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IMPACT OF HUMAN ACTIVITIES ON BIRD SPECIES DIVERSITY AT GAURI SAROVAR, DIST. BHIND (M.P.), INDIA

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Abstract: The present study was conducted to evaluate the impact of over-exploitation of natural resources and tree harvesting on the diversity and distribution of avian species around Gauri Sarovar, Bhind. Bird surveys were carried out during dawn and dusk using point count and line transect methods across different localities over a two-year period, from October 2021 to September 2023. A diverse range of 74 bird species, representing 11 orders and 26 families, were observed. The distribution of bird species across families revealed that 10 species belonged to the family Anatidae, while 9 species were from the families Ardeidae and Scolopacidae. Families such as Threskiornithidae, Rallidae, Charadriidae, and Motacillidae were represented by 4 species each. Phalacrocoracidae, Alcedinidae, and Sturnidae had 3 species each, while several other families, including Ciconiidae, Jacanidae, Estrildidae, Hirundinidae, and Cisticolidae, were represented by 2 species each while 11 families were represented by single species. Currently, the ecological conditions in the areas surrounding Gauri Sarovar support a moderate bird population. Authors observed that ongoing construction of the Gauri Sarovar Bridge badly influencing the diversity and distribution of avian species. As bird communities are highly responsive to anthropogenic pressures, the study recommends the restoration of large forest patches and well-planned conservation-focused reforestation efforts.

Keywords: Anthropogenic activities, Aquatic bird, Bhind district, Gauri Sarovar, Urbanization.

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INTRODUCTION

Biodiversity is widely recognized for its influence on the magnitude and stability of numerous ecosystem properties. Ecosystems with high biodiversity are considered to be more functionally robust. Consequently, diverse systems may provide safer habitats for vulnerable species, leading to a positive relationship between biodiversity and the collective vulnerability of species within an assemblage (Weeks *et al.,* 2016; Ashok, 2016). Asia was once considered one of the most biodiversity-rich continents. However, the increasing human population has negatively impacted the region's biodiversity. The growing demand for food and shelter has led to agricultural intensification, urbanization, industrialization, and pollution. Conducting a population census of all species in

urbanized and peri-urban areas is necessary for effective conservation planning (Altaf *et al.,* 2018).

Biodiversity can be impacted by anthropogenic activities, which encompass various human-induced disturbances (Prakash and Verma, 2022). These disturbances can have both short- and long-term effects on wildlife, leading to changes in behaviour, physiology, and reproduction. Increased anthropogenic activity reduces the persistence of local populations by compromising habitat suitability, limiting feeding and breeding opportunities, and increasing regional wildlife extinctions (Sheta *et al.,* 2011).

Urbanization is a dominant geographical trend and a significant component of global change, with profound implications for socio-economic, cultural, and environmental characteristics (Pedreros *et al.,* 2018). Climate change as well as habitat degradation and destruction caused by human activities are major drivers of global biodiversity declines. Understanding the variations in species' responses to human disturbances is crucial for making effective conservation decisions (Asefa *et al.,* 2017; Kumar, 2021).

Birds serve as excellent bio-indicators of the effects of urbanization on ecosystems due to their high diversity and conspicuous presence. They are key species in various ecosystems because they are widely distributed, easily visible, and resonate with us. Bird species richness is influenced by the urban environment, landscape, floral diversity, degree of anthropogenic disturbances, invasion, and predation, making them a significant component of urban biodiversity (Maurice *et al.,* 2020).

Birds play numerous roles in maintaining ecosystems and supporting biodiversity. They act as bioindicators of healthy ecosystems, regulate disease vectors, recycle biomass, and reduce levels of disposable waste (Gatesire *et al.,* 2014). Birds are additionally crucial as pollinators and scavengers, use specific plants in nest construction, and they serve as bio monitors that control insects and pests (Verma and Prakash, 2016). They are excellent ecological indicators and play roles as both primary and tertiary consumers in the food chain, contributing significantly to nutrient recycling (Ratchford *et al.,* 2005; Galgani *et al.,* 2010; Joshi and Vinod, 2014; Kadam and Dhar, 2017; Kurve, 2017; Altaf *et al.,* 2018; Maurice *et al.,* 2020).

The species diversity of birds presents in a specific area, along with their distribution records and the extent of threats they face, are essential for guiding conservation efforts. Major threats to birds that influence their sustainability include illegal hunting, urbanization, intensification of agriculture, eutrophication, pollution, and livestock grazing (Bhadouria *et al.,* 2012; Dwivedi and Singh, 2017; Altaf *et al.,* 2018; Verma and Prakash, 2019; Singh *et al.,* 2023). A number of workers including Sharma and Sharma (2022) and Sharma and Kurar (2023) studied the avian fauna but no systematic data is available on the avian species of Gauri Sarovar hence this study provides baseline information for understanding the status of bird populations in the region and the potential effects of sewage pollution on them.

MATERIALS AND METHODS

Gauri Sarovar, located in the Bhind District of Madhya Pradesh and part of the Chambal division, is a protected area known as one of Bhind town's oldest ponds (Fig. 1, 2). Positioned at latitude 26°56'38" North and longitude 78°7'61" East, the Sarovar experiences a dry and hot climate in summer, humid and hot weather during the rainy season, and cold conditions in winter. This man-made pond attracts numerous aquatic bird species for nesting, feeding, and breeding, making it a popular tourist destination. Every winter, a vast number of migratory aquatic avian species gather at this lake from various parts of the world.

During a complete year from October 2021 to September 2023, aquatic avifauna was observed across winter, summer, and rainy seasons to analyse seasonal variations. Observations were conducted during early morning hours from 6:00 am to 11:00 am and in the evening from 3:00 pm to 6:00 pm. The Point Count method and Line Transect method were employed for sampling.

Digital photographs were captured using a Nikon D-5300 camera with a 70-300 mm zoom lens for species identification, while Olympus binoculars (10x50 S, 50 mm) aided in visual counts. Identification and classification of aquatic birds were facilitated using field guide books authored by Grimmett *et al.* (2001) and Ali (2006).

Fig. 1: Satellite view of Gauri Sarovar.

Fig. 2: A view of Gauri Sarovar

RESULTS AND DISCUSSION

A total of 74 species of aquatic birds, belonging to 11 orders and 26 families, were observed and identified from Gauri Sarovar (Table 1a and 1b). These recorded aquatic bird species are listed in Table 2. The 74 species identified represented 11 different orders. The order Charadriiformes had the highest number of species with 17, followed by Passeriformes with 16 species, Pelecaniformes with 13 species, and Anseriformes with 10 species. Additionally, Coraciiformes was represented by 5 species, while both Suliformes and Gruiformes accounted for 4 species each, and Ciconiiformes by 2 species. The orders namely Podicipediformes, Cuculiformes, and Accipitriformes were each represented by a single species (Table 1a; Fig. 3).

The 74 species belonged to 26 families, with the family Anatidae recording the highest number of species (10). This was followed by Ardeidae and Scolopacidae, each with 9 species. Families such as Threskiornithidae, Rallidae, Charadriidae, and Motacillidae were each represented by 4 species. Additionally, Phalacrocoracidae, Alcedinidae, and Sturnidae had 3 species each. Several families, including Ciconiidae, Jacanidae, Estrildidae, Hirundinidae, and Cisticolidae, were represented by 2 species each. Families such as Podicipedidae, Anhingidae, Coraciidae, Meropidae, Recurvirostridae, Rostratulidae, Ploceidae, Nectariniidae, Muscicapidae, Cuculidae, and Accipitridae were all represented by a single species each (Table 1b; Fig. 4).

Altaf *et al.* (2018) told that avian diversity and distribution across various habitats were influenced by factors such as food availability, shelter, human activity, habitat fragmentation, habitat loss, invasive plant species, and the removal of vegetation. Allen *et al.* (2019) found that agricultural intensification negatively affects bird diversity through the use of chemicals, reduction of nesting sites, bird mortality from farming activities, and increased predation rates following crop harvesting. Additionally, large areas with a high density of trees have a positive correlation with bird diversity, as trees provide essential food and shelter for birds (Asefa *et al.*, 2017; Allen *et al.*, 2019; Maurice *et al.*, 2020).

Currently, the ecological conditions in the Gauri Sarovar area, Bhind support a moderate bird population. However, the over-exploitation of natural resources due to the ongoing construction of the Gauri Sarovar Bridge, along with tree harvesting, urbanization, bird hunting and domestic pollution, is expected to negatively impact avian diversity in the future. Therefore, the data presented in this article can serve as baseline information for future studies.

Table 1a: Order wise distribution of recorded aquatic bird species in study site during study period (2021-2023).

S. No.	Orders	Total recorded species		
		Gauri Sarovar		
		2021-2022	2022-2023	2021-2023
1.	Pelecaniformes	10	13	13
2.	Podicipediformes	01	01	01
3.	Suliformes	04	04	04
4.	Gruiformes	04	04	04
5.	Coraciiformes	05	05	05
6.	Ciconiiformes	01	02	02
7.	Charadriiformes	17	17	17
8.	Passeriformes	16	14	16
9.	Cuculiformes	01	01	01
10.	Accipitriformes	01	01	01
11.	Anseriformes	10	10	10
Total	**11**	**70**	**72**	**74**

Table 1b: Family-wise distribution of recorded aquatic bird species in study site during study period (2021-2023).

S. No.	Families	Total recorded species		
		Gauri Sarovar		
		2021-2022	2022-2023	2021-2023
1.	Threskiornithidae	02	04	04
2.	Ardeidae	08	09	09
3.	Podicipedidae	01	01	01
4.	Phalacrocoracidae	03	03	03
5.	Anhingidae	01	01	01
6.	Rallidae	04	04	04
7.	Alcedinidae	03	03	03
8.	Coraciidae	01	01	01
9.	Meropidae	01	01	01
10.	Ciconiidae	01	02	02
11.	Jacanidae	02	02	02
12.	Scolopacidae	09	09	09
13.	Charadriidae	04	04	04
14.	Recurvirostridae	01	01	01
15.	Rostratulidae	01	01	01

16.	Motacillidae	04	04	04
17.	Estrildidae	02	---	02
18.	Hirundinidae	02	02	02
19.	Ploceidae	01	01	01
20.	Sturnidae	03	03	03
21.	Cisticolidae	02	02	02
22.	Nectariniidae	01	01	01
23.	Muscicapidae	01	01	01
24.	Cuculidae	01	01	01
25.	Accipitridae	01	01	01
26.	Anatidae	10	10	10
Total	**26**	**70**	**72**	**74**

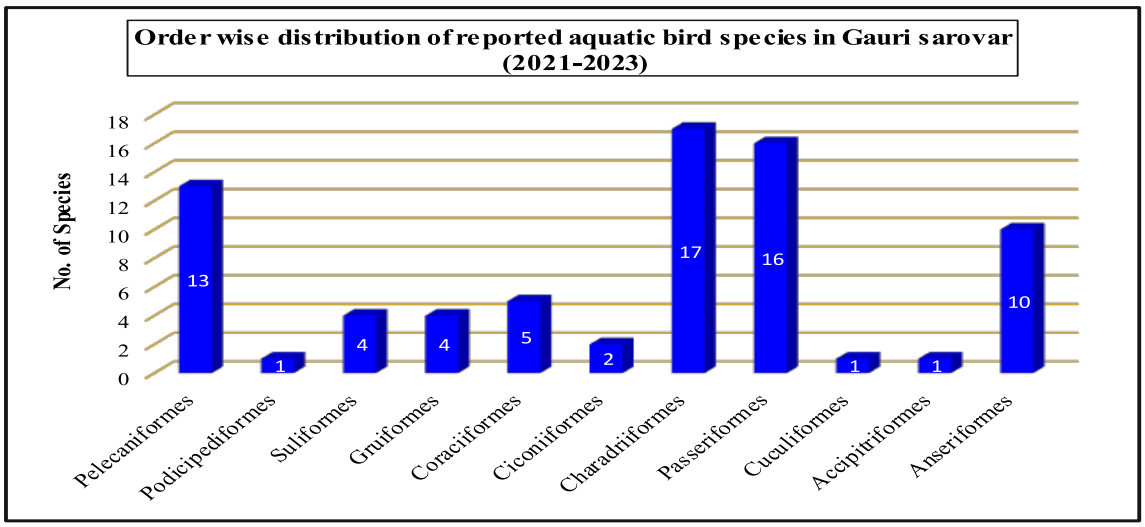

Fig. 3: Order-wise distribution of recorded aquatic bird species in study site during study period (2021-2023).

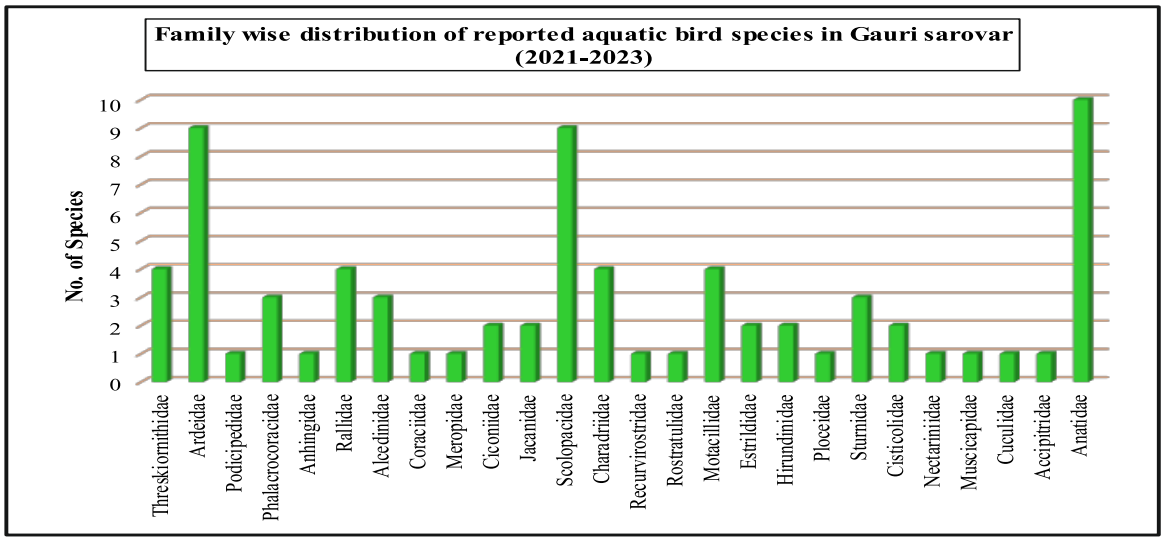

Fig. 4: Family-wise distribution of recorded aquatic bird species in study site during study period (2021-2023).

Table 2: List of aquatic bird species recorded at study sites during 2021 to 2023.

S. No.	Common Name	Gauri Sarovar	
		2021-2022	2022-2023
1.	Black-headed ibis	Y	Y
2.	Eurasian spoonbill	Y	Y
3.	Red-naped ibis	N	Y
4.	Glossy ibis	N	Y
5.	Cattle egret	Y	Y
6.	Eastern great egret	Y	Y
7.	Intermediate egret	Y	Y
8.	Little egret	Y	Y
9.	Indian pond heron	Y	Y
10.	Black-crowned night heron	Y	Y
11.	Purple heron	N	Y
12.	Great egret	Y	Y
13.	Grey heron	Y	Y
14.	Little grebe	Y	Y
15.	Little cormorant	Y	Y
16.	Indian cormorant	Y	Y
17.	Great cormorant	Y	Y
18.	Oriental darter	Y	Y
19.	White-breasted waterhen	Y	Y
20.	Purple swamphen	Y	Y
21.	Common moorhen	Y	Y
22.	Eurasian coot	Y	Y
23.	White-breasted kingfisher	Y	Y
24.	Pied kingfisher	Y	Y
25.	Common kingfisher	Y	Y
26.	Indian roller	Y	Y
27.	Asian green bee-eater	Y	Y
28.	Asian openbill	N	Y
29.	Woolly-necked stork	Y	Y
30.	Bronze-winged jacana	Y	Y
31.	Pheasant-tailed jacana	Y	Y
32.	Marsh sandpiper	Y	Y
33.	Common sandpiper	Y	Y
34.	Green sandpiper	Y	Y

35.	Wood sandpiper	Y	Y
36.	Temminck's stint	Y	Y
37.	Ruff (bird)	Y	Y
38.	Common redshank	Y	Y
39.	Common greenshank	Y	Y
40.	Sanderling	Y	Y
41.	Little ringed plover	Y	Y
42.	Long-billed plover	Y	Y
43.	Yellow-wattled lapwing	Y	Y
44.	Red-wattled lapwing	Y	Y
45.	Black-winged stilt	Y	Y
46.	Greater painted-snipe	Y	Y
47.	White-browed wagtail	Y	Y
48.	White wagtail	Y	Y
49.	Western yellow wagtail	Y	Y
50.	Citrine wagtail	Y	Y
51.	Tricoloured munia	Y	N
52.	Scaly-breasted munia	Y	N
53.	Wire-tailed swallow	Y	Y
54.	Barn swallow	Y	Y
55.	Black-breasted weaver	Y	Y
56.	Indian pied myna	Y	Y
57.	Bank myna	Y	Y
58.	Common myna	Y	Y
59.	Ashy prinia	Y	Y
60.	Plain prinia	Y	Y
61.	Purple sunbird	Y	Y
62.	Oriental magpie-robin	Y	Y
63.	Greater coucal	Y	Y
64.	Black kite	Y	Y
65.	Knob-billed duck	Y	Y
66.	Lesser whistling duck	Y	Y
67.	Mallard	Y	Y
68.	Rouen duck	Y	Y
69.	Domestic goose	Y	Y
70.	Swan goose	Y	Y
71.	Ruddy shelduck	Y	Y
72.	Northern shoveler	Y	Y
73.	Bar-headed goose	Y	Y
74.	Indian spot-billed duck	Y	Y
Total	**74**	**70**	**72**

Note: Y = Present N = Absent

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