Waterbirds Diversity in and Around Shilaj Lake: Anthropogenic Pressure

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Abstract— Shilaj Lake, located in Ahmedabad, Gujarat, is an important urban wetland that provides critical habitat for a wide range of resident and migratory waterbird species. This study focuses on the documentation of waterbird diversity and the assessment of anthropogenic pressures in and around the lake. A total of 32 species from 9 orders and 15 families were recorded through systematic visual surveys conducted at multiple time intervals over 31 days. The findings underscore the ecological value of Shilaj Lake and highlight the urgent need for conservation efforts to mitigate anthropogenic pressures that threaten its biodiversity.

Index Terms— Anthropogenic pressure, Biodiversity, Shilaj lake, Waterbirds, Wetlands.

I. INTRODUCTION

Water birds are a large and varied group of birds. Most are exclusive to fresh water sources such as rivers, lakes, dams and wetlands, however many sea and shore birds can also be regularly found in fresh water [1]. Wetlands and lakes are important bird's habitats and birds use them for feeding, roosting, nesting and rearing their young ones. The waterbirds could be classified into different groups namely Swimming & Diving Birds and Shore & Wading Birds which belongs to various orders such as Anseriformes, Passeriformes, Ciconiiformes, Coraciformes, Gruiformes and Podicipediformes. The total bird species of Ahmedabad is approximately 300 to 326 per year[2] out of which waterbirds are more than 100, [3] which greatly increases during the winter season as the state welcomes and harbour many migratory birds. Wetlands and lakes in India, are facing tremendous anthropogenic pressure. These anthropogenic pressures include construction of commercial buildings around the lake, reduction of the lake area, dumping of sanctified remnants and human waste into the lake etc.

II. STUDY SITE

This study was conducted in Shilaj Lake which is a natural ensemble in Ahmedabad city, located at the heart of Gujarat state with 1330m perimeter and 56,810.65m2 area. It is located between 23°03'20"N Latitude and 72°28'29"E Longitude. The lake is surrounded by dense vegetation on one side and, providing habitat to migratory and local bird species. The perimeter of study site was divided into 6 observation points.

Study site: Shilaj lake
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

III.MATERIALS & METHOD

The present work was carried out over a period of 31 days in January 2025. The line transect method and Point count method was used to document the birds within the study area.[4] The transect covered roughly 500-600m in all 6 sites.

The birds were scrutinized at various times throughout the day, with the day being divided into three hours intervals for systematic observation. Birds were recorded along with frequency of sightings of different species at a particular site. Birds were observed using 12×42 binocular and identified using field guide such as Birds of India (Ali & Ripley 1987; Grimmett et al. 1999) and photographed by EOS 700D DSLR camera with EF-S 55-250mm lens.

The percent occurrence is calculated as [2]

$$\text{Percent Occurrence} = \frac{\text{No. of species of each family}}{\text{Total no. of different species seen}} \times 100$$

IV.RESULT AND DISCUSSION

Details such as order, family, common and scientific names, IUCN status and status of aquatic avifauna in the study area is as given in Table 1. A total of thirty-two species of birds belonging to 9 orders and 15 families were recorded. Charadriiformes appeared to be the most abundant order represented by 4 families. Of all, family Ardeidae and Anatidae (5 species) was relatively dominant. Species distribution chart is given in fig no. 1 and Percent occurrence is given in Table no. 2.

The number of species observed varied across different sites. Site-1, located near a construction zone with frequent mechanical activity (e.g., JCB and tractor operations), lacks vegetation but features a lakeside that provides roosting and feeding habitats for several bird species. Site-2, situated farther from the construction area and closer to dense vegetation, is characterized by minimal human disturbance and the absence of a lakeside. Consequently, the number of species recorded here is higher compared to Site-1. However, Site-2 is defined by a direct cliff with no bank, offering limited land area near the lake for birds such as Lapwing, Eurasian Moorhen, and Little Grebe to rest or roost, which may limit species diversity despite the absence of disturbance. Site-3, located near substandard housing, is impacted by both construction and human waste, with a lakeside present. Nevertheless, the species diversity at this site is relatively low, likely due to continued anthropogenic pressure. Additionally, habitat degradation at Site-3 is exacerbated by firewood collection by construction workers, contributing to further ecological stress. Site-4, situated in an isolated area surrounded by dense vegetation with no anthropogenic pressure, contains a small wetland and lakeside, offering favourable conditions for a diverse range of species. This site supports extensive foraging, roosting, and nesting opportunities for ducks such as the Lesser Whistling Duck, Common Pochard and Northern shoveler. Dense vegetation and dry thorny plants also serve as nesting sites for herons and darters. During the current season, raised water levels have made the site inaccessible to humans, feral dogs, and Nilgai, creating an isolated niche ideal for sustaining bird diversity. As a result, this site harbours the highest number of species observed. Site-5 experiences substantial anthropogenic disturbances, including construction activities and the disposal of human and sanctified remnants. Although the site features low water levels that could support wading birds, high levels of human interference and regular presence of wild animals such as Nilgai and feral dogs result in the destruction of roosting and nesting sites (red wattled lapwing), contributing to consistently low species abundance. Habitat degradation is further intensified by firewood collection by construction workers, as also noted at Site-3. Finally, Site-6, located near a temple where sanctified remnants are regularly discarded, also shows a low diversity of species.

The observed variations in species distribution across different observation sites in Shilaj Lake suggest that species occurrence is significantly influenced by various anthropogenic activities. Temporal fluctuations in species distribution were also noted, with patterns of fluctuation aligning with the intensity of anthropogenic activities at sites with lower overall species diversity. Specifically, at Site-3 and Site-1, species abundance was highest during early morning hours (from 6:30 AM onwards), coinciding with reduced anthropogenic disturbances such as construction work, JCB operations, and human interference. However, species numbers subsequently declined as human activities increased throughout the day at the construction site and lakeside areas.

Conversely, at Site-4, which is located in relative isolation near dense vegetation, species abundance remained consistently high throughout the day, likely due to its undisturbed nature. In contrast, Site-5, despite offering a wetland with shallow water—a favourable habitat—exhibited the lowest species abundance throughout the day. This was attributed to the high level of anthropogenic disturbances, destruction by feral animals, and the presence of garbage piles resulting from human and sanctified remnants disposal.

Comparative chart of species distribution at observation site-4 & site-5 which are respectively the most species abundant and least species abundant sites is given in fig no. 2 and species distribution at different observation sites during various time intervals is given in fig no. 3.

Table 1. Aquatic avifauna documented in & around Shilaj Lake

Order	Family	Scientific name	Common name	IUCN status	Status	Sr no.
Anseriformes	Anatidae	Dendrocygna javanica	Lesser Whistling-Duck	LC	R	1
		Spatula clypeata	Northern Shoveler	LC	W	2
		Anas poecilorhyncha	Indian Spot-billed Duck	LC	R	3
		Aythya ferina	Common Pochard	VU	W	4
		Sarkidiornis melanotos	Knob-billed Duck	LC	R	5
Passeriformes	Motacillidae	Motacilla alba	White-Wagtail	LC	W	6
		Motacilla cinerea	Gray Wagtail	LC	W	7
	Hirundinidae	Hirundo smithii	Wire-tailed Swallow	LC	R	8
Charadriiformes	Charadriidae	Vanellus indicus	Red-Wattled Lapwing	LC	R	9
		Vanellus malabaricus	Yellow-wattled lapwing	LC	R	10
	Recurvirostridae	Himantopus himantopus	Black Winged Stilt	LC	R	11
	Scolopacidae	Actitis hypoleucos	Common Sandpiper	LC	W	12
		Tringa ochropus	Green Sandpiper	LC	W	13
		Tringa glareola	Wood Sandpiper	LC	W	14
		Tringa nebularia	Common Greenshank	LC	W	15
	Laridae	Sterna aurantia	River Tern	NT	R	16
Pelecaniformes	Threskiornithidae	Pseudibis papillosa	Red-naped Ibis	LC	R	17
		Threskiornis melanocephalus	Black- headed ibis	NT	R	18
	Ardeidae	Egretta garzetta	Little Egret	LC	R	19
		Ardea intermedia	Medium Egret	LC	R	20
		Ardea alba	Great Egret	LC	R	21
		Ardeola idea	Pond Heron	LC	R	22
		Ardea purpurea	Purple Heron	LC	R	23
Gruiformes	Rallidae	Gallinula chloropus	Eurasian Moorhen	LC	R	24
		Amaurornis phoenicurus	White-breasted Waterhen	LC	R	25
		Porphyrio porphyrio	Grey-headed Swamphen	LC	R	26
Coraciiformes	Alcedinidae	Alcedo atthis	Common Kingfisher	LC	R	27
		Halcyon smyrnensis	White-throated Kingfisher	LC	R	28
Podicipediformes	Podicipedidae	Tachybaptus ruficollis	Little Grebe	LC	R	29
Suliformes	Anhingidae	Anhinga melanogaster	Oriental Darter	NT	R	30
	Phalacrocoracidae	Microcarbo niger	Little Cormorant	LC	R	31
Apodiformes	Apodidae	Cypsiurus balasiensis	Asian Palm Swift	LC	R	32

LC: Least concern, NT: Near threatened, VU: Vulnerable, R: Resident, W: Winter migrant

Table 2. Aquatic avifauna representation in families and its percent occurrence

Sr. No.	Family	Number of Species	Percent Occurrence
1	Anatidae	5	15.6
2	Motacillidae	2	6.2
3	Hirundinidae	1	3.1
4	Charadriidae	2	6.2
5	Recurvirostridae	1	3.1
6	Scolopacidae	4	12.5
7	Laridae	1	3.1
8	Threskiornithidae	2	6.2
9	Ardeidae	5	15.6
10	Rallidae	3	9.3
11	Alcedinidae	2	6.2
12	Podicipedidae	1	3.1
13	Anhingidae	1	3.1
14	Phalacrocoracidae	1	3.1
15	Apodidae	1	3.1

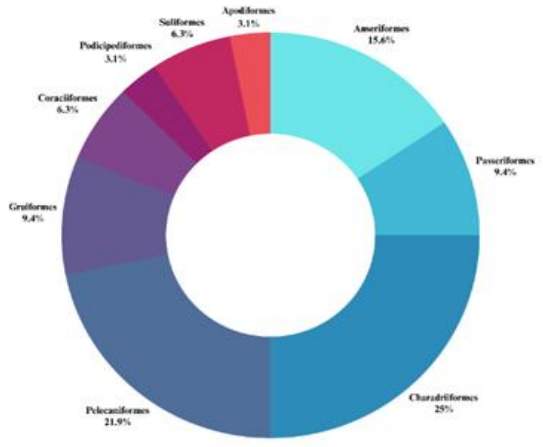

Fig 1. Species distribution chart

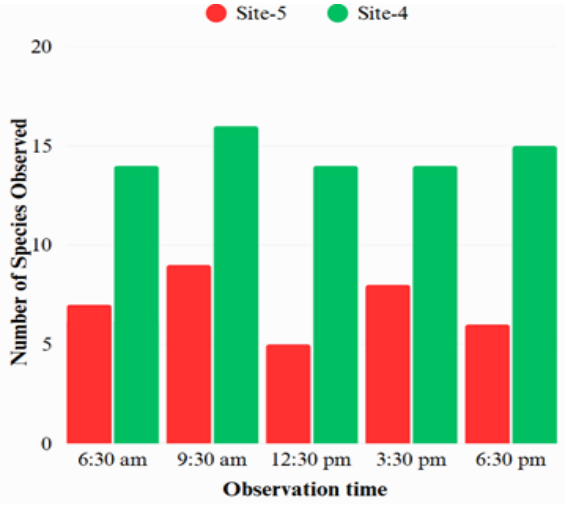

Fig2. Comparative chart of species distribution at observation site-4 & site-5

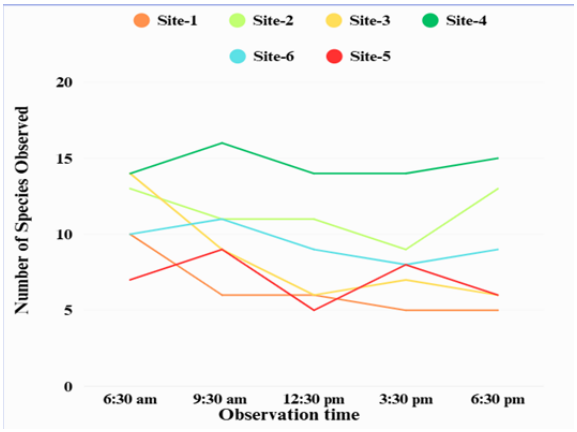

Fig.3 Species distribution in different observation sites at various time intervals

V.THREATS & CONSERVATION

Shilaj Lake plays a significant role in the urban ecology of Ahmedabad District, as it is situated within the surrounding urban landscapes. The lake supports a variety of migratory bird species, particularly during the early winter season. Notable migratory waterfowl, such as the Northern Shoveler and Common Pochard, as well as passerine species like the White Wagtail and Gray Wagtail, are observed in the area. Additionally, the lake provides habitat for near-threatened species, such as the Oriental Darter, and vulnerable species, including the Common Pochard. However, Shilaj Lake faces significant ecological threats due to the encroachment of multiple construction activities in its vicinity, including commercial developments and recreational parks, which contribute to the degradation of the wetland habitat along the lakeshore. Furthermore, the continuous accumulation of waste from nearby temples and local communities exacerbates the environmental stress on the site. These anthropogenic pressures may result in a decline in species diversity and could ultimately lead to the abandonment of Shilaj Lake by both migratory and resident species, rendering the area increasingly unsuitable as a viable habitat.

REFERENCE

[1] Water birds | BIRDS in BACKYARDS. www.birdsinbackyards.net/birds/featured/Water-birds.

[2] Birds of Gujarat. Checklist of Birds of Gujarat. Available at: https://birdsofgujarat.co.in/checklist.php
[3] eBird. Birds of Ahmedabad District, Gujarat, India. Available at: http://ebird.org/region/IN-GJ-AH
[4] "Effects of Anthropogenic Activities on Bird Diversity in an Urban Waterbody (Bhoj Wetland), Bhopal, Madhya Pradesh, India." International Journal of Fauna and Biological Studies, vol. 9, no. 2, Mar. 2022, pp. 21–24.
[5] Sekarappa, Basavarajappa. (2004). Avifauna of agro-ecosystems of Maidan area of Karnataka. Zoos' Print Journal. 21. 10.11609/JoTT.ZPJ.1277.2217-9.
[6] Ali, S. and S.D. Ripley 1987. Compact handbook of the birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka.
[7] Prasad, S.N., T.V. Ramachandra, N. Ahalya, T. Sengupta, A. Kumar, A.K. Tiwari, V.S. Vijayan and L. Vijayan 2002. Conservation of wetlands of India- A review. Tropical Ecology 43(1): 173-186.
[8] Grimmett, R., C. Inskipp and T. Inskipp 1999. Pocket guide to the birds of the Indian subcontinent. Oxford University Press, Delhi.
[9] Ramsar Convention Bureau. Background papers on wetland values and function. Gland, Switzerland: Ramsar Convention Bureau, 2000.
[10] Kushlan, J.A. 1992. Population biology and conservation of colonial water birds. Colonial Water Birds 15: 1-7
[11] Jayson, E.A. and D.N. Mathew 2002. Structure and composition of two bird communities in the southern Western Ghats. J. Bombay Nat. Hist. Soc. 99(1): 8-25.
[12] Stewart, Robert E., Jr. "Wetlands as Bird Habitat." National Water Summary on Wetland Resources, edited by Judy D. Fretwell, John S. Williams, and Patrick J. Redman, U.S. Geological Survey Water-Supply Paper 2425, 1996.