

a Study On Diversity And Status Of Avifauna In Kukkarahalli Lake: Mysuru, Karnataka, India

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Abstract:

Birds are highly diverse and conspicuous species of the environmental ecosystem. And act as potential bio-indicators. The present study deals with the diversity and status of avian species. The survey carried out from March 2023 to July 2023 in the Kukkarahalli Lake, Mysuru. A total 85 species of avifauna belonging to 17 orders and 40 families has been recorded in study area by using Line transect method, The order Passeriformes has the most species (37 species), whereas the orders Bucerotiformes, Galliformes, Podicipediformes, Psittaciformes and Strigiformes have the fewest species (1 species each). Among the recorded species 64 (75%) species were Resident and 21 (25%) species were resident migratory. The result of relative diversity (RD) showed that Ardeidae (RD Index value= 9.523), was the dominant family. The present study provides baseline information for the bird diversity in and around study area and is a preliminary effort to assess species richness and the avifaunal diversity of Kukkarahalli Lake.

Keywords: Avifaunal Diversity, Residential status, Line transect method, Diversity indices, Mysuru city.

1. Introduction

Birds are bipedal, warm-blooded feathered creatures (**Jordan and Verma, 2004**) known for their ecological economical, ethical, medicinal, and scientific values (**Ali S and Ripley, 1996**) and are cosmopolitan in distribution inhabiting all the ecosystems across the globe. They are the most prominent species of the Earth's biodiversity and are sensitive to environmental changes (**Singh et al., 2018**).

Bird diversity can be used as both a qualitative and quantitative tool to monitor habitat types (**Rapoport, 1993**) and are pivotal in an agro-ecosystem for maintaining ecological balance (**Haslem and Bennett, 2008**).

Globally 11,162 species of birds are recorded and in India 1,369 bird species are recorded till date indicating that 15% of the world avian fauna is present in India making it a biodiversity rich region. Out of 1,369 species found in India, 83 species are endemic to the region, 3 species are breeding endemic and 105 species are globally threatened (**Bird Life International, 2022**).

Species richness in an area depends on various factors like availability of food, climate and predation pressure (**Jayson and Mathew, 2000**). Apparently, the Indian bird population has been dwindling due to Anthropogenic activities and climatic changes (**Bala Chandranan et al., 2005**) leading to habitat loss, fragmentation and severe biotic pressure (**Manjunatha and Joshi, 2012**).

Many people derive great pleasure from watching birds (**Lameed, 2011**). These feathered companions leave man astounded by their radiant plumages, miraculous

flights and adaptations (Sonika Kushwaha *et al.*,2015). The present study was undertaken to assess the species diversity and status of avifauna in different habitats within Mysuru City, Karnataka, India

2. Materials and Methods

Study area: (Kukkarahalli Lake), Coordinates: 12.3098° N ,76.6326°

A picturesque lake located within Mysuru city, it is bordered on two sides by the University of Mysuru, on the north by state highway and to the south by a residential area. It was built by the Maharaja of Mysuru in 1864 AD. The lake is large with an area of 150 acres, receives both south-western and the north-east monsoons with an average rainfall 782mm. The lake drains a catchment area of more than 414 square kilometre (160 sq. mi) and the waterbody spread over 65 hectares with the maximum depth 5m(16ft).

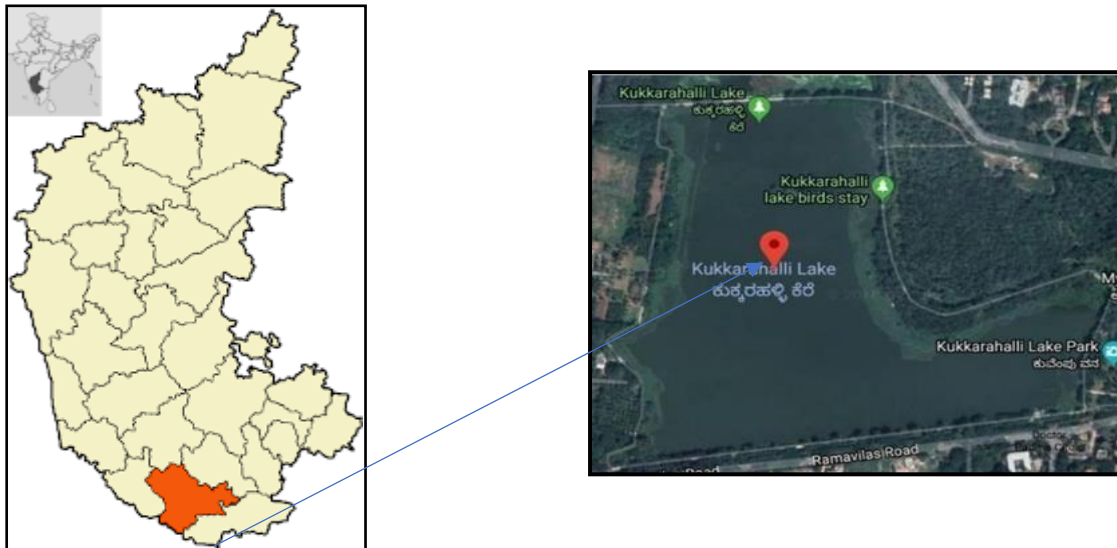


Fig 1: Map Showing the Study area

Survey Time: The field observation was conducted everyday from March 2023 to July 2023 for a period of 5 months to record the avifauna diversity. Birds were sighted during the peak hours of their activity from 6:30 am to 8:30 am in the morning and 5:00 pm to 6:30 pm in the evening.

Identification of Birds: The birds were identified using Spotting scope with tripod, Photography was done using Cannon HD 30X Optimal Zoom Camera. The recorded birds were identified based on their morphological features such as beak shape, colour, type of foot (e.g., webbed or non-webbed), colour of shank, foot and feather colour with the help of field guide and various key books (Ali S, 2002 and Grimmet and Inskipp, 2007). The check list of species was prepared following Ali S, 2002 and Grimmet and Inskipp, 2007.

Monitoring: The study area was surveyed for recording avifauna diversity by applying **Line transect method**

Statistical analysis: Bird species listed and the complete count of the number of species represented the habitat were done for species composition and distribution analysis. These results were used to indicate the bird species diversity, calculated using **PAST software (Ver.2.01) (Magurran, 2004 and Kiran *et al.*, 2022).**

Relative diversity (RD) was calculated by following formula

$$RD = \frac{\text{Total number of species in a family (n)}}{\text{Total number of species (N)}} \times 100$$

Further, MS EXCEL was used to tabulate the collected data, to prepare necessary tables, graphs and figures.

3. Results and discussion

As a result of 5 months (March 2023 to July 2023) observation, A total 85 species of birds belonging to 17 orders and 40 families were recorded during the study area (**Table 1**), out of which order Passeriformes (37 species) dominated the avifauna followed by Pelecaniformes (12 species), Accipitriformes, Coraciformes, Columbiformes, Gruiformes (4 species each), Cuculiformes, Piciformes, Suliformes (3 species each), Anseriformes, Charadriiformes, Ciconiformes (2 species each), Bucerotiformes, Galliformes, Podicipediformes, Psittaciformes, Strigiformes (1 species each) (**Figure 2**). Ardeidae was found to be the most dominant family in study area (RD Index value= 9.523) followed by Muscicapidae (RD Index value=5.952), Nectarinidae, Accipitridae, Rallidae (RD Index value=4.761), Pycnonotidae, Cisticolidae, Corvidae, Threskiornithidae, Columbidae, Cuculidae, Phalacrocoracidae (RD Index value=3.571) and others. The relative diversity of the families of bird is shown in (**Figure 3**).

Ardeidae was represented by 8 species followed by Muscicapidae (5 species), Nectarinidae, Accipitridae, Rallidae (4 species each), Pycnonotidae, Cisticolidae, Corvidae, Threskiornithidae, Columbidae, Cuculidae, Phalacrocoracidae (3 species each), Timaliidae, paridae, Sturnidae,

Leiothrichidae, Hirundinidae, Meropidae, Alcedinidae, Picidae, Anatidae, Ciconiidae (2 species each), and one species belonging to each of the Oriolidae, Dicruidae, Rhipiduridae, Motacillidae, Dicacidae, Aegithinidae, Passeridae, Acrocephalidae, Campephagidae, Pelecanidae, Megalaimidae, Jacanidae, Charadriidae, Bucerotidae, Phasianidae, Podicipedidae, Psittaculidae, Strigidae families (**Table 1**).

The Shannon Weaver index, Simpson's dominance index, Menhinick's index, Margalef's index, Evenness index and Berger-parker dominance index values 2.073, 0.785, 1.688, 3.204, 0.529 and 0.147 (**Table 2**) respectively suggest that the species of birds are moderately and evenly distributed at the study area during March to July, 2023. Thus, these values were keen to understand for long period assessment on bird distribution and diversity. Further it may also help to analyse their community structure, behaviour and impact of urbanization, habitat modifications at the study area.

Due to the varied habitats in Kukkarahalli Lake, it provided a diverse range of habitats including wetland farming redd beds, and open water, which attracted different bird species with varying ecological needs. This lake ecosystem supported a rich food web, including aquatic plants, invertebrates, and small fish providing ample food sources for various bird species.

The wetland of Kukkarahalli Lake found that out of 85 species, 64 species were resident and 21 species were resident migrant. According to a seasonal basis, there

were 12 rare bird species and 67 common bird species in the month of March, 6 rare bird species and 73 common bird species in the month of April, 4 rare bird species and 75 common bird species in the month of May, 7 rare bird species and 72 common bird species in the month of June, and 13 rare bird species and 66 common bird species in the month of July. Many migratory birds used Kukkarahalli Lake as stopover point during their long journeys, adding to the seasonal diversity of birds. These were the outcomes of the present study's diversity and status.

Table 1. Diversity, residential status, nesting season and feeding guild of the avian fauna from the study area.

Order	Family	Common names	Scientific names	Residential status	Nesting season	Feeding guild
Passeriformes	Muscicapidae	Oriental Magpie Robin	<i>Copsychus saularis</i>	R	Apr-Jul	IV
		Indian Blue Robin	<i>Luscinia brunnea</i>	RM	May-Jul	IV
		Asian Brown Flycatcher	<i>Muscicapa dauurica</i>	RM	Apr-Jun	IV
		Tickell's Blue Flycatcher	<i>Cyornis tickelliae</i>	R	Mar-Aug	IV
		Pied Bushchat	<i>Saxicola caprata</i>	R	Feb-May	IV
	Nectarinidae	Purple Rumped Sunbird	<i>Nectarinia zeylonica</i>	R	Feb-Jul	IV
		Loten's Sunbird	<i>Nectarinia lotenia</i>	R	Mar-May	NV
		Purple Sunbird	<i>Nectarinia astiatica</i>	R	Mar-May	NV
		Small Sunbird	<i>Nectarinia minima</i>	R	Dec-Apr	NV
	Pycnonotidae	Red-Whiskered Bulbul	<i>Pycnonotus jocosus</i>	R	Feb-Aug	OV
		Red - Vented Bulbul	<i>Pycnonotus cafer</i>	R	Feb-May	OV
		White-Eared Bulbul	<i>Pycnonotus leucotis</i>	R	Mar-Sep	OV
	Cisticolidae	Ashy Prinia	<i>Prinia socialis</i>	R	Mar-Sep	IV
		Rufous-Fronted Prinia	<i>Prinia buchanani</i>	R	Jun-Sep	IV
		Common Tailor Bird	<i>Orthotomus sutotrius</i>	R	Apr-Sep	IV

Corvidae	House Crow	<i>Corvus splendens</i>	R	Apr-Jun	OV
	Common Raven	<i>Corvus corax</i>	R	Dec-Mar	OV
	Jungle Crow	<i>Corvus macrorhynchos</i>	R	Dec-Apr	OV
Timaliidae	Red -Capped Babbler	<i>Timalia pileate</i>	R	Mar-Oct	IV
	Yellow-Breasted Babbler	<i>Macronous gluaris</i>	R	Apr-Jul	IV
Paridae	Great Tit	<i>Parus major</i>	R	Feb-Nov	IV
	Pied Tit	<i>Parus nuchalis</i>	R	May-Aug	IV
Sturnidae	Common Myna	<i>Acridotheres tristis</i>	R	Apr-Aug	OV
	Jungle Myna	<i>Acridotheres fuscus</i>	R	Feb-Jul	OV
Leiothrichidae	Large Grey Babbler	<i>Turdoides malcolmi</i>	R	All year	OV
	Jungle Babbler	<i>Turdoides striatus</i>	R	All year	OV
Hirundinidae	Red-Rumped Swallow	<i>Hirundo daurica</i>	RM	Apr-Aug	IV
	Wire Tailed Swallow	<i>Hirundo smithii</i>	R	Mar-Sep	IV
Oriolidae	Eurasian Golden Oriole	<i>Oriolus oriolus</i>	RM	Apr-Jul	OV
Dicruidae	Black Drongo	<i>Dicrurus macrocercus</i>	R	Apr-Aug	OV
Rhipiduridae	White Throated Fantail Flycatcher	<i>Rhipidura albicollis</i>	R	Mar-Aug	IV
Motacillidae	Large Pied Wagtail	<i>Motacilla maderaspatensis</i>	R	Mar-Sep	IV
Dicaeidae	Thick-Billed Flowerpecker	<i>Dicaeum agile</i>	R	Jan-Jun	IV
Aegithinidae	Common Iora	<i>Aegithina tiphia</i>	R	May-Sep	IV
Passeridae	House Sparrow	<i>Passer domesticus</i>	R	All year	OV
Acrocephalidae	Blyth's Reed-Warbler	<i>Acrocephalus dumetorum</i>	RM	May-Jul	IV

	Campephagi dae	Small Minivet	<i>Pericrocotus cinnamome us</i>	R	Feb-Sep	IV
Pelecaniformes	Ardeidae	Grey Heron	<i>Ardea cinerea</i>	RM	Nov-Mar	CV
		Black- Crowned Night-Heron	<i>Nycticorax nycticorax</i>	R	Dec-Feb	CV
		Large Egret	<i>Casmerodi u s albus</i>	RM	Jul-Feb	CV
		Indian Pond- Heron	<i>Argeola grayii</i>	R	Nov-Jan	CV
		Little Egret	<i>Egretta garzetta</i>	R	Nov-Feb	CV
		Purple Heron	<i>Ardea purpurea</i>	RM	Jun-Mar	CV
		Cattle Egret	<i>Bubulcus ibis</i>	RM	Nov-Mar	CV
		Median Egret	<i>Mesophoyx intermedia</i>	RM	Jul-Feb	CV
	Threskiornith idae	Oriental White Ibis	<i>Threskiornis melanoceph alus</i>	R	Nov-Feb	OV
			Glossy Ibis	<i>Plegadis falcinellus</i>	RM	May-Jul
Black Ibis			<i>Pseudibis papillosa</i>	R	Nov-Dec	IV
	Pelecanidae	Spot-Billed Pelican	<i>Pelecanus philippensis</i>	RM	Nov-Apr	PV
Accipitriformes	Accipitridae	Brahminy Kite	<i>Haliastur indus</i>	R	Dec-Apr	CV
		Black Kite	<i>Milvus migrans</i>	R	Jan-Feb	CV
		Shikra	<i>Accipiter badius</i>	R	Mar-Jun	CV
		Long-Legged Buzzard	<i>Buteo rufinus</i>	R	Mar-May	CV
Coraciformes	Meropidae	Blue- Cheeked Bee- Eater	<i>Merops persicus</i>	RM	Apr-Aug	IV
		Blue-Tailed Bee-Eater	<i>Merops philippinus</i>	RM	Mar-Jun	IV
	Alcedinidae	White- Breasted Kingfisher	<i>Halcyon smyrnensis</i>	R	Mar-Jul	CV
		Small Blue Kingfisher	<i>Alcedo atthis</i>	RM	Mar-Jun	CV

Gruiformes	Rallidae	Common Coot	<i>Fulica atra</i>	RM	Jul-Aug	IV
		Purple Moorhen	<i>Porphyrio porphyrio</i>	R	Jun-Sept	IV
		Common Moorhen	<i>Gallinula chloropus</i>	RM	Jun-Oct	IV
		White-Breasted Waterhen	<i>Amaurornis phoenicurus</i>	R	Jun-Oct	IV
Columbiformes	Columbidae	Spotted Dove	<i>Streptopelia chinensis</i>	R	All year	GV
		Blue rock Pigeon	<i>Columba Livia</i>	R	All year	GV
		Little Brown Dove	<i>Streptopelia senegalensis</i>	R	All year	GV
Cuculiformes	Cuculidae	Asian Koel	<i>Eudynamis scolopacea</i>	R	Apr-Aug	OV
		Greater Coucal	<i>Centropus sinensis</i>	R	Feb-Sep	CV
		Lesser Coucal	<i>Centropus bengalensis</i>	R	May-Sep	CV
Piciformes	Megalaimidae	Coppersmith Barbet	<i>Megalaima haemacephala</i>	R	Jan-Jun	FV
		White-Cheeked Barbet	<i>Megalaima viridis</i>	R	Dec-Jun	FV
	Picidae	Lesser Golden-Backed Woodpecker	<i>Dinopium benghalense</i>	R	Mar-Aug	IV
		Common Golden-Backed Woodpecker	<i>Dinopium javanense</i>	R	Jan-May	IV
Suliformes	Phalacrocoracidae	Great Cormorant	<i>Phalacrocorax carbo</i>	RM	Sept-Feb	PV
		Little Cormorant	<i>Phalacrocorax niger</i>	RM	Nov-Feb	PV
		Darter	<i>Anhinga melanogaster</i>	RM	Nov-Feb	PV
Anseriformes	Anatidae	Spot-Billed Duck	<i>Anas poecilorhyncha</i>	RM	Nov-Dec	OV
		Lesser Whistling-Duck	<i>Dendrocygna javanica</i>	R	May-Oct	OV

Charadriiformes	Jacaniidae	Bronze-Winged Jacana	Metopidius indicus	R	June-Sep	IV
	Charadriidae	Red-Wattled Lapwing	Vanellus indicus	R	Mar-Aug	IV
Ciconiiformes	Ciconiidae	Asian Openbill Stork	Anastomus oscitans	R	Nov-Mar	CV
		Painted Stork	Mycteria leucocephala	RM	Aug-Jan	CV
Bucerotiformes	Bucerotidae	Indian Grey Hornbill	Ocyrceros birostris	R	Mar-Jun	OV
Galliformes	Phasianidae	Indian Peafowl	Pavo cristatus	R	Jan-Oct	OV
Podicipediformes	Podicipedidae	Little Grebe	Tachybaptus ruficollis	R	Apr-Oct	CV
Psittaciformes	Psittaculidae	Rose-Ringed Parakeet	Psittacula krameri	R	Feb-Apr	GV
Strigiformes	Strigidae	Spotted Owlet	Athene brama	R	Nov-Apr	CV

Note - Residential status: R-Resident, RM-Resident Migratory

Feeding guild: IV-Insectivorous, CV-Carnivorous, PV-Piscivorous, NV-Nectivorous, OV-Omnivorous, GV-Granivorous, FV-Frugivorous

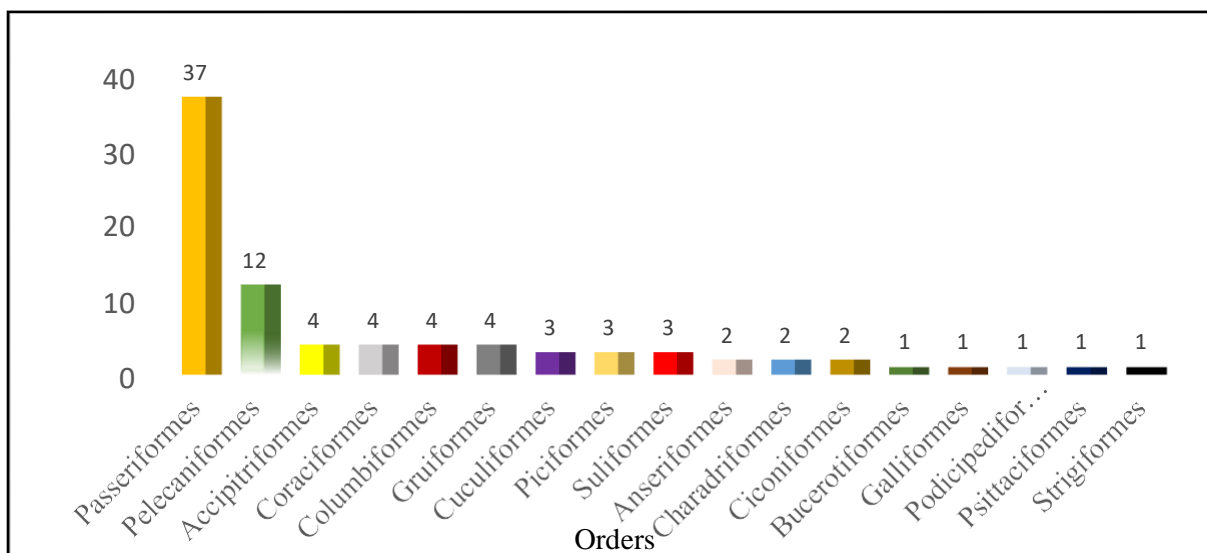


Figure 2: Avian fauna diversity among various orders found at the Study area.

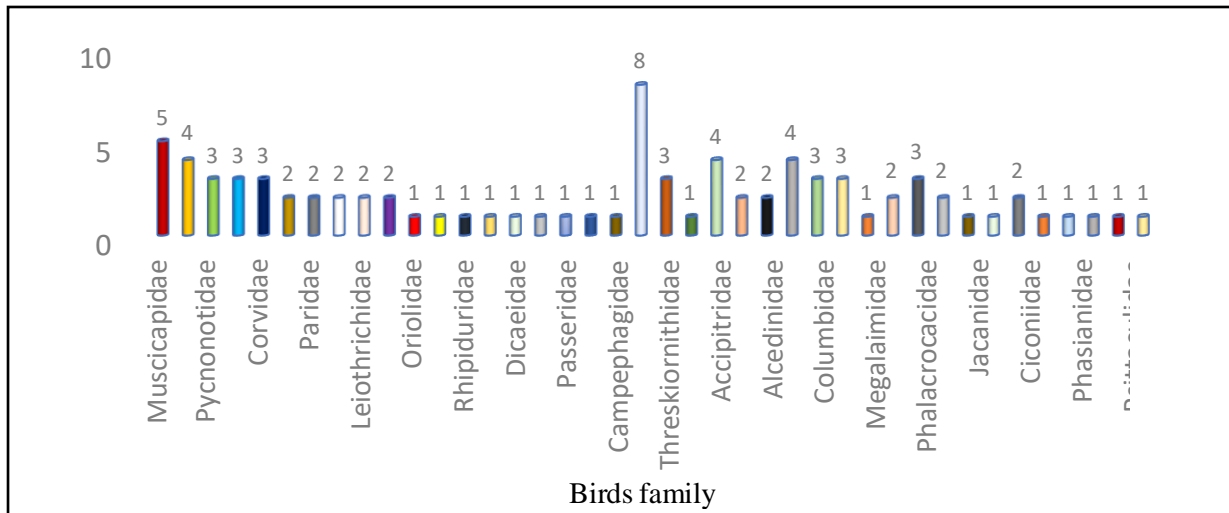


Figure 3: Relative diversity of the avian families found at the study area

Table 2: Diversity indices of avian fauna

S1. No.	Diversity indices	KukkarahalliLake
1	Shannon-Wiener Index (H ₁)	2.073
2	Simpson’s Dominance Index (D)	0.785
3	Menhinick’s Index (□□□)	1.688
4	Margalef’s Index (□□□)	3.204
5	Evenness Index (E)	0.529
6	Berger-Parker Dominance Index (d)	0.417



Copsychus saularis
(Oriental magpie-)



Cyornis tickelliae
(Tickell's blue)



Pycnonotus jocosus
(Red-whiskered)



Acridotheres
(Common)



Argeola grayii
(Indian pond-heron)



Ardea purpurea
(Purple heron)



Bubulcus ibis
(Cattle egret)



Pelecanus philippensis
(Spot-billed pelican)



Haliastur indus
(Brahminy kite)



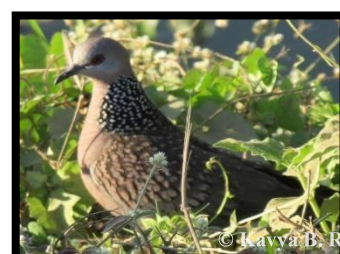
Milvus migrans
(Black kite)



Accipiter badius
(Shikra)



Amaurornis phoenicurus
(White-breasted waterhen)





Porphyrio porphyrio
(Purple moorhen)

Amaurornis phoenicurus
(White-breasted waterhen)

Streptopelia chinensis
(Spotted dove)

Mycteria leucocephala
(Painted stork)



Ocyrceros birostris
(Indian grey hornbill)



Pavo cristatus
(Indian peafowl)



Psittacula kramera
(Rose-ringed parakeet)



Athene brama
(Spotted owlet)

Fig 4: Documentation of Bird Species at Kukkarahalli Lake, Mysuru (2023)

4. Conclusion

The study documented the rich avifauna diversity indicating that the area still provides some potential habitats for the declining population of the threatened birds. Therefore, systematic monitoring of this area with special emphasis on the study of its status, distribution and conservation of birds in Kukkarahalli Lake is the need of hour. Conservation efforts should focus on maintaining the ecological integrity of the lake as it plays a crucial role in sustaining avian biodiversity in the region. The study effectively provided baseline for research which could be used for conservation purpose of birds.

5. Acknowledgement

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