

Feathered Richness: Avifaunal diversity of Sharanabasaveshwara Lake, Kalaburagi, Karnataka, India

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Abstract

Avian diversity of Sharanabasaveshwara lake (76°- 04" to 77°- 42" Longitude and 16°- 12" to 17°- 46" Latitude) located 454 m above MSL, present at the centre of Kalaburagi, Karnataka. Line transact method and point transact methods were used for the survey purpose, study was conducted from June 2024 to May 2026. A total of 51 avian species belonging to 33 families under 15 orders was observed. Order Passeriformes with 19 species belonging to 14 families dominated the avifauna whereas orders Piciformes, Psittaciformes, Ciconiiformes, Anseriformes, Buceotiformes, Strigiformes and Charadriiformes were poorly represented with a single species each. Ardeidae family was the most dominant representing 13.72% of the total species recorded. Among the reported species 70% were resident while 15% were migrant and 11.76% were local migrant. Greater leaf bird (*Chloropsis sonnerati*) is endangered and Greater spotted eagle (*Clanga clanga*) is vulnerable whereas the rest of the species were in the Least Concern category of the IUCN Red List 2019. Species abundance and diversity were evaluated using multiple diversity indices, indicating high avian diversity with low dominance and minor seasonal variation. The rich avifaunal diversity of the Sharanabasaveshwara Lake confirms it as a suitable habitat for both resident and migrant bird species. This particular Lake study aids in maintaining the database of bird species to preserve and enhance the lake's current state. With the goal to pinpoint this location as a worldwide significant environment for bird population conservation, this research aims to present information on the biodiversity of birds.

Keywords: Avifauna, Sharanabasaveshwara lake, Diversity, Aquatic bird

Introduction

Avian diversity represents one of the most significant components of global biodiversity, playing a crucial role in maintaining ecological balance and providing valuable ecosystem services. The majority of birds are beneficial to humans. Birds are pollinators, carriers of seeds, scavengers, and environmental health indicators which dwell a broad range of circumstances, encompassing urban ecosystems, woodlands, wetlands, and grasslands. Their high mobility, sensitivity to habitat changes, and well-documented taxonomy make them effective bioindicators for assessing ecosystem integrity and the impacts of anthropogenic pressures such as deforestation, urbanization, pollution, and climate change are affecting their number (Blair R.B.1999, Gaston, 1975; Hardy *et al.*, 1987) ^[5, 9, 10].

Globally, more than 10,000 bird species have been identified, reflecting remarkable adaptations in morphology, behaviour, and ecological roles (Manjunath and Joshi, 2012) ^[13].

In India alone, which is recognized as one of the 17 megadiverse countries of the world, hosts around 1,353 species of birds (Praveen & Jaypal 2023) contributing significantly to the country's natural heritage (Javed and Kaul, 2000). In Karnataka, 500 bird species are reported by

various ornithologists, among them 48 bird species are enlisted under threatened category (Patil and Hiragond, 2013) ^[15]. Basavarajappa (2006) ^[4] has reported 27 species of aquatic birds from Maidan region of Karnataka. Both the protection of biodiversity and the sustainable management of natural resources rely on an understanding of avifaunal variety at the local and regional levels. Lakes and wetlands in cities serve as reservoirs for sustaining native flora and fauna (Grimmett and Inskipp, 2007; Surana *et al.*, 2007) ^[7, 8, 16].

In recent decades, the study of avian diversity has gained prominence in ecological research, conservation planning, and policy-making. Comprehensive surveys of bird communities provide insights into species richness, abundance, habitat preferences, and seasonal variations, thereby aiding in the identification of priority areas for conservation.

The current study aims to provide the fundamental data of the avifauna for future research related to avifaunal diversity in the Sharanabasaveshwara Lake, which may help to raise awareness about the conservation of local avifauna. It is focused not only on creating a checklist of birds but also on determining their occurrence status.

Material method

Study area

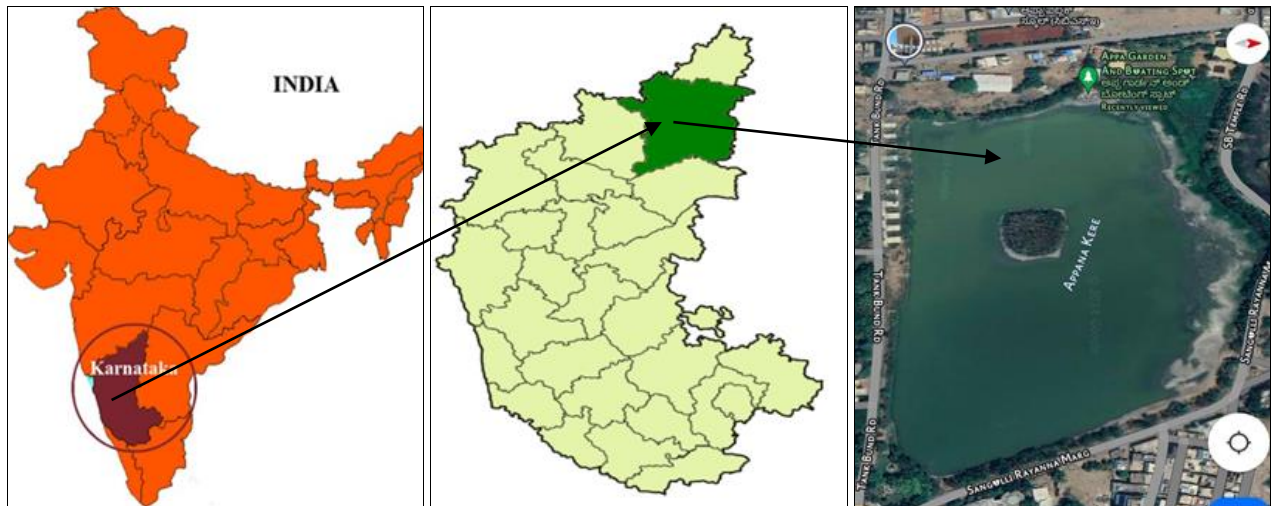


Fig 1: Map of Sharanabasaveshwara lake study area

Kalaburagi is a city situated in the northern part of Karnataka state (76°- 04" to 77°- 42" Longitude and 16°- 12" to 17°- 46" Latitude) located 454 m above MSL. The total area of the Sharanabasaveshwara lake is 67 acres 27 gunta. The major work taken up for the management of lake was Chain link fencing for around 2 km of the circumstance of the lake, desilting and dredging was the next main task as years of neglect and unwise use has turned lake into big pool of silt. Later the silt was removed in the year 2005 and used for making of 4 acre garden and recreation area as well as creating an island in the middle of the lake.

Sharanabasaveshwara Lake, locally known as Appan Kere, is a vital freshwater ecosystem nestled in the heart of Kalaburagi city, Karnataka. This urban lake serves as a crucial habitat for a diverse array of avifaunal species. Its ecological significance is underscored by the presence of both resident and migratory birds, making it a hotspot for ornithological interest and biodiversity conservation.

Material method

Survey of birds was conducted early morning from 6.00 am – 9.30 a.m. periodic field visit was undertaken at fortnightly intervals throughout the study period every month from October 2024 to September 2025. Mainly two different methods were used, point transact method (Verner 1985) [19] and line transact method (Sale and Berknuller, 1988) [17]. An efficient protocol has been adopted (Turner, 2003). Bird sampling was made by walking at a slow pace (about 1-1.5 km hr⁻¹) along the bank of the lakes (as the aquatic birds are usually found around or in the lake) as followed by Gaston (1975) [9] and Bibby *et al.*, (2000).

However, wherever necessary point transact method was used for aquatic birds, there were mainly 3 different points about 30-45 min were spent in each point. Birds were counted at their point of first detection and care was taken to ensure that same birds were not counted again. Birds were observed with the help of binoculars and photographs were made with the help of Nikon D7200 camera. Birds were identified and classified with the help of Salim Ali and Ripley (1987) [1]: The handbook of birds of India and

Pakistan, Richard Girmmett, Carol Inskipp and Tim Inskipp: Birds of the Indian subcontinent, field books like Birds of our neighbourhood by Kiran Purandare and Birds of Sharanabasaveshwara lake by Shankerappa S Hatti. The common and scientific names given in the checklist followed the birds of the world, recommended English names (Gill *et al.*, 2006). Conservation status, Migration status and food habits were classified according to Shankerappa S Hatti (2024). A checklist of species was prepared following the nomenclature of (Parveen *et al.*, 2016) [14]. The whole year was divided into 4 seasons as per (Borthakur, 1986) [6]. They are as follows- Pre-monsoon - March to May, Monsoon - June to September, Retreating-monsoon - October to November and Winter - December to February.

Data analysis

The species diversity of the study area was assessed using multiple ecological diversity indices. Different diversity indices on collected data were used in present research work like: Shannon Wiener Index (H')

The **Shannon index of diversity (H')** quantifies species diversity weighted by relative abundance (Begon *et al.*, 1996). It is calculated using the formula:

$$H' = \sum p_i \ln p_i$$

Where p_i is the proportion of individuals belonging to the i^{th} species. This index is employed to indicate bird diversity across the study area.

Simpson's Index of Dominance (1-D)

$$\frac{\sum n(n-1)}{N(N-1)}$$

$$D = \frac{1}{\sum p_i^2}$$

Where D = Simpson's index of dominance.

Pielou's evenness index (J')

$$J' = \frac{H'}{H'_{\max}}$$

$$J' = \frac{H'}{H'_{\max}}$$

Where $H'_{\max} = \ln S$, H' is value-driven from the Shannon-Weaver index,

Margalef Richness Index (Dmg)

$$\frac{S-1}{\ln N}$$

$$R = \frac{S-1}{\ln N}$$

Where S = number of species and N is the total number of individuals.

Menhinick's Index (Dmn)

$$\frac{S}{\sqrt{N}}$$

$$D = \frac{S}{\sqrt{N}}$$

where S is the total number of species in the sample and N is the total number of individuals in the sample.

Berger-Parker Index (d)

$$\frac{N_{\max}}{N}$$

$$d = \frac{N_{\max}}{N}$$

where **d** is the dominance, $N_{\max}$ is the count of individuals in the most abundant species, and N is the total count of all individuals in the sample, showing the proportion of the dominant species.

Multiple diversity indices were employed to comprehensively assess avian community structure, as biodiversity is a multidimensional concept encompassing species richness, evenness, and dominance. Shannon–Wiener and Simpson's indices were used to estimate overall species diversity, Pielou's evenness index to evaluate the distribution of individuals among species, Margalef's and Menhinick's indices to quantify species richness, and the Berger–Parker index to assess species dominance. The combined use of these indices provides a robust and holistic

evaluation of avian diversity and facilitates meaningful comparisons across sites and seasons.

Results and Discussion

The avian fauna recorded in the study includes both terrestrial and aquatic birds. The common name, scientific name, family, migratory status, IUCN status and food habit of different species of birds has been recorded at Sharanabasaveshwara lakes in the Kalaburagi are given in Table 1. A total of 51 avian species were recorded during the study period, representing 33 different families and 15 different order. This diversity reflects a rich assemblage of both resident and migratory birds. Families such as Ardeidae (7), Sturnidae (3), Accipitridae (3), Rallidae (3), Pycnonotidae (2), Cisticolidae (2), Columbidae (2), Corvidae (2), Cuculidae (2), Muscicapidae (2) and Phalacrocoracidae (2) were among the most commonly represented, whereas the remaining families represent by a single species each like Dicruridae, Megalaimidae, Passeridae, Charadriidae, Psittaculidae, Nectariniidae, Halyonidae, Meropidae, Ciconiidae, Threskiornithidae, Antidae, Chloropsidae, Oriolidae, Campephagidae, Zosteropidae, Bucerotidae, Strigidae, Anhingidae, Recurvirostridae, Motacillidae and Aegithinidae were represented by fewer species.

According to the dispersal status of the 51 recorded species, 36 were resident (70.58%), 8 species were migratory (15.68%) and 6 species were local migrants (11.76%). Among 51 bird species Greater leaf bird (*Chloropsis sonnerati*) is endangered and Greater spotted eagle (*Clanga clanga*) is vulnerable whereas the rest of the species were in the Least Concern category of the IUCN Red List 2019.

Table 1: Family, order, migratory status, IUCN status and food habit of birds of Sharanabasaveshwara lake

Sl. No	Common Name	Scientific Name	Family	Order	Conservation status	Migration status	Food habit
	Red vented bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	Passeriformes	LC	Resident	Omnivorous
	Black drongo	<i>Dicrurus paradiseus</i>	Dicruridae	Passeriformes	LC	Resident	Insectivores
	Ashy prinia	<i>Prinia socialis</i>	Cisticolidae	Passeriformes	LC	Resident	Insectivores
	Domestic pigeon	<i>Columba livia domestica</i>	Columbidae	Columbiformes	LC	Resident but messenger	Omnivorous And granivorous
	Laughing dove	<i>Spilopelia senegalensis</i>	Columbidae	Columbiformes	LC	Resident but local migrant	granivorous And Insectivores
	Coppersmith barbet	<i>Megalaima haemacephala</i>	Megalaimidae	Piciformes	LC	Resident	Frugivorous
	House sparrow	<i>Passer domesticus</i>	Passeridae	Passeriformes	LC	Resident	Omnivorous
	Indian robin	<i>Copsychus fulicatus</i>	Muscicapidae	Passeriformes	LC	Resident	Insectivores but during breeding season feeds on frogs and lizard
	Common Myna	<i>Acridotheres tristis</i>	Sturnidae	Passeriformes	LC	Resident	Carnivorous
	Red wattled lapwing	<i>Vanellus malabaricus</i>	Charadriidae	Suliformes	LC	Resident	Carnivorous
	Rose ringed parakeet	<i>Psittacula krameri</i>	Psittacidae	Psittaciformes	LC	Resident	Fruits and grains
	Purple rumped sunbird	<i>Nectarinia ceylonica</i>	Nectariniidae	Passeriformes	LC	Resident	Nectar, insect and fruits
	White throated kingfisher	<i>Halcon smyrnensis</i>	Haleyonidae	Coraciiformes	LC	Resident	Carnivorous

	Warbling white eye	<i>Zosterops japonicus</i>	Zosteropidae	Passeriformes	LC	Resident	Omnivorous
	Common tailor bird	<i>Orthotomus sutorius</i>	Cisticolidae	Passeriformes	LC	Resident	Insectivores
	Greater spotted eagle	<i>Clanga clanga</i>	Accipitridae	Accipitriformes	VU	Migratory	Scavenger
	House crow	<i>Corvus splendens</i>	Corvidae	Passeriformes	LC	Resident	Omnivorous
	Green bee-eater	<i>Merops orientalis</i>	Meropidae	Coraciiformes	LC	Resident but seasonal local migrant	Insectivores
	Greater coucal	<i>Centropus sinensis</i>	Cuculidae	Cuculiformes	LC	Resident	Omnivorous Or sometime Insectivores
	Grey heron	<i>Ardea cinerea</i>	Ardeidae	Pelecaniformes	LC	Resident	Carnivorous
	Indian Pond heron	<i>Ardeola grayii</i>	Ardeidae	Pelecaniformes	LC	Resident	Carnivorous
	Indian cormorant	<i>Phalacrocorax fuscicollis</i>	Phalacrocoracidae	Suliformes	LC	Resident	Carnivorous
	Common moorhen	<i>Gallinula</i>	Rallidae	Gruiformes	LC	Resident but local migratory	Carnivorous
	Painted stork	<i>Mycteria leucocephala</i>	Ciconiidae	Ciconiiformes	LC	Migratory	Carnivorous
	Glossy ibis	<i>Plagadis falcinellus</i>	Threskiornithidae	Pelecaniformes	LC	Migratory	Carnivorous
	Cattle egret	<i>Ardea</i>	Ardeidae	Pelecaniformes	LC	Resident partly migratory	Carnivorous
	Little egret	<i>Egretta garzetta</i>	Ardeidae	Pelecaniformes	LC	Migratory	Carnivorous
	Spot billed duck	<i>Anas poecilorhyncha</i>	Anatidae	Anseriformes	LC	Migratory	Herbivorous
	Purple swamphen	<i>Porphyrio poliocephalus</i>	Rallidae	Gruiformes	LC	Resident	Carnivorous
	Red-whiskered bulbul	<i>Pycnonotus jocosus</i>	Pycnonotidae	Passeriformes	LC	Resident	Omnivorous
	Asian koal	<i>Eudynamis scolopaceus</i>	Cuculidae	Cuculiformes	LC	Resident as well as migratory	Omnivorous
	Brahminy starling	<i>Sturnia pagodarum</i>	Sturnidae	Passeriformes	LC	Resident	Fruit nectar and insect
	Eurasian coot	<i>Fulica atra</i>	Rallidae	Gruiformes	LC	Migratory	Carnivorous
	Greater leaf bird	<i>Chloropsis sonnerati</i>	Chloropseidae	Passeriformes	EN	Resident	Omnivorous
	Indian Golden oriole	<i>Oriolus kundoo</i>	Oriolidae	Passeriformes	LC	Migratory	Fruit nectar and insect
	Small minivet	<i>Pericrocotus cinnamomeus</i>	Campephagidae	Passeriformes	LC	Resident	Insectivores
	Rufous treepie	<i>Dendrocitta vagabunda</i>	Corvidae	Passeriformes	LC	Resident	Omnivorous
	Shikra	<i>Tachyspiza badia</i>	Accipitridae	Accipitriformes	LC	Resident	Carnivorous
	Baya weaver	<i>Ploceus philippinus</i>	Ploceidae	Passeriformes	LC	Resident	Seeds and Insects
	Indian grey hornbill	<i>Ocyeros birostris</i>	Bucerotidae	Buceotiformes	LC	Resident	Omnivorous
	Spotted owlet	<i>Athene brama</i>	Strigidae	Strigiformes	LC	Resident	Carnivorous
	Intermediate egret	<i>Mesopoyx intermedia</i>	Ardeidae	Pelecaniformes	LC	Resident	Carnivorous
	Brahmini kite	<i>Haliastur indus</i>	Accipitridae	Accipitriformes	LC	Resident but seasonal migrant	Scavenger but some time it hunts bats and birds
	Purple heron	<i>Ardea purpurea</i>	Ardeidae	Pelecaniformes	LC	Migratory	Carnivorous
	Eastern great egret	<i>Ardea alba</i>	Ardeidae	Pelecaniformes	LC	Resident	Carnivorous
	Oriental darter	<i>Anhinga melanogaster</i>	Anhingidae	Suliformes	LC	Resident	Carnivorous
	Little cormorant	<i>Microcarbo niger</i>	Phalacrocoracidae	Suliformes	LC	Resident	Carnivorous
	River turn	<i>Sterna aurantia</i>	Sturnidae	Charadriiformes	LC	Resident	Carnivorous
	Black winged stilt	<i>Himantopus himantopus</i>	Recurvirostridae	Suliformes	LC	Resident but local migratory	Carnivorous

	White wagtail	<i>Motacilla alba</i>	Motacillidae	Passeriformes	LC	Resident	Carnivorous
	Common iora	<i>Aegithina humeii</i>	Aegithinidae	Passeriformes	LC	Resident	Insectivores

The results highlight the ecological heterogeneity of the study area, supporting species from a wide range of feeding guilds and habitats. Based on the feeding habitat, from the present data it is apparent that the avifauna of the study area

is dominated by Carnivorous (22 species) followed by Omnivorous (16), Insectivorous (7), Frugivorous (2), Scavenger (2) Granivorous (1) and Herbivorous (1) birds respectively and the same is represented in the Fig. 2.

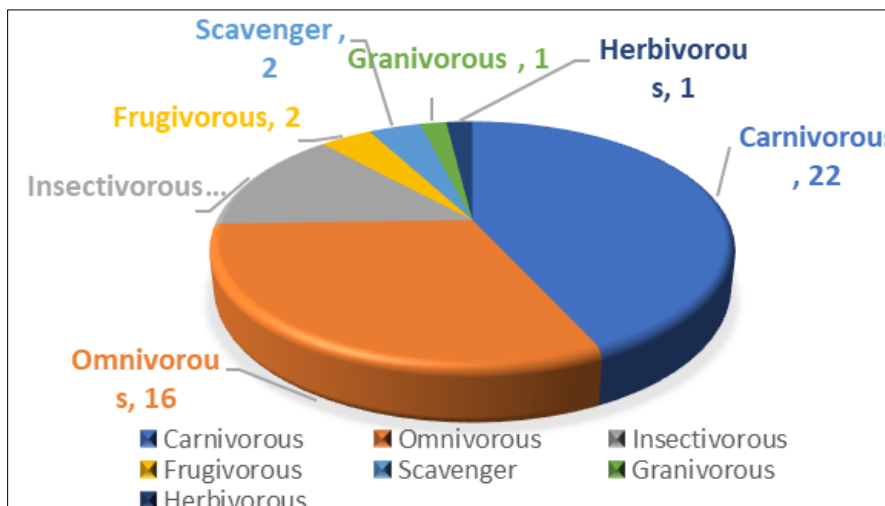


Fig 2: Pie chart representing percentage composition of birds according to their feeding habitat

Table 2: Diversity Indices for Abundance of Birds at Sharanabasaveshwara Lake for the year 2024-25.

Sl. No	Season	Taxa (S)	Individuals (N)	Shannon-Wiener Index (H')	Simpson's Index (1-D)	Pielou's Evenness (J')	Margalef Richness Index (Dmg)	Menhinick's Index (Dmn)	Berger-Parker Index (d)
1	Pre-monsoon	51	1885	3.706	0.9729	0.7977	6.63	1.175	0.04562
2	Monsoon	51	2393	3.72	0.9736	0.8092	6.426	1.043	0.04388
3	Retreating Monsoon	50	1690	3.696	0.9717	0.806	6.593	1.216	0.05621
4	Winter	51	2793	3.717	0.9731	0.8063	6.301	0.965	0.04082

Season wise Shannon-wiener's index was highest in monsoon ($H' = 3.72$), followed by winter ($H' = 3.717$), pre-monsoon ($H' = 3.706$) and least was in retreating monsoon ($H' = 3.696$). The highest Shannon-Wiener diversity index during the monsoon ($H' = 3.72$) indicates that bird species richness and evenness were greatest in the monsoon season. This is likely due to higher food availability, better habitat conditions, and breeding activity during this period. Winter ($H' = 3.717$) also showed high diversity, which may be attributed to the presence of resident species along with migratory birds, increasing overall species composition (Borthakur, 1986) [6]. The slightly lower diversity during pre-monsoon ($H' = 3.706$) suggests moderate species richness and evenness, possibly due to rising temperatures and reduced food resources. The lowest diversity during the retreating monsoon ($H' = 3.696$) indicates a relative decline in species richness and/or uneven distribution of individuals, which may be associated with post-breeding dispersal and changing environmental conditions. Simpson's diversity index (1-D) showed consistently high values across all seasons, ranging from 0.9717 to 0.9736, indicating a high level of bird species diversity and low dominance by any single species. The highest diversity was recorded during winter (1-D = 0.9736), followed by retreating monsoon (1-D = 0.9731), monsoon (1-D = 0.9729), while the lowest value was observed during pre-monsoon (1-D = 0.9717). Overall, the minimal seasonal variation suggests a relatively

stable and well-balanced avian community throughout the study period. Pielou's evenness index (J') ranged from 0.7977 to 0.8092 across seasons, indicating a relatively even distribution of individuals among bird species. The highest evenness was observed during winter ($J' = 0.8092$), while the lowest was recorded in the monsoon ($J' = 0.7977$), suggesting minor seasonal variation with no strong dominance of any single species. Margalef's richness index (Dmg) ranged from 6.301 to 6.63 across seasons, indicating high species richness with slight seasonal variation in bird assemblages. Menhinick's index (Dmn) ranged from 0.965 to 1.216 across seasons, indicating moderate to high species richness of birds. The highest richness was observed during the pre-monsoon season (Dmn = 1.216), while the lowest occurred during the retreating monsoon (Dmn = 0.965), reflecting seasonal fluctuations in species composition. The Berger-Parker dominance index (d) ranged from 0.04082 to 0.05621 across seasons, indicating low dominance by any single bird species. The lowest dominance was observed during the retreating monsoon (d = 0.04082), while slightly higher dominance occurred in the pre-monsoon season (d = 0.05621), suggesting minor seasonal variation in species dominance.

Conclusion

According to observations and data gathered from the current study region, which is Sharanabasaveshwara Lake

Kalaburagi in Karnataka State, India, there is a good diversity of birds in the study area. The current study found 51 bird species, indicating a generally healthy level of biodiversity for the study area. The most variety of birds have been observed during the winter, and this study area operates as a feeding and nesting site for lots of birds. Furthermore, the lake is heavily infested by the growth of the hydrophytes like water hyacinth (*Eichhornia crassipes*), *Salvinia molesta*, has rapidly covered the water surface of lake and thereby reducing the feeding areas for water birds. All these activities affected the aquatic bird's habitat and resulting in loss of avifaunal diversity of the lake ecosystem (Harisha *et al.*, 2011)^[11]. The greater number of birds were recorded when lakes were full during monsoon and winter periods, while in summer with drying lakes abundance of waterbirds

The integrated assessment using multiple diversity indices demonstrates that the wetland/lake ecosystem supports a highly diverse, species-rich, and ecologically stable avian community. High Shannon–Wiener and Simpson's index values across seasons indicate overall high bird diversity, while Pielou's evenness and low Berger–Parker dominance values reflect a balanced distribution of individuals with minimal dominance by any single species. Margalef's and Menhinick's richness indices reveal seasonal fluctuations in species richness, with relatively higher diversity during monsoon and winter seasons, likely due to enhanced food availability, suitable habitat conditions, and the presence of migratory species (Rajashekhar and Venkatesha, 2011)^[18]. The relatively small seasonal variation in all indices suggests that the wetland provides consistent and favourable habitat conditions throughout the year, highlighting its importance for avian conservation and management.

Yet, modern anthropogenic activities pose a threat to the study area's current bird variety since they may result in the destruction of many birds' foraging and feeding habitats. Therefore, the only way to prevent the extinction of avifauna from this specific ecosystem is to adhere to the sustainable development approach, which calls for minimizing needless habitat degradation, growing plants around the lake and it is necessary to enhance the planting of fruiting trees using scientific knowledge in order to support the foraging, sheltering, and breeding of birds (Indur *et al.*, 2021)^[3].

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