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Diversity and feeding guild structure of avifauna across Sendh Lake, Jhanjh, Khandwa and Pounta Ponds and Their surrounding wetlands in New Raipur, Chhattisgarh, India

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Abstract

Wetlands are believed to play a vital role in maintaining biodiversity. This study aimed at investigating the diversity of birds and their feeding guilds from observations of birds at Sendh Lake, Jhanjh, Khandwa and Pounta Ponds and surrounding wetland habitats in New Raipur, Chhattisgarh in India. Researchers identified 57 different species belonging to 14 orders and 28 families. Birds that belong to the order Passeriformes made up the majority of species found in this study area at 42.10% (24 species); followed by Pelecaniformes with 7 species and Charadriiformes with 6 species. Based upon the feeding guilds of the birds, the greatest number of birds belong to the insectivore feeding guild (29.82%) followed by omnivores, carnivores and granivores, herbivores/frugivores then piscivores. A Shannon-Wiener diversity index was calculated and obtained an index value of 3.89 indicating high levels of diversity. This wetland ecosystem is an essential habitat because it contains a large number of waterbirds; such as herons, egrets, cormorants, and ibises. This study also indicates that this area can be considered as an opportunity for conservation of avifaunal diversity within urban Chhattisgarh.

Keywords: Avifauna, wetland biodiversity, feeding guilds, bendri pond, New Raipur, Chhattisgarh

1. Introduction

Wetlands are one of the most productive ecosystem types and are critical habitats for numerous birds, especially those that migrate or inhabit coastal areas. By providing food, breeding, and roosting locations, wetland areas support many different bird communities (Datta, 2011) ^[7]. The abundance and variety of birds inhabiting wetland ecosystems are good indicators of the overall health of those environments. Birds respond rapidly to changes in the environment and habitat, making them very strong indicators of ecological health (Kumar & Sharma, 2019; Boora & Kumar, 2022) ^[4, 9]. Many researchers report that aquatic vegetation, fish, insects, and other types of feeding resources found in wetland environments support large numbers and types of bird communities (Barik & al., 2022) ^[1]. Bird communities in these environments have been shown to be sensitive to human activity and changes in land use (Barik *et al.*, 2022) ^[1].

Many different researchers over the past few decades have studied the diversity of bird species in India's wetlands. This illustrates the importance of wetland habitats for conserving different types of living things. For example, in Chhattisgarh, scientists have identified many bird species using the wetlands that have water and marshes (Bharos *et al.*, 2022; Shrimali *et al.*, 2025) ^[3, 12]. In addition, researchers have also analysed how the wetlands in Karnataka, Haryana and Nepal conserve the avifauna of these wetlands (Neelgund&Kadadevaru, 2020; Pant *et al.*, 2024) ^[10, 11]. Atal Nagar is the capital city of the Chhattisgarh State and is the new Raipur that is rapidly urbanising. Some of the wetlands, like the Sendh Lake, Jhanjh, Khandwa and Pounta Ponds, are important to help conserve the avifauna despite the urbanisation of these wetland ecosystems. Wetland ecosystems provide bird habitat due to the presence of water plants, field agriculture and open water areas.

Although avian diversity has been studied in other parts of the state of Chhattisgarh (Bharos *et al.*, 2023) ^[2], there is currently no information available on the types of birds or feeding guilds present in Bendri Pond. In light of this, the objective of this study is to identify how many unique types of birds (total species richness) live at Sendh Lake, Jhanjh, Khandwa and Pounta Ponds and observe their feeding behaviours throughout New Raipur's wetland area surrounding the pond.

2. Materials and Methods

2.1 Study Area

The study was done at the Sendh Lake, Jhanjh, Khandwa and Pounta Ponds which is a Wetland located in New Raipur (Atal Nagar), Chhattisgarh (India) that contains areas of Open Water Body & Marshy Vegetation plus farmland & tree/shrub cover. Wetlands provide critical breeding ground & feeding area for both resident & migratory birds throughout Central India.

2.2 Bird Survey Method

Birds were surveyed by direct (visual) observation (e.g. with binoculars) during the morning & evening period when they are active, followed by identifying them through common field guides and taxonomic literature. The Sendh Lake, Jhanjh, Khandwa and Pounta Ponds Physical Characteristics & Behavioural Characteristics were used to identify them.

2.3 Data Analysis

Species diversity was analyzed using standard ecological indices.

Species Richness

Total number of species recorded = 57

Shannon–Wiener Diversity Index

The Shannon–Wiener index was used to estimate species diversity.

Evenness Index

3. Results

3.1 Avifaunal Diversity

A total of 57 bird species belonging to 14 orders and 28 families were recorded during the study.

Table 1: Taxonomic classification of recorded avifauna

S. No.	Common Name	Scientific Name	Order	Family	Feeding Habit
1	Lesser Whistling Duck	<i>Dendrocygna javanica</i>	Anseriformes	Anatidae	Omnivorous (aquatic plants, seeds, insects)
2	Gray Francolin	<i>Ortygornis pondicerianus</i>	Galliformes	Phasianidae	Omnivorous (seeds, insects)
3	Eurasian Collared Dove	<i>Streptopelia decaocto</i>	Columbiformes	Columbidae	Herbivorous (seeds, grains)
4	Spotted Dove	<i>Spilopelia chinensis</i>	Columbiformes	Columbidae	Herbivorous (seeds, grains)
5	Laughing Dove	<i>Spilopelia senegalensis</i>	Columbiformes	Columbidae	Herbivorous
6	Greater Coucal	<i>Centropus sinensis</i>	Cuculiformes	Cuculidae	Carnivorous (insects, small reptiles)
7	Little Ringed Plover	<i>Charadrius dubius</i>	Charadriiformes	Charadriidae	Insectivorous
8	Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>	Charadriiformes	Charadriidae	Insectivorous
9	Red-wattled Lapwing	<i>Vanellus indicus</i>	Charadriiformes	Charadriidae	Insectivorous
10	Bronze-winged Jacana	<i>Metopidius indicus</i>	Charadriiformes	Jacanidae	Omnivorous (aquatic insects, seeds)
11	Common Sandpiper	<i>Actitis hypoleucos</i>	Charadriiformes	Scolopacidae	Insectivorous
12	Barred Buttonquail	<i>Turnix suscitator</i>	Charadriiformes	Turnicidae	Omnivorous
13	Asian Openbill	<i>Anastomus oscitans</i>	Ciconiiformes	Ciconiidae	Carnivorous (snails, molluscs)
14	Asian Cormorant	<i>Microcarbo nigripes</i>	Suliformes	Phalacrocoracidae	Piscivorous
15	Great Cormorant	<i>Phalacrocorax carbo</i>	Suliformes	Phalacrocoracidae	Piscivorous
16	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	Suliformes	Phalacrocoracidae	Piscivorous
17	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Pelecaniformes	Threskiornithidae	Carnivorous (insects, fish)
18	Red-naped Ibis	<i>Pseudibis papillosa</i>	Pelecaniformes	Threskiornithidae	Omnivorous
19	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	Pelecaniformes	Ardeidae	Carnivorous
20	Little Egret	<i>Egretta garzetta</i>	Pelecaniformes	Ardeidae	Carnivorous (fish)
21	Indian Pond Heron	<i>Ardeola grayii</i>	Pelecaniformes	Ardeidae	Carnivorous
22	Eastern Cattle Egret	<i>Bubulcus coromandus</i>	Pelecaniformes	Ardeidae	Insectivorous
23	Great Egret	<i>Ardea alba</i>	Pelecaniformes	Ardeidae	Carnivorous
24	Medium Egret	<i>Ardea intermedia</i>	Pelecaniformes	Ardeidae	Carnivorous
25	Purple Heron	<i>Ardea purpurea</i>	Pelecaniformes	Ardeidae	Carnivorous
26	Short-toed Snake Eagle	<i>Circaetus gallicus</i>	Accipitriformes	Accipitridae	Carnivorous (snakes)
27	Black-winged Buzzard	<i>Butastur teesa</i>	Accipitriformes	Accipitridae	Carnivorous
28	Black-winged Kite	<i>Elanus caeruleus</i>	Accipitriformes	Accipitridae	Carnivorous
29	Eastern Barn Owl	<i>Tyto javanica</i>	Strigiformes	Tytonidae	Carnivorous (rodents)
30	Asian Green Bee-eater	<i>Merops orientalis</i>	Coraciiformes	Meropidae	Insectivorous
31	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	Coraciiformes	Alcedinidae	Carnivorous
32	Pied Kingfisher	<i>Ceryle rudis</i>	Coraciiformes	Alcedinidae	Piscivorous
33	House Crow	<i>Corvus splendens</i>	Passeriformes	Corvidae	Omnivorous
34	Copper-smith Barbet	<i>Psilopogon haemacephalus</i>	Piciformes	Megalaimidae	Frugivorous
35	Indian Golden Oriole	<i>Oriolus kundoo</i>	Passeriformes	Oriolidae	Omnivorous
36	Black Drongo	<i>Dicrurus macrocercus</i>	Passeriformes	Dicruridae	Insectivorous
37	Ashy-crowned Sparrow-Lark	<i>Eremopterix griseus</i>	Passeriformes	Alaudidae	Granivorous
38	Indian Bush Lark	<i>Mirafra erythroptera</i>	Passeriformes	Alaudidae	Omnivorous
39	Plain Prinia	<i>Prinia inornata</i>	Passeriformes	Cisticolidae	Insectivorous

40	Plum-headed Parakeet	<i>Psittaculacyanocephala</i>	Psittaciformes	Psittaculidae	Herbivorous (fruits, seeds)
41	White-browed Bulbul	<i>Pycnonotus luteolus</i>	Passeriformes	Pycnonotidae	Omnivorous
42	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Passeriformes	Pycnonotidae	Omnivorous
43	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	Passeriformes	Pycnonotidae	Omnivorous
44	Greenish Warbler	<i>Phylloscopus trochiloides</i>	Passeriformes	Phylloscopidae	Insectivorous
45	Rosy Starling	<i>Pastor roseus</i>	Passeriformes	Sturnidae	Omnivorous
46	Indian Pied Starling	<i>Gracupica contra</i>	Passeriformes	Sturnidae	Omnivorous
47	Brahminy Starling	<i>Sturniাপagodorum</i>	Passeriformes	Sturnidae	Omnivorous
48	Common Myna	<i>Acridotheres tristis</i>	Passeriformes	Sturnidae	Omnivorous
49	Indian Robin	<i>Saxicoloidesfulicatus</i>	Passeriformes	Muscicapidae	Insectivorous
50	Pied Bushchat	<i>Saxicola caprata</i>	Passeriformes	Muscicapidae	Insectivorous
51	Pied Bushlark	<i>Miraframicroptera</i>	Passeriformes	Alaudidae	Omnivorous
52	Scaly-breasted Munia	<i>Lonchura punctulata</i>	Passeriformes	Estrildidae	Granivorous
53	Yellow-throated Sparrow	<i>Gymnorisxanthocollis</i>	Passeriformes	Passeridae	Granivorous
54	Western Yellow Wagtail	<i>Motacilla flava</i>	Passeriformes	Motacillidae	Insectivorous
55	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	Passeriformes	Motacillidae	Insectivorous
56	Paddyfield Pipit	<i>Anthusrufulus</i>	Passeriformes	Motacillidae	Insectivorous
57	Baya Weaver	<i>Ploceus philippinus</i>	Passeriformes	Ploceidae	Granivorous

The order Passeriformes had the largest representation (42.10%), followed by Pelecaniformes (12.28%) and Charadriiformes (10.52%).

Table 2: Order-wise distribution

Order	Number of Species	Percentage
Passeriformes	24	42.10%
Pelecaniformes	7	12.28%
Charadriiformes	6	10.52%
Accipitriformes	3	5.26%
Suliformes	3	5.26%
Columbiformes	3	5.26%
Others	11	19.32%

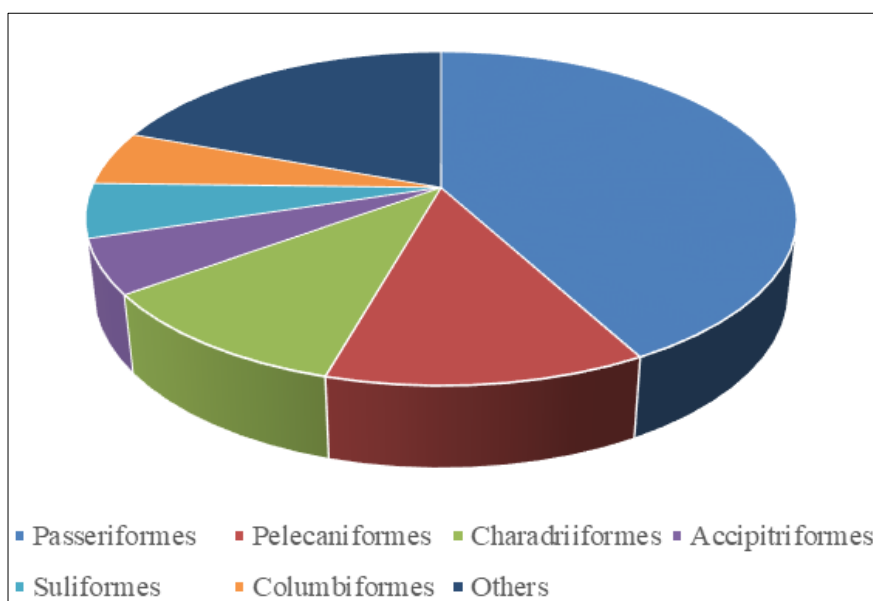


Fig 1: Order-wise distribution

The dominance of passerine birds among birds in wetland habitats in India is further supported through other wetland studies in India as passerines were found to represent a major part of the bird populations (Neelgund&Kadadevaru 2020) ^[10].

3.2 Family-wise Diversity

The family Ardeidae, which consist of herons and egrets, had the highest number of species with a total of six species. These five species are: Indian Pond-Dove, Little Egret, Purple Heron, and Great Egret.

Table 3: Family-wise diversity table

S. No.	Family	Number of Species
1	Ardeidae	7
2	Sturnidae	4

3	Columbidae	3
4	Alaudidae	3
5	Motacillidae	3
6	Charadriidae	3
7	Phalacrocoracidae	3
8	Accipitridae	3
9	Pycnonotidae	3
10	Threskiornithidae	2
11	Alcedinidae	2
12	Muscicapidae	2
13	Anatidae	1
14	Phasianidae	1
15	Cuculidae	1
16	Jacaniidae	1
17	Scolopacidae	1
18	Turnicidae	1
19	Ciconiidae	1
20	Tytonidae	1
21	Meropidae	1
22	Corvidae	1
23	Megalaimidae	1
24	Oriolidae	1
25	Dicruridae	1
26	Cisticolidae	1
27	Psittaculidae	1
28	Phylloscopidae	1
29	Estrildidae	1
30	Passeridae	1
31	Ploceidae	1

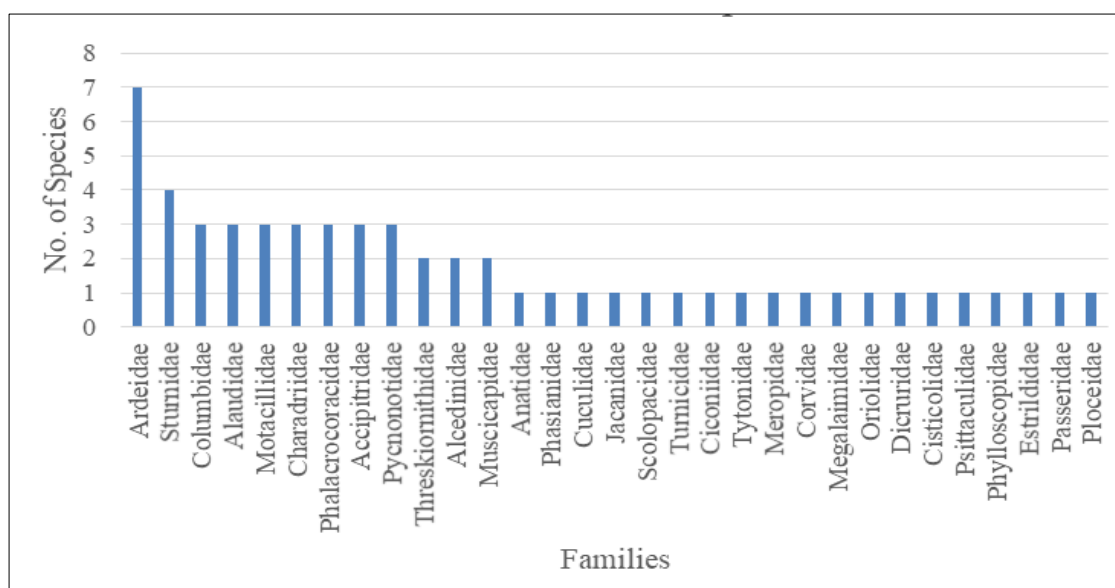


Fig 2: Number of avifaunal species

Sturnidae, Pycnonotidae, and Alaudidae are examples of other bird families in addition to Passerines, which all showed representation in the Passerine group.

3.3 Feeding Guild Analysis

Birds that belong to the same feeding guild are characterised as belonging to one of five primary alphabetic dietary groups: Granivores, Folivores, Nectar feeders, Frugivores, and Insectivores.

Table 4: Feeding habits indicate insectivorous species dominate, followed by omnivorous and carnivorous birds

Feeding Habit	Number of Species	Percentage
Insectivorous	17	29.82%
Omnivorous	15	26.31%
Carnivorous	15	26.31%
Granivorous	5	8.77%
Herbivorous/Frugivorous	5	8.77%
Piscivorous	3	5.26%

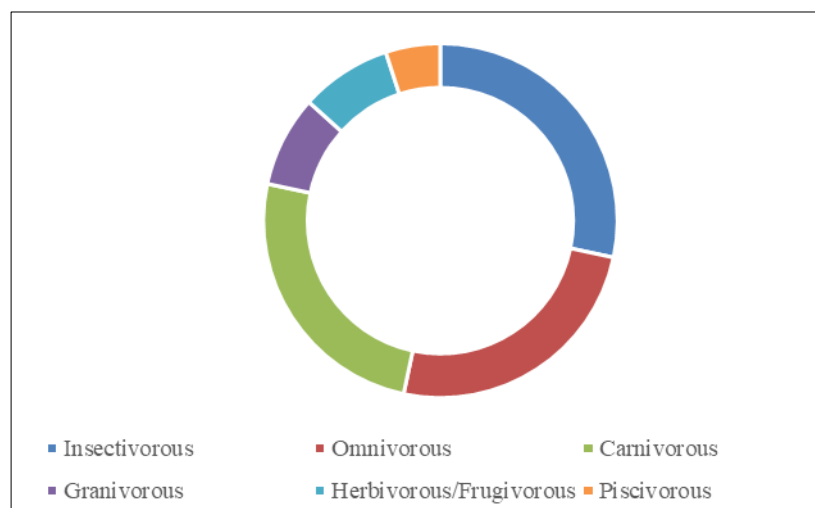


Fig 3: Feeding habit percentage

With regard to birds that fall into an Insectivore (that is, feeding primarily on insects), this indicates that there are

insects found within the wetlands of this specific habitat or environment.

Table 5: Ecological Diversity Indices of Recorded Avifauna

S. No.	Diversity Index	Formula	Value	Interpretation
1	Species Richness (S)	S = Total number of species recorded	57	Indicates high species richness of avifauna in the wetland habitat
2	Shannon–Wiener Diversity Index (H')	$H' = - \sum_{i=1}^S p_i \ln p_i$	3.89	Represents high species diversity and ecological stability
3	Maximum Diversity (Hmax)	$H_{max} = \ln(S)$	4.04	Maximum possible diversity for 57 species
4	Evenness Index (E)	$E = \frac{H'}{\ln(S)}$	0.96	Indicates very even distribution of species
5	Dominance (Simpson's Dominance Index)	$D = \sum p_i^2$	0.03	Low dominance indicates no single species dominates the community
6	Simpson Diversity Index	1 - D	0.97	Very high diversity with low dominance

The analysis of the biodiversity at Sendh Lake, Jhanjh, Khandwa and Pounta Ponds showed that there are 57 different bird species. This demonstrates how important wetlands are for supporting biodiversity. The Shannon-Wiener Index for the biodiversity at Sendh Lake, Jhanjh, Khandwa and Pounta Ponds was 3.89, meaning that there is high biodiversity for the birds at Sendh Lake, Jhanjh, Khandwa and Pounta Ponds. The hydrology and types of plants in the area provide suitable habitat for many different bird species and provide access to multiple food sources. The evenness value for the 57 species at Ponds was also calculated to be 0.96; therefore, there are many individual bird species, and no one species has an overwhelming dominance. The Simpson's Index for the biodiversity at respective Ponds was calculated to be 0.97, indicating that a high probability exists that if two randomly selected individuals are sampled that they would belong to different bird species. The Dominance Index for the Sendh Lake, Jhanjh, Khandwa and Pounta Ponds ecosystem was calculated to be 0.03; this further supports this Ponds have a highly diverse and unique ecosystem.

4. Discussion

According to this research study, Sendh Lake, Jhanjh, Khandwa and Pounta Ponds are a significant locale regarding the variety of birds. A total of 57 bird species reported from this location indicates sufficient ecological conditions exist for various bird species to thrive here. Numerous studies have shown that wetlands provide suitable habitats for a high number of birds because wetlands' habitat structure allows for food sources for these birds. Other studies on Indian wetlands have found similar patterns of bird diversity associated with the combination of vegetation and water bodies (Boora & Kumar, 2022; Chavan, 2023) ^[4, 5]. The present study's finding of a significant density of passerine birds is analogous to the findings from other Indian wetlands with regards to density of birds (Neelgund&Kadadevaru, 2020) ^[10], which use vegetation, grassland, and agricultural areas as habitat for feeding and nesting. Based on the conclusions drawn from the analysis of feeding guilds, it can be stated that birds that forage on insects comprised the most significant portion of the bird community, indicating high insect density in this wetland ecosystem.

Observations of the abundance of aquatic birds such as egrets, cormorants, ibises, and herons indicate that aquatic

animals such as fish, amphibians, have been found at wetlands near the Chhattisgarh state. Other studies conducted at wetlands in this region have also noted the presence of marsh vegetation and appropriate water depths within these area of wetlands support the presence of these species of water fowl (Bharos et al., 2022; Shrimali et al., 2025) [12]. Wetlands near urban areas are also being negatively impacted by pollution, destruction of habitat from human development, and other human caused disruptions to wetland habitats. Studies conducted have shown that anthropogenic actions impact both the distribution and diversity of birds found in wetland ecosystems (Datta, 2011; Barik et al., 2022) [1, 7]. The pace at which New Raipur is urbanized is increasing, yet all this ponds are able to support a still diverse grouping bird species. Therefore, the ecology of the wetland must continue to be preserved and protected so that the multiple species of birds found within the wetland can continue to exist.

5. Conclusion

A survey was conducted on wetlands of Sendh Lake, Jhanjh, Khandwa and Pounta Ponds and New Raipur, which yielded 57 species of birds distributed among 14 orders, 28 families. The predominance of passerine birds, as well as insectivorous feeding guilds, highlights the high diversity of wetland habitats. This study reaffirms that urban wetlands are important for ecological balance and conserving bird species diversity. The wetlands and ponds are critical for the maintenance of both terrestrial and aquatic birds. Therefore, the conservation and management of this habitat are necessary for the maintenance of ecological balance and conservation of bird species diversity. Additional studies of the ecosystem in this area are necessary to examine seasonal fluctuations in the ecosystem and patterns of migratory birds.

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