IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Anthropogenic Impact on Aquatic Avifaunal Study in Bhoj Wetland, Bhopal (M.P.)

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Abstract: Birds play a very important role in ecological balance in an ecosystem. Their diversity related to the habitat diversity. It provides a variety of nesting, breeding and feeding. The present studies on aquatic birds carried out in Bhoj Wetland of Bhopal. This study helps to evaluate bird density and diversity, species composition, abundance and distribution of aquatic birds of Bhojtal Lake. The study was carried out from July- 2022 up to June- 2023. The surveys were made early morning of the day and evening of the day by using the point count and line transects method for recording and identification of bird. Identification was made by captured photograph with the help of DSLR camera and birds observed by binocular. Anthropogenic activities were measured by using grading system by self observation (0-5%). During the study, a total of 56 species of birds belonging to 17 families and 08 orders were recorded. Among the recorded order and family Charadriiformes and Anatidae were most dominant. During the study periods three categories of birds viz. resident, resident migratory and migratory birds were noticed. Bhoj wetland has rich diversity of birds due to the availability of sufficient food and better ecological conditions but due to anthropogenic activities affecting the presence of bird population and species.

Keywords- Avifauna, Diversity, Anthropogenic activity, Bhoj wetland.

I. INTRODUCTION

Bird community evaluation has become an important tool in biodiversity conservation and for identifying conservation actions in areas of high human and animal's pressure especially aquatic resources (Patode *et al.,* 2021). Wetlands are important ecosystems that provide support to grow a different variety of plant and animal by nourishing them and then connecting aquatic and terrestrial environments. They provide various ecosystem services and serve as habitats for many bird species. Wetlands are important and especially for various aquatic species, including waters bird, some wetland-dependent mammals, many fresh-water fishes, turtle, and Crocodiles. As Concern about avifauna, wetlands are used by residents and migratory bird for food, feeding and also breeding. Regular monitoring for assessing biodiversity in wetland ecosystem, it gives the ecological importance of resident and migratory birds, and their movement patterns, also their tropic status and their adaptability in various habitat (Sheta *et al.,* 2023).

The geographic location of a wetland may determine how and when birds will use it or use adjacent habitat. Local people used the wetlands for various purposes for their livelihood, fishing being most common activity. Anthropogenic factors cause the degradation of wetland ecosystem which leads to the destruction of habitat of water birds (Joshi, 2012). The abundance of avifauna indicates the healthy status of lakes owing the availability of water, safe habitat and food sources for both adults and nestlings, and essential nesting/roosting sites in and around the lakes are important for the occurrence and abundance of aquatic bird populations. Diversity of the avifauna is one of the most important ecological indicators to evaluate the quality of habitats (Puri and Virani, 2016).

The important functions of wetlands are to provide a habit and habitat for birds. Wetlands as a source of drinking water, nourishment, sleeping, lodging, and social relations use by bird (Rather and Shrivastava, 2021). Avifaunal distribution and diversity have going to be declining due to anthropogenic activities in wetlands area (Bhadja and Vaghela, 2013). Bhoj Wetland of Bhopal is a Ramsar site and supports a huge diversity of aquatic birds as well as terrestrial birds. The present work has been carried out with the aim to identify and enlisted various bird species visiting in the Upper Lake which may provide a baseline for the future management of avian fauna in urban area.

II. Study Area

Bhojtal is situated on the west central part of Bhopal city and is surrounded by VAN Vihar National Park on the south, human settlement on the east and north, and agriculture fields on the west. This lake was created in the early-11th century by King Bhoj by construction of an earthen dam across the Kolans River, a rain-fed tributary of the Betwa River. It has an area of 31 $km^{2,}$ and drains a catchment or watershed of 361 km^2 Maximum length 31.5 km and Maximum width 5 km. The watershed of the Upper Lake is mostly rural, with some urbanized areas around its eastern end. The Kolans was formerly a tributary of the Halali River, but with the creation of the lake using an earthen dam and a diversion channel, the upper reach of the Kolans River and Bada Talaab now drain into the Kaliasote River.

III. Materials and Methods

Aquatic avifauna of Bhoj wetland were observed during rainy, winter and summer season at the most active period of the day in early morning 6:00- 10:00 hour and evening 4:00-6:00 hour for a period of one year from July-2022 to June-2023. The study area was surveyed for recording of avifauna by applying point count method (Verner, 1985), and line transect method (Sale and Berkmuller, 1988) where ever possible. The birds were observed with the help of Binoculars (Nikon Action 8X40) and Photographs were taken to identify birds accurately to the generic and species level by using DSLR camera (Nikon D-60 with magnifying lens 70-300). Grimmett *et al.,* (2011); Woodcock and Heinzel, (1980) field guide books were followed for bird identification.

IV. Result and Discussion

The study reveals the occurrence of 56 species of birds belonging to 17 families 08 orders were recorded from Bhojtal wetland. Details such as orders, families, common and scientific names, IUCN status

and resident status of the wetland birds are presented (Table 1). Harisha (2016) has evaluated the status, diversity and conservation threats of wetland birds of Kondajji Lake in Davanagere District. Bora et al. (2017) have recorded 30 bird species which belong to 13 families and measured their diversity at Samaguri Beel nearby Nagaon town in Nagaon District of Assam.

Charadriiformes appeared to be the most dominant order represented by 16 species followed by Anseriformes12 species, Pelecaniformes 11 species, Gruiformes 6, Ciconiiformes 4 species, Coraciiformes 3, Suliformes and Passeriformes 2 species of each showed in pie chart with their percentage (Fig. 1). Kalsi (1998) studied the avian diversity of Kalesar Wildlife Sanctuary. A total of 161 species were observed, of which 112 were resident and 49 were migrant species. Order Passeriformes dominated the avifauna with 63 species represented by 29 families while Strigiformes and Cuculiformes were poorly represented orders with single species each.

Out of total recorded families contribution of Anatidae were the most dominated with 12 species followed by Ardeidae 8 species, Scolopacidae 6 species, Rallidae and Ciconiidae each 4 species, Threskiornithidae and Alcedinidae each 3 species, Laridae, Charadriidae, Jacanidae, Gruidae, Phalacrocoracidae, Motacillidae each 2 species, Rostratulidae, Recurvirostridae, Burhinidae, Glareolidae 1 species of each showed in pie chart with their percentage (Fig. 2). Manjunath and Ravikiran (2016) observed most of the families represented by one or two species (relative percentage of species 0-2, 10 families; 2-4, 2 families; 4-6, 2 families and above 6 in one family), while the maximum relative percentage is from Ardeidae respectively. Out of total recorded species international union conservation of nature (IUCN) status showed that most of bird species lest concern 50 with 89%, near threatened 3 with 6% and Vulnearble 3 with 5% (Fig. 3). The IUCN conservation status of avian species was assigned according to the IUCN version 3.1. Out of the 126 species, 121 were Least Concern (LC), 4 were Near Threatened (NT) and 1 was Endangered (EN). Among the recorded avifauna, Egyptian Vulture (Neophron percnopterus) is Endangered (EN); and Painted Stork (Mycteria leucocephalia), River Lapwing (Vanellus duvaucelii), Alexandrine Parakeet (Psittacula eupatria) and Great Hornbill (Buceros bicornis) are listed as near threatened species in IUCN Red list observed by Rai *et al.,* (2017).

The most of birds observed during this study were resident migrtory 45% with 25 species, migratory 30% with 17 species and residential 25% with 14 species of total recorded (Fig. 4). Similarly Lodhi *et al.,* (2017) reported least concern (51 species), vulnerable (3 species) and near threatened (2 species). They were also reported migrant 53% while residential migrant 29%, residential 18% of total recorded species. Adhurya *et al.,* (2023) studied avian diversity in Durgapur Government College Campus, West Bengal, India and documented 106 avian species belonging to 47families. Among these 106 species, 23 were winter migrants (WM), 04 were summer migrants(SM), 01 was passage migrant (PM), 01 was vagrant and 77 were residents (R). Every year the peak population of winter migratory birds was seen during the month of January and February and almost all of them leave the wetland by end of March. The basic requirements of the migratory water birds at their wintering sites are adequate food supply and safety (Bharatha, 2006).

Table 1: Check List of Avian species with their common, scientific name and Status

S. No.	Order	Family	Scientific Name	Common Name	Status	Resident Status
1	Charadriiformes	Scolopacidae	*Tringa ochropus*	Green Sandpiper	LC	RM
2			*Tringa glareola*	Wood Sandpiper	LC	RM
3			*Actitis hypoleucos*	Common Sandpiper	LC	RM
4			*Tringa ochropus*	Green Sandpiper	LC	RM
5			*Calidris minuta*	Little Stint	LC	RM
6			*Numenius arquata*	Eurasian Curlew	NT	RM
7		Laridae	*Larus brunnicephalus*	Brown-headed Gull	LC	M
8			*Sterna aurantia*	River Tern	VU	RM
9		Charadriidae	*Vanellus indicus*	Red-wattled Lapwing	LC	R
10			*Charadrius dubius*	Little Ringed Plover	LC	RM
11		Jacanidae	*Metopidius indicus*	Bronze-winged Jacana	LC	R
12			*Hydrophasianus chirurgus*	Pheasant-tailed Jacana	LC	R
13		Rostratulidae	*Rostratula benghalensis*	Greater Painted-snipe	LC	M
14		Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	LC	R
15		Burhinidae	*Burhinus indicus*	Indian Thick-knee	LC	R
16		Glareolidae	*Cursorius coromandelicus*	Indian Courser	LC	RM
17	Anseriformes	Anatidae	*Anser anser*	Greylag Goose	LC	M
18			*Dendrocygna javanica*	Lesser Whistling-duck	LC	RM
19			*Spatula clypeata*	Northern Shoveler	LC	M
20			*Aythya ferina*	Common Pochard	VU	M
21			*Sarkidiornis melanotos*	Knob-billed Duck	LC	M
22			*Nettapus coromandelianus*	Cotton Pygmy-goose	LC	M
23			*Anser indicus*	Bar-headed Goose	LC	M
24			*Anas poecilorhyncha*	Indian Spot-billed Duck	LC	M
25			*Anas crecca*	Common Teal	LC	M
26			*Anas acuta*	Northern Pintail	LC	M
27			*Tadorna ferruginea*	Ruddy Shelduck	LC	M
28			*Netta rufina*	Red-crested Pochard	LC	M
29	Pelecaniformes	Ardeidae	*Egretta garzetta*	Little Egret	LC	RM
30			*Bubulcus ibis*	Cattle Egret	LC	R
31			*Ardea cinerea*	Grey Heron	LC	RM
32			*Nycticorax nycticorax*	Black-crowned Night-heron	LC	RM
33			*Ardea purpurea*	Purple Heron	LC	RM
34			*Ardeola grayii*	Indian Pond-heron	LC	R
35			*Ardea intermedia*	Intermediate Egret	LC	RM
36			*Ardea alba*	Great White Egret	LC	RM
37		Threskiornithidae	*Pseudibis papillosa*	Red-naped Ibis	LC	RM
38			*Platalea leucorodia*	Eurasian Spoonbill	LC	M
39			*Plegadis falcinellus*	Glossy Ibis	LC	RM
42	Gruiformes	Rallidae	*Porphyrio porphyrio*	Purple Swamphen	LC	R
43			*Amaurornis phoenicurus*	White-breasted Waterhen	LC	R
44			*Gallinula chloropus*	Common Moorhen	LC	R
45			*Fulica atra*	Common Coot	LC	M
40		Gruidae	*Grus antigone*	Sarus Crane	VU	RM
41			*Anthropoides virgo*	Demoiselle Crane	LC	M
46	Ciconiiformes	Ciconiidae	*Ephippiorhynchus asiaticus*	Black Necked Stork	NT	M
47			*Ciconia episcopus*	Asian Woollyneck	NT	RM
48			*Anastomus oscitans*	Asian Openbill	LC	RM
49			*Mycteria leucocephala*	Painted Stork	LC	RM
50	Coraciiformes	Alcedinidae	*Halcyon smyrnensis*	White-breasted Kingfisher	LC	R
51			*Ceryle rudis*	Pied Kingfisher	LC	R
52			*Alcedo atthis*	Common Kingfisher	LC	R
53	Suliformes	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	LC	RM
54			*Microcarbo niger*	Little Cormorant	LC	RM
55	Passeriformes	Motacillidae	*Motacilla alba*	White Wagtail	LC	R
56			*Motacilla flava*	Yellow Wagtail	LC	RM

NT= Near Threatened, VU= Vulnerable, LC= Least Concern

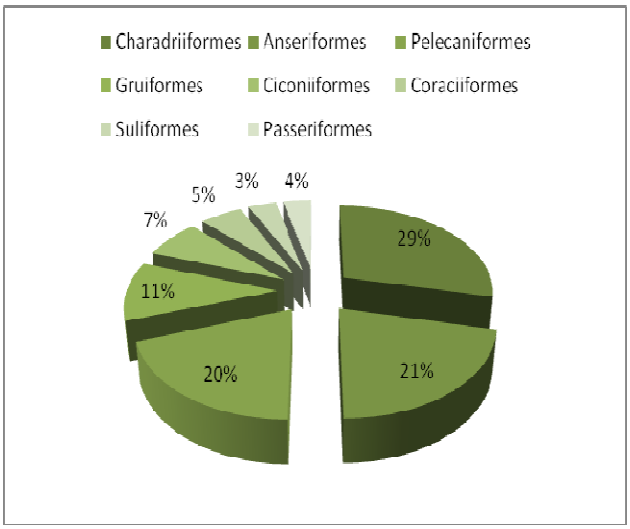

Fig. 1: Order wise species composition

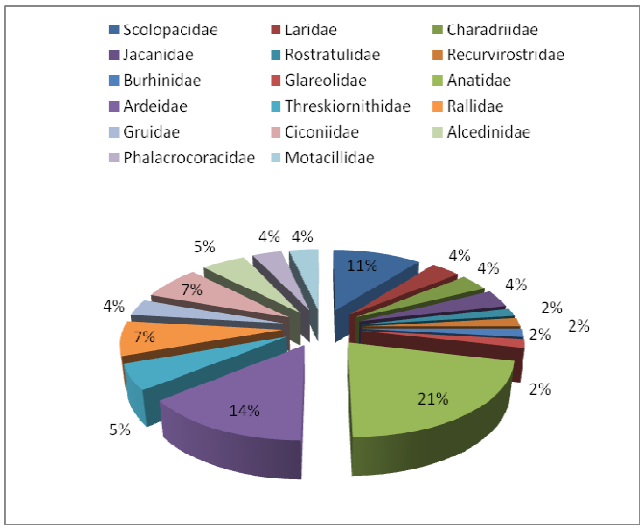

Fig. 2: Family wise species composition

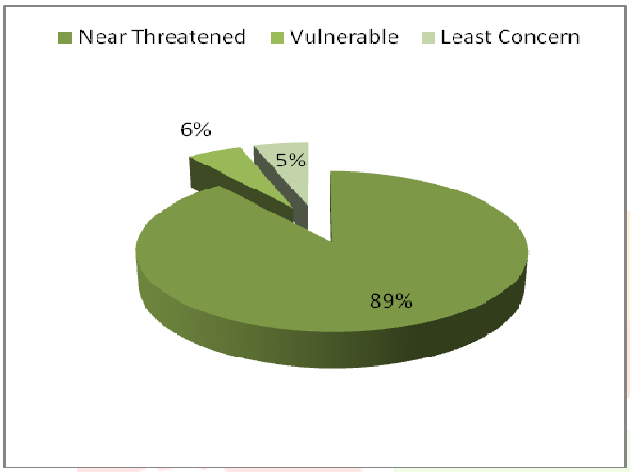

Fig. 3: IUCN status of recorded species

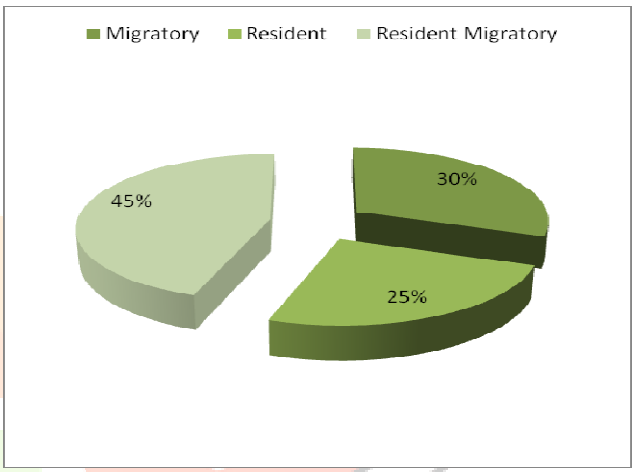

Fig. 4: Residential status of recorded species

Uses of anthropogenic activities were graded depending on the number of usage such as human presence, looping, wood cutting, Grass cutting, Pollution, Weed infestation, Drainage, Agriculture, Bath washing, Cattle wading, Grazing and Irrigation (Fig. 5). During the study it was revealed that the grading (0-5%) Bhoj wetland highly affected due to anthropogenic activities which affect the presence of bird. Similar work Lodhi and Rao (2019) observed on anthropogenic activities in wetlands of district Shivpuri Madhya Pradesh, India.

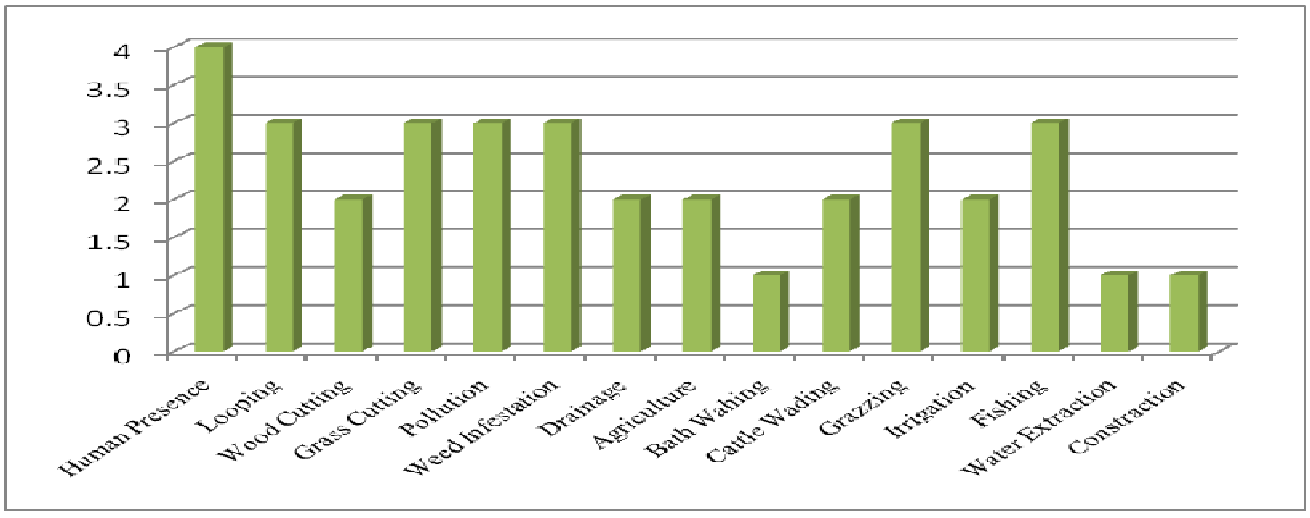

Fig. 5: Anthropogenic activities in and surrounding area of Bhoj Wetland

V. CONCLUSION

Aquatic birds are very essential, playing a pivotal role in different food chains and food web at different trophic levels in agro-climatic region. Further, migratory birds seasonal visit to lakes amidst dry agroclimatic region indicated the presence of suitable habitat and life supporting conditions for their safe survival. The study suggested that the Upper Lake of Bhopal is a growing ecosystem consist essential features for survival of birds and other aquatic species. Anthropogenic activity and agriculture process in and around the Lake affected the diversity of aquatic bird species. Proper awareness program is very importance for bird and their vital role in daily life should be adopted.

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