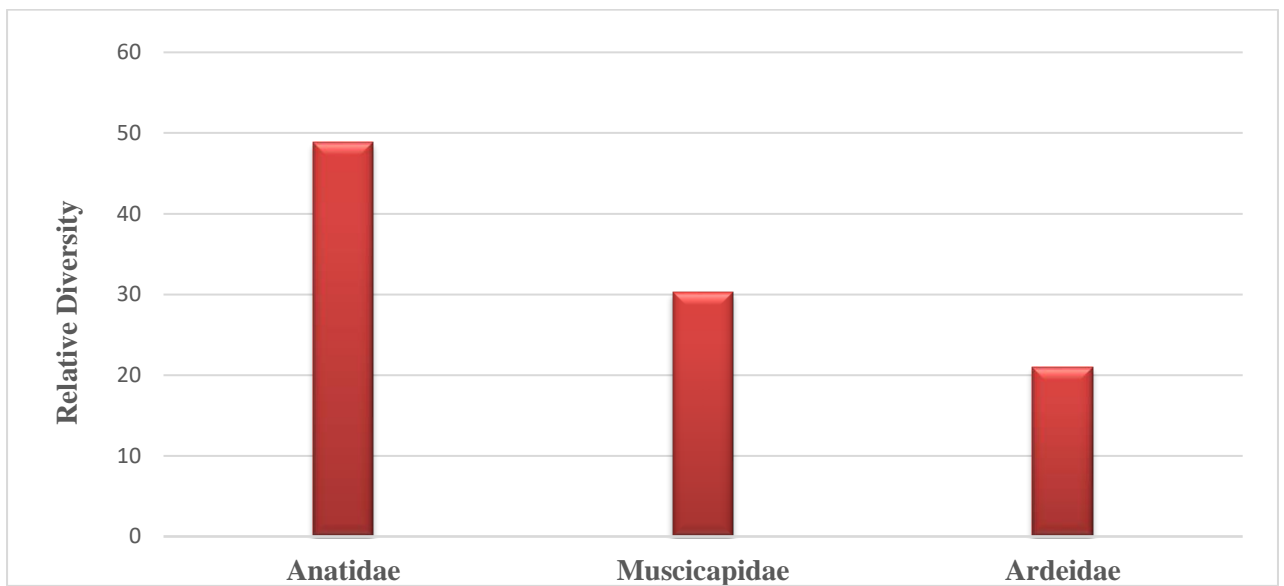


Figure- 3: Relative diversity among all avian families in the Upper Lake, Bhopal.

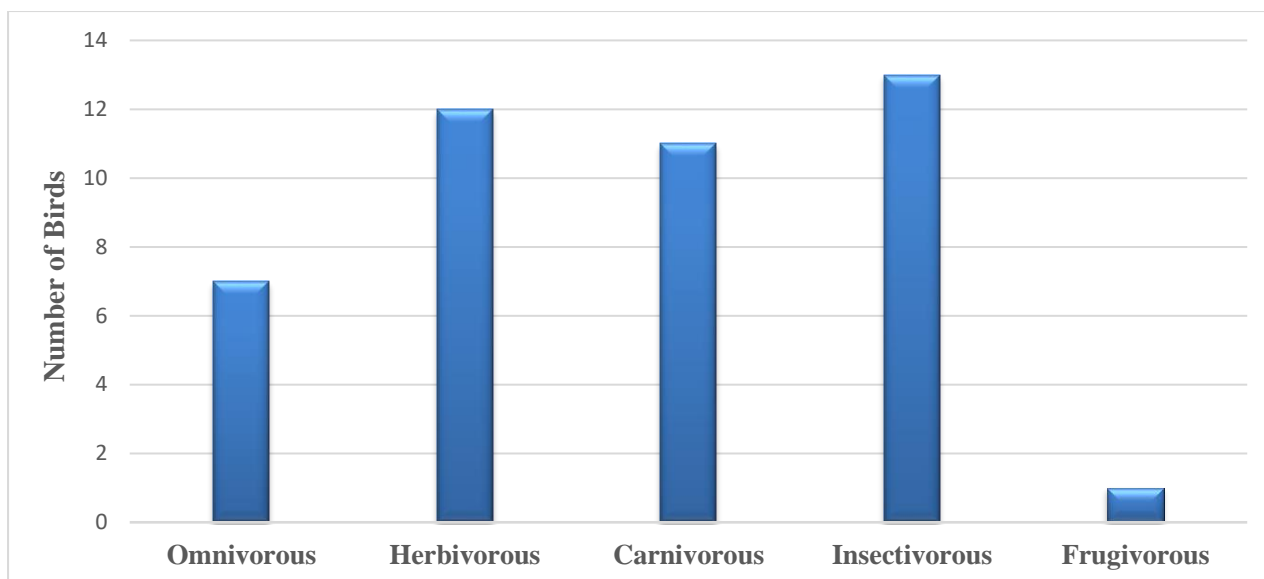


Figure-4: Guild-based classifications of avian species in the Upper Lake, Bhopal.

CONCLUSION

Avifaunal diversity of the Upper Lake at Bhopal, affirm that the lake is appropriate environment for the private and for transient birds too. In any case, the birds present in and around the lake are impacted by anthropogenic exercises, for example, diminishing of green cover because of enormous scope development, washing garments, direct washing in lake, washing domesticated animals, submersion of icons, fishing practices and contamination by manures and bug sprays coming from rice fields through overflow. The profluent coming from the agrarian fields and through sewage will spread over an enormous region, which could be liable for the decrease in the quantity of water birds in the Upper Lake. Accordingly, there is a dire need to tackle this issue, which might be useful in expanding the quantity of water birds and in expanding ecotourism nearby. However, the avifauna of the Upper Lake in Bhopal is different; keeping in view the fluctuated avifauna recorded, steps ought to be taken to do legitimate upkeep and mindfulness projects ought to be done on schedule to time to mindful individuals who are dwelling on the banks on this lake.

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