

# Composition and status of avian diversity in the Mandothi wetland habitat of Jhajjar, Haryana, India

Manju Chhikara<sup>1</sup>, Harkrishan Kamboj<sup>2</sup>, Parveen Kumar<sup>1</sup>, Vinay Malik<sup>3\*</sup> 

<sup>1</sup>Department of Zoology, Baba Mastnath University, Rohtak, Haryana, India.

<sup>2</sup>Department of Zoology, Chaudhary Devi Lal University, Sirsa, Haryana, India.

<sup>3</sup>Department of Zoology, Maharshi Dayanand University, Rohtak, Haryana, India.

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## ABSTRACT

This study was carried out from October 2021 to May 2023 to explore the diversity, feeding guild, and threat status of avian fauna in the Mandothi Wetlands, Haryana, India. A total of 133 bird species were documented belonging to 94 genera of 42 families in 18 orders. Among them, 86 species were residents, 40 species were winter visitors, 6 species were summer visitors, and 1 species was passage visitor. Based on feeding guilds, omnivorous birds were dominant 42 (31.6%), followed by carnivorous 39 (29.3%) and insectivorous 33 (24.8%) bird species. In addition, the wetlands provided habitat to one endangered species (Steppe Eagle, *Aquila nipalensis*), one vulnerable species (Sarus Crane, *Grus antigone*), and six near-threatened species. A rich number of avian species with diverse feeding guilds as well as endangered, vulnerable, and threatened bird species confirmed that Mandothi wetlands are suitable habitats for both migratory and residential birds and emphasize the need for its conservation. The findings of this study will raise awareness among the public and state governments regarding the importance of Mandothi Wetlands in preparing conservation strategies for its avian fauna.

## 1. INTRODUCTION

Avian fauna within an ecosystem plays a vital role in monitoring the quality of any habitat. Because they occupy a diverse ecological niche, birds are excellent indicators of environmental health, productivity, trophic structure, human disturbance, and contamination levels [1]. Unfortunately, bird diversity is declining due to the destruction of natural habitats, over-exploitation of forest resources, and soil erosion. Understanding both resident and migratory bird populations is essential for determining niche relationships and developing effective management strategies for the protection and conservation of avian fauna. Water pollution and degradation of water sources pose major threats to bird populations. The intense anthropogenic activities in bird natural habitats compelled them to adapt to urban and non-native habitats [2]. Assessing bird communities has become crucial for biodiversity conservation, particularly in areas with high human impact [3,4].

Being one of the top 12 mega biodiversity countries, India is home to 1348 bird species accounting for approximately 12% of the world's avifauna [5]. In the state of Haryana, approximately 450 bird species have been documented in various wetland areas such as ponds and lakes [6]. Wetlands are highly productive and dynamic ecosystems [7,8] that serve as a transitional link between aquatic and terrestrial habitats [9,10]. They have been recognized as potential habitats for a diverse range of water birds providing them with essential resources such as feeding grounds, breeding sites, roosting areas, and wintering habitats. Wetlands play a crucial role in supporting the livelihood of about 300 bird species [11]. Previous studies have suggested the wetlands of Haryana as a potential roosting and feeding grounds for migratory and several residential birds. In Haryana studies on avian fauna have been mostly performed in the Kurukshetra, Karnal, Panipat, Hisar, and Gurugram districts. However, there have been very few reports on the avian diversity of water birds in Jhajjar district [6,12-19].

The village Mandothi, Jhajjar, Haryana, has a vast area under wetlands. It has three large ponds surrounded by an agricultural ecosystem with a diverse vegetative cover comprising herbs, shrubs, and trees. These man-made wetlands serve as complementary habitats and food sources for a diverse variety of birds. Thus, the study aimed to evaluate the species diversity, feeding guilds, threat status, and population trends of aves in the Mandothi wetlands.

\*Corresponding Author:

Vinay Malik,

Department of Zoology,

Maharshi Dayanand University,

Rohtak, Haryana, India.

E-mail: [vinaymalikzoo@mdurohtak.ac.in](mailto:vinaymalikzoo@mdurohtak.ac.in)

## 2. MATERIALS AND METHODS

### 2.1. Study Area

Mandhoti (28°70'65" N and 76°82'07" E) is located 40 km (25 miles) northwest of New Delhi in the Jhajjar district of Haryana [Figure 1]. Mandhoti encloses an area of 25 km<sup>2</sup> comprising nearly 1000 acres of wetland and 3 large ponds with a human population of about 11,000. The place experiences semi-arid type climatic conditions with moderate rainfall and harbors many tree species such as *Dalbergia sissoo* (Shisham), *Prosopis cineraria* (Jand), *Ziziphus mauritiana* (Beri), *Salvadora oleoides* (Jaal), *Eucalyptus* spp. (Safeda), *Capparis decidua* (Kair), *Azadirachta indica* (Neem), *Acacia nilotica* (Kikar), and *Ficus religiosa* (Peepal). Eucalyptus and Shisham trees are commonly abundant in areas with high soil moisture content, while Kikar is mostly spotted in areas with low moisture content. The area also harbors aquatic weeds such as Typha, Phragmites, and Water hyacinth.

### 2.2. Data Collection

The avian fauna diversity and seasonal migration patterns were investigated over a period of 1 year and 8 months from October 2021 to May 2023. Regular surveys were conducted every fortnight. During winters, the birds were observed from 07:00 AM to 10:00 AM and 04:00 PM to 07:00 PM, while, in summer, the birds were observed from 06:00 AM to 09:00 AM and 04:00 PM to 07:00 PM. The line transect method was employed in the study during each visit [20]. Birds were observed with Olympus binoculars (8 × 40), and photographs were

taken with a Nikon P950 Coolpix camera. The identification of bird species was done by referring to field guides [21,22].

The status of the birds was categorized as Resident (R), Summer Migrant (SM), Winter Migrant (WM), and Passage Migrant (PM) based on their presence or absence at the study site following the guidelines [21]. The nomenclature, conservation status, and population trend were determined as per IUCN Red Data List version 15.1 (July 2022). Feeding guilds were assigned as per observation during the study and relevant literature sources [23-25].

The calculation of relative diversity (RDi) was performed as described earlier [26]:

$$RDi = \frac{\text{Total number of species in a family}}{\text{Total number of species}} \times 100$$

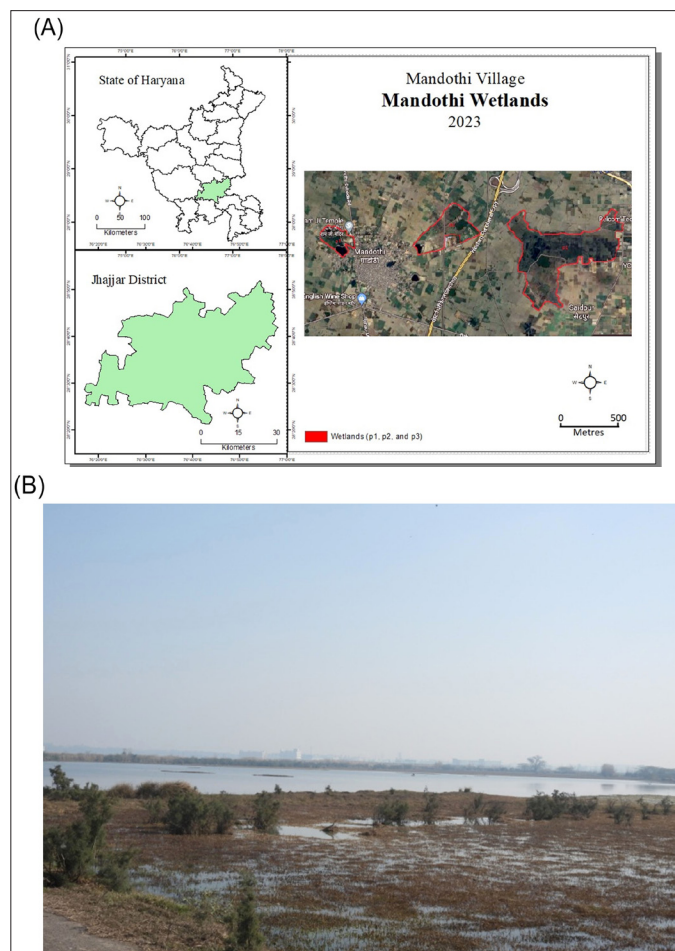
## 3. RESULTS AND DISCUSSION

This study of Mandhoti Wetlands recorded a total of 133 bird species distributed among 94 genera of 42 families in 18 orders [Table 1]. Order Passeriformes ( $n = 50$ ) was the most dominant followed by order Charadriiformes ( $n = 18$  species); Pelecaniformes, Anseriformes ( $n = 13$  species each); Columbiformes ( $n = 6$  species); Accipitriformes, Gruiformes ( $n = 5$  species each); Suliformes ( $n = 4$  species); Ciconiiformes, Coraciiformes, Cuculiformes ( $n = 3$  species each); and Galliformes, Piciformes, Psittaciformes ( $n = 2$  species each), while order Bucerotiformes, Phoenicopteriformes, Podicipediformes, and Strigiformes reported with only one species [Table 1]. The findings of the study were in accordance with the previous studies on the dominance of the Passeriformes order as prevalent avian taxa in Haryana [26-28].

The analysis of RDi revealed Anatidae ( $n = 13$  species, 9.77%) as the most dominant family followed by the family Scolopacidae ( $n = 11$  species, 8.27%); Ardeidae ( $n = 9$  species, 6.77%); Motacillidae ( $n = 8$  species, 6.02%); Muscicapidae ( $n = 7$  species, 5.26%); Columbidae ( $n = 6$  species, 4.51%); Accipitridae, Cisticolidae, Sturnidae ( $n = 5$  species each, 3.76%); Rallidae, Hirundinidae, Leiothrichidae, Threskiornithidae ( $n = 4$  species each, 3.01%); Ciconiidae, Cuculidae, Corvidae, Estrildidae, Phalacrocoracidae ( $n = 3$  species each, 2.26%); and Charadriidae, Recurvirostridae, Alcedinidae, Phasianidae, Alaudidae, Laniidae, Passeridae, Ploceidae, Psittaculidae ( $n = 2$  species each, 1.50%), whereas family Upupidae, Strigidae, Burhinidae, Jacanidae, Rostratulidae, Meropidae, Anhingidae, Gruidae, Dicruridae, Nectariniidae, Pycnonotidae, Phoenicopteridae, Megalaimidae, Picidae, and Podicipedidae ( $n = 1$  species each, 0.75%) represented least RDi [Table 2].

Feeding habits of the recorded birds revealed that the highest number of species belonged to the omnivorous (OV) ( $n = 42$ ), followed by carnivorous (CV) ( $n = 39$ ), insectivorous (IV) ( $n = 33$ ), granivorous (GV) ( $n = 11$ ), herbivorous (HV) ( $n = 3$ ), frugivorous (FG) ( $n = 4$ ), and the least represented guild was nectarivorous (NV) ( $n = 1$ ). The diversity of feeding guilds suggested the adequate resource distribution and rich availability of food in the study site which attracts and supports a large number of birds [Figure 2].

The threat status analysis found that Steppe Eagle (*Aquila nipalensis*) is an endangered species and Sarus Crane (*Grus antigone*) is a vulnerable species. The Woolly-Necked Stork (*Ciconia episcopus*), Black-Tailed Godwit (*Limosa limosa*), Painted Stork (*Mycteria leucocephala*), Black-Headed Ibis (*Threskiornis melanocephalus*), Oriental Darter (*Anhinga melanogaster*), and Alexandrine Parakeet (*Psittacula*



**Figure 1:** Study site (A) location and outline map. (B) Landscape of Mandhoti Wetland, Jhajjar, Haryana.

**Table 1:** Checklist and status of birds in Mandothi wetlands, Jhajjar, Haryana.

S. No.	Scientific Name	Common Name	Residential Status	IUCN Status	Population Trend	Feeding Guild
<b>Order: Accipitriformes</b>						
<b>Family: Accipitridae</b>						
1	<i>Milvus migrans</i>	Black Kite	R	LC	Stable	OV
2	<i>Circus aeruginosus</i>	Eurasian Marsh Harrier	WM	LC	Stable	CV
3	<i>Accipiter badius</i>	Shikra	R	LC	Stable	CV
4	<i>Elanus caeruleus</i>	Black-Winged Kite	R	LC	Stable	CV
5	<i>Aquila nipalensis</i>	Steppe Eagle	WM	EN	Decreasing	CV
<b>Order: Anseriformes</b>						
<b>Family: Anatidae</b>						
6	<i>Anser indicus</i>	Bar-Headed Goose	WM	LC	Decreasing	HV
7	<i>Dendrocygna javanica</i>	Lesser Whistling Duck	SM	LC	Decreasing	OV
8	<i>Sarkidiornis melanotos</i>	Knob Billed Duck	R	LC	Decreasing	OV
9	<i>Anas poecilorhyncha</i>	Spot-Billed Duck	R	LC	Decreasing	OV
10	<i>Anas acuta</i>	Northern Pintail	WM	LC	Decreasing	OV
11	<i>Anas clypeata</i>	Northern Shoveler	WM	LC	Decreasing	OV
12	<i>Anas strepera</i>	Gadwall	WM	LC	Increasing	OV
13	<i>Tadorna ferruginea</i>	Ruddy Shelduck	WM	LC	Unknown	OV
14	<i>Anser anser</i>	Graylag Goose	WM	LC	Increasing	OV
15	<i>Anas penelope</i>	Eurasian Wigeon	WM	LC	Decreasing	HV
16	<i>Anas crecca</i>	Common Teal	WM	LC	Unknown	OV
17	<i>Anas platyrhynchos</i>	Mallard	WM	LC	Increasing	OV
18	<i>Anas querquedula</i>	Garganey	WM	LC	Decreasing	HV
<b>Order: Bucerotiformes</b>						
<b>Family: Upupidae</b>						
19	<i>Upupa epops</i>	Common Hoopoe	R	LC	Decreasing	IV
<b>Order: Charadriiformes</b>						
<b>Family: Burhinidae</b>						
20	<i>Burhinus indicus</i>	Indian Thick-knee	R	LC	Decreasing	CV
<b>Family: Charadriidae</b>						
21	<i>Vanellus leucurus</i>	White-Tailed lapwing	WM	LC	Unknown	CV
22	<i>Vanellus indicus</i>	Red-Wattled Lapwing	R	LC	Unknown	CV
<b>Family: Jacanidae</b>						
23	<i>Hydrophasianus chirurgus</i>	Pheasant-Tailed Jacana	SM	LC	Decreasing	OV
<b>Family: Recurvirostridae</b>						
24	<i>Himantopus himantopus</i>	Black-Winged Stilt	R	LC	Increasing	CV
25	<i>Recurviro straaavosetta</i>	Pied Avocet	WM	LC	Unknown	CV
<b>Family: Rostratulidae</b>						
26	<i>Rostratula benghalensis</i>	Greater Painted Snipe	R	LC	Decreasing	OV
<b>Family: Scolopacidae</b>						
27	<i>Limosa limosa</i>	Black-Tailed Godwit	WM	NT	Decreasing	IV
28	<i>Tringa totanus</i>	Common Redshank	WM	LC	Unknown	CV
29	<i>Gallinago gallinago</i>	Common Snipe	WM	LC	Decreasing	CV
30	<i>Philomachus pugnax</i>	Ruff	WM	LC	Decreasing	OV
31	<i>Tringa stagnatilis</i>	Marsh Sandpiper	WM	LC	Decreasing	CV
32	<i>Tringa glareola</i>	Wood Sandpiper	WM	LC	Stable	IV
33	<i>Calidris minuta</i>	Little Stint	WM	LC	Increasing	IV
34	<i>Calidris temminckii</i>	Temminck's Stint	WM	LC	Unknown	IV
35	<i>Tringa erythropus</i>	Spotted Redshank	WM	LC	Stable	IV

(Continued)

Table 1: (Continued)

S. No.	Scientific Name	Common Name	Residential Status	IUCN Status	Population Trend	Feeding Guild
36	<i>Tringa ochropus</i>	Green Sandpiper	WM	LC	Increasing	IV
37	<i>Actitis hypoleucos</i>	Common Sandpiper	WM	LC	Decreasing	CV
<b>Order: Ciconiiformes</b>						
<b>Family: Ciconiidae</b>						
38	<i>Mycteria leucocephala</i>	Painted Stork	R	NT	Decreasing	CV
39	<i>Anastomus oscitans</i>	Asian Openbill Stork	R	LC	Unknown	CV
40	<i>Ciconia episcopus</i>	Woolly-Necked Stork	R	NT	Decreasing	CV
<b>Order: Columbiformes</b>						
<b>Family: Columbidae</b>						
41	<i>Columba livia</i>	Blue Rock Pigeon	R	LC	Decreasing	GV
42	<i>Stigmatopelia chinensis</i>	Spotted Dove	R	LC	Increasing	GV
43	<i>Stigmatopelia senegalensis</i>	Laughing Dove	R	LC	Stable	GV
44	<i>Streptopelia decaocto</i>	Eurasian Collared Dove	R	LC	Increasing	GV
45	<i>Streptopelia tranquebarica</i>	Red Collared Dove	R	LC	Decreasing	GV
46	<i>Treron phoenicopterus</i>	Yellow-Footed Green Pigeon	R	LC	Increasing	FV
<b>Order: Coraciiformes</b>						
<b>Family: Alcedinidae</b>						
47	<i>Halcyon smyrnensis</i>	White-Throated Kingfisher	R	LC	Increasing	CV
48	<i>Ceryle rudis</i>	Pied Kingfisher	R	LC	Unknown	CV
<b>Family: Meropidae</b>						
49	<i>Merops orientalis</i>	Green Bee-Eater	SM	LC	Increasing	IV
<b>Order: Cuculiformes</b>						
<b>Family: Cuculidae</b>						
50	<i>Centropus sinensis</i>	Greater Coucal	R	LC	Stable	OV
51	<i>Clamator jacobinus</i>	Jacobin Cuckoo	SM	LC	Stable	OV
52	<i>Eudynamis scolopaceus</i>	Asian Koel	SM	LC	Stable	OV
<b>Order: Galliformes</b>						
<b>Family: Phasianidae</b>						
53	<i>Francolinus pondicerianus</i>	Gray Francolin	R	LC	Stable	OV
54	<i>Pavo cristatus</i>	Indian Peafowl	R	LC	Stable	OV
<b>Order: Gruiformes</b>						
<b>Family: Gruidae</b>						
55	<i>Grus antigone</i>	Sarus Crane	R	V	Decreasing	OV
<b>Family: Rallidae</b>						
56	<i>Amaurornis phoenicurus</i>	White-Breasted Waterhen	R	LC	Unknown	OV
57	<i>Fulica atra</i>	Common Coot	WM	LC	Increasing	OV
58	<i>Gallinula chloropus</i>	Common Moorhen	WM	LC	Stable	OV
59	<i>Porphyrio porphyrio</i>	Purple Swamphen	R	LC	Unknown	OV
<b>Order: Passeriformes</b>						
<b>Family: Alaudidae</b>						
60	<i>Galerida cristata</i>	Crested Lark	R	LC	Decreasing	GV
61	<i>Mirafra erythroptera</i>	Indian Bush-Lark	R	LC	Stable	GV
<b>Family: Cisticolidae</b>						
62	<i>Orthotomus sutorius</i>	Common Tailorbird	R	LC	Stable	IV
63	<i>Prinia flaviventris</i>	Yellow- Bellied Prinia	R	LC	Decreasing	IV
64	<i>Prinia gracilis</i>	Graceful Prinia	R	LC	Stable	IV
65	<i>Prinia inornata</i>	Plain Prinia	R	LC	Stable	IV
66	<i>Prinia socialis</i>	Ashy Prinia	R	LC	Stable	IV

(Continued)

Table 1: (Continued)

S. No.	Scientific Name	Common Name	Residential Status	IUCN Status	Population Trend	Feeding Guild
<b>Family: Corvidae</b>						
67	<i>Corvus macrorhynchos</i>	Large-Billed Crow	R	LC	Stable	OV
68	<i>Corvus splendens</i>	House Crow	R	LC	Stable	OV
69	<i>Dendrocitta vagabunda</i>	Rufous Treepie	R	LC	Decreasing	OV
<b>Family: Dicuridae</b>						
70	<i>Dicrurus macrocercus</i>	Black Drongo	R	LC	Unknown	CV
<b>Family: Estrildidae</b>						
71	<i>Amandava amandava</i>	Red Avadavat	R	LC	Stable	OV
72	<i>Euodice malabarica</i>	Indian Silver Bill	R	LC	Stable	GV
73	<i>Lonchura punctulata</i>	Scaly- Breasted Munia	R	LC	Stable	GV
<b>Family: Hirundinidae</b>						
74	<i>Hirundo smithii</i>	Wire-Tailed Swallow	SM	LC	Increasing	IV
75	<i>Hirundo rustica</i>	Barn Swallow	WM	LC	Decreasing	IV
76	<i>Petrochelidon fluvicola</i>	Streak-Throated Swallow	R	LC	Increasing	IV
77	<i>Riparia paludicola</i>	Plain Martin	R	LC	Decreasing	IV
<b>Family: Laniidae</b>						
78	<i>Lanius schach</i>	Long-Tailed Shrike	R	LC	Unknown	CV
79	<i>Lanius vittatus</i>	Bay-Backed Shrike	R	LC	Stable	CV
<b>Family: Leiothrichidae</b>						
80	<i>Turdoides caudata</i>	Common Babbler	R	LC	Stable	OV
81	<i>Turdoides earlei</i>	Striated Babbler	R	LC	Decreasing	OV
82	<i>Turdoides malcolmi</i>	Large Gray Babbler	R	LC	Stable	OV
83	<i>Turdoides striata</i>	Jungle Babbler	R	LC	Stable	OV
<b>Family: Muscipidae</b>						
84	<i>Copsychus saularis</i>	Oriental Magpie-Robin	R	LC	Stable	IV
85	<i>Luscinia svecica</i>	Bluethroat	WM	LC	Stable	IV
86	<i>Oenanthe fusca</i>	Brown Rock Chat	R	LC	Stable	IV
87	<i>Oenanthe isabellina</i>	Isabelline Wheatear	WM	LC	Stable	IV
88	<i>Saxicola caprata</i>	Pied Bushchat	R	LC	Stable	IV
89	<i>Saxicola torquatus</i>	Common Stonechat	WM	LC	Stable	IV
90	<i>Saxicoloides fulicatus</i>	Indian Robin	R	LC	Stable	IV
<b>Family: Motacillidae</b>						
91	<i>Anthus hodgsoni</i>	Olive-Backed Pipit	WM	LC	Stable	IV
92	<i>Anthus rufulus</i>	Paddyfield Pipit	R	LC	Stable	IV
93	<i>Anthus trivialis</i>	Tree Pipit	WM	LC	Decreasing	IV
94	<i>Motacilla alba</i>	White Wagtail	WM	LC	Stable	IV
95	<i>Motacilla cinerea</i>	Gray Wagtail	WM	LC	Stable	IV
96	<i>Motacilla citreola</i>	Citrine Wagtail	WM	LC	Increasing	IV
97	<i>Motacilla flava</i>	Yellow Wagtail	WM	LC	Decreasing	IV
98	<i>Motacilla maderaspatensis</i>	White- Browed Wagtail	R	LC	Stable	IV
<b>Family: Nectariniidae</b>						
99	<i>Cinnyris asiaticus</i>	Purple Sunbird	R	LC	Stable	NV
<b>Family: Passeridae</b>						
100	<i>Gymnoris xanthocollis</i>	Chestnut -Shouldered Petronia	R	LC	Stable	GV
101	<i>Passer domesticus</i>	House Sparrow	R	LC	Decreasing	GV
<b>Family: Ploceidae</b>						
102	<i>Ploceus philippinus</i>	Baya Weaver	R	LC	Stable	OV
103	<i>Ploceus manyar</i>	Streaked Weaver	R	LC	Stable	OV
<b>Family: Pycnonotidae</b>						

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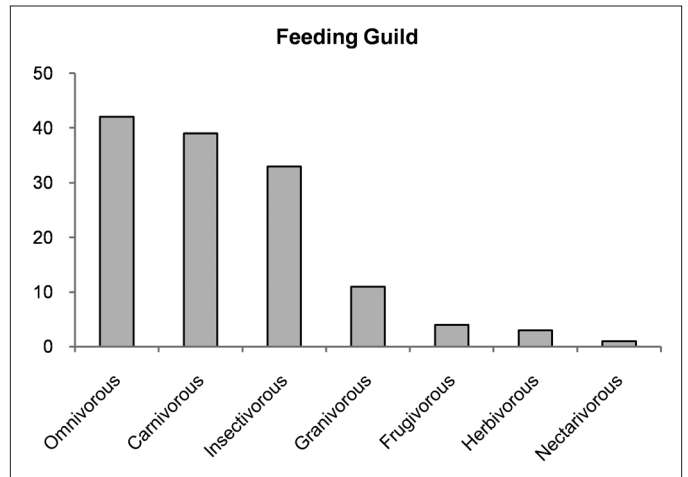
Table 1: (Continued)

S. No.	Scientific Name	Common Name	Residential Status	IUCN Status	Population Trend	Feeding Guild
104	<i>Pycnonotus cafer</i>	Red-Vented Bulbul	R	LC	Increasing	OV
<b>Family: Sturnidae</b>						
105	<i>Acridotheres ginginianus</i>	Bank Myna	R	LC	Increasing	OV
106	<i>Acridotheres tristis</i>	Common Myna	R	LC	Increasing	OV
107	<i>Gracupica contra</i>	Asian Pied Starling	R	LC	Increasing	OV
108	<i>Pastor roseus</i>	Rosy Starling	PM	LC	Unknown	OV
109	<i>Sturnus vulgaris</i>	Common Starling	WM	LC	Decreasing	OV
<b>Order: Pelecaniformes</b>						
<b>Family: Ardeidae</b>						
110	<i>Ardea cinerea</i>	Gray Heron	R	LC	Unknown	CV
111	<i>Ardea purpurea</i>	Purple Heron	R	LC	Increasing	CV
112	<i>Ardeola grayii</i>	Indian Pond Heron	R	LC	Unknown	CV
113	<i>Bubulcus ibis</i>	Cattle Egret	R	LC	Increasing	CV
114	<i>Casmerodius albus</i>	Large Egret	R	LC	Unknown	CV
115	<i>Egretta garzetta</i>	Little Egret	R	LC	Increasing	CV
116	<i>Ixobrychus sinensis</i>	Yellow Bittern	R	LC	Unknown	CV
117	<i>Mesophoyx intermedia</i>	Median Egret	R	LC	Decreasing	CV
118	<i>Nycticorax nycticorax</i>	Night Heron	R	LC	Decreasing	CV
<b>Family: Threskiornithidae</b>						
119	<i>Pseudibis papillosa</i>	Red-Naped Ibis	R	LC	Decreasing	CV
120	<i>Platalea leucorodia</i>	Eurasian Spoonbill	R	LC	Unknown	CV
121	<i>Plegadis falcinellus</i>	Glossy Ibis	WM	LC	Increasing	CV
122	<i>Threskiornis melanocephalus</i>	Black Headed Ibis	R	NT	Decreasing	CV
<b>Order: Phoenicopteriformes</b>						
<b>Family: Phoenicopteridae</b>						
123	<i>Phoenicopus roseus</i>	Greater Flamingo	R	LC	Increasing	OV
<b>Order: Piciformes</b>						
<b>Family: Megalaimidae</b>						
124	<i>Megalaima haemacephala</i>	Coppersmith Barbet	R	LC	Increasing	FV
<b>Family: Picidae</b>						
125	<i>Jynx torquilla</i>	Eurasian Wryneck	WM	LC	Decreasing	IV
<b>Order: Podicipediformes</b>						
<b>Family: Podicipedidae</b>						
126	<i>Tachybaptus ruficollis</i>	Little Grebe	R	LC	Decreasing	OV
<b>Order: Psittaciformes</b>						
<b>Family: Psittacidae</b>						
127	<i>Psittacula eupatria</i>	Alexandrine Parakeet	R	NT	Decreasing	FV
128	<i>Psittacula krameri</i>	Rose-Ringed Parakeet	R	LC	Increasing	FV
<b>Order: Strigiformes</b>						
<b>Family: Strigidae</b>						
129	<i>Athene brama</i>	Spotted Owlet	R	LC	Stable	CV
<b>Order: Suliformes</b>						
<b>Family: Anhingidae</b>						
130	<i>Anhinga melanogaster</i>	Oriental Darter	R	NT	Decreasing	CV
<b>Family: Phalacrocoracidae</b>						
131	<i>Phalacrocorax carbo</i>	Great Cormorant	R	LC	Increasing	CV
132	<i>Phalacrocorax fuscicollis</i>	Indian Cormorant	R	LC	Unknown	CV
133	<i>Phalacrocorax niger</i>	Little Cormorant	R	LC	Unknown	CV

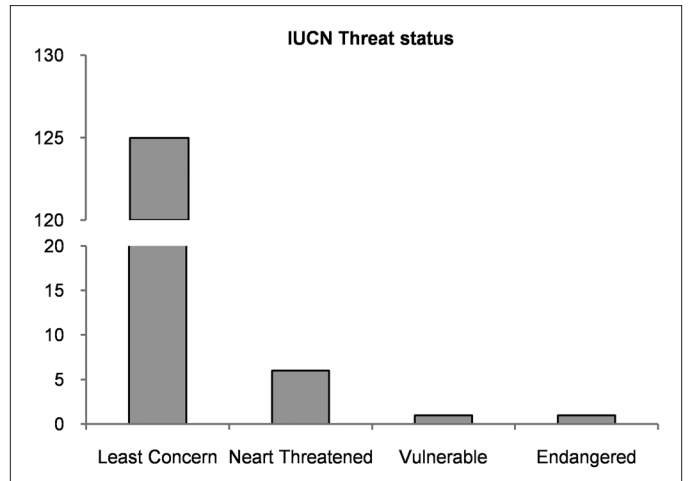
WM: Winter migrants. SM: Summer migrants. PM: Passage migrants. LC: Least concerned. NT: Near threatened. V: Vulnerable. EN: Endangered. CV: Carnivorous. GV: Granivorous. IV: Insectivorous. NV: Nectarivorous. OV: Omnivorous. HV: Herbivorous. FG: Frugivorous.

**Table 2:** RDi of avian fauna in Mandothi wetland, Jhajjar, Haryana.

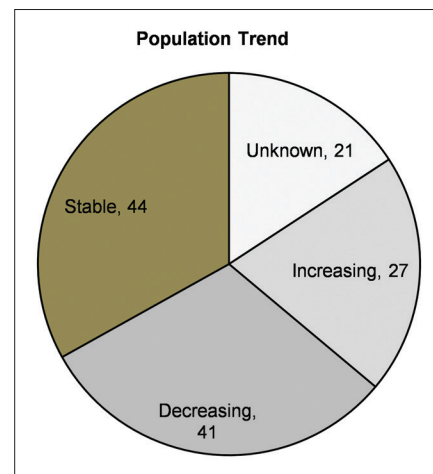
S. No.	Family	Genera	Species	RDi
1	Anatidae	5	13	9.77
2	Scolopacidae	6	11	8.27
3	Ardeidae	8	9	6.77
4	Motacillidae	2	8	6.02
5	Muscicapidae	5	7	5.26
6	Columbidae	4	6	4.51
7	Accipitridae	5		
8	Cisticolidae	2	5	3.76
9	Sturnidae	4		
10	Rallidae	4		
11	Hirundinidae	3	4	3.01
12	Leiothrichidae	1		
13	Threskiornithidae	4		
14	Ciconiidae	3		
15	Cuculidae	3		
16	Corvidae	2	3	2.26
17	Estrildidae	3		
18	Phalacrocoracidae	1		
19	Charadriidae	1		
20	Recurvirostridae	2		
21	Alcedinidae	2		
22	Phasianidae	2		
23	Alaudidae	2	2	1.50
24	Laniidae	1		
25	Passeridae	2		
26	Ploceidae	1		
27	Psittaculidae	1		
28	Upupidae	1		
29	Burhinidae	1		
30	Jacanidae	1		
31	Rostratulidae	1		
32	Meropidae	1		
33	Gruidae	1		
34	Dicruridae	1		
35	Nectariniidae	1	1	0.75
36	Pycnonotidae	1		
37	Phoenicopteridae	1		
38	Megalaimidae	1		
39	Picidae	1		
40	Podicipedidae	1		
41	Strigidae	1		
42	Anhingidae	1		
		94	133	



**Figure 2:** Feeding habits observed in avian community observed at Mandothi Wetland, Jhajjar, Haryana.



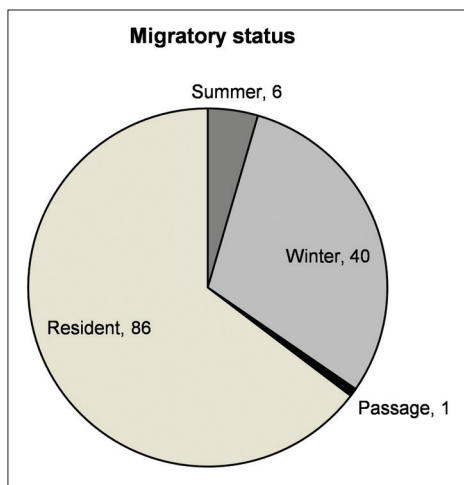
**Figure 3:** Threat status (IUCN) of avian diversity recorded at Mandothi Wetland, Jhajjar, Haryana.



**Figure 4:** Population trends (IUCN) of avian community recorded at Mandothi Wetland, Jhajjar, Haryana.

*eupatria*) are near-threatened (NT) species ( $n = 6$ ). The rest of the 125 species are least concerned (LC) [Figure 3]. The findings addressing conservation status are in accordance with an earlier study reporting 124 species in Mandothi Wetlands [28]. The assessment of the global population trend in the study area showed that a stable population is

exhibited by 44 species, 41 species exhibited a decreasing population, 27 species exhibited an increasing population, and 21 species represented an unknown population trend [Figure 4]. The presence of



**Figure 5:** Migratory status observed in avian community recorded at Mandothi Wetland, Jhajjar, Haryana.

a substantial number of species with declining population trends as well as the presence of endangered birds in this area highlights the importance of this site in avian conservation.

The seasonal migration data revealed that out of the 133 recorded species, 86 were resident species. While 47 exhibited migratory behavior, among them, 40 species are winter visitors, 6 are summer visitors, and 1 is passage migratory [Figure 5]. The findings are in accordance with a previous study conducted in Bhindawas Bird Sanctuary reporting 82 resident species, 30 WMs, 6 SMs, and 1 PM [16]. Despite a high number of winter migratory bird species in the present study as compared with Bhindawas Bird Sanctuary, a Ramsar site, which is merely 20 km away from the study site, highlights the importance of this site and also suggests that this wetland is a potential bird habitat in Haryana.

#### 4. CONCLUSION

The presence of 133 avian species including 47 migratory birds concludes that Mandothi provides a suitable habitat with rich and diverse feeding resources to support bird diversity. The presence of one endangered species, one vulnerable species, and six NT species draws immediate attention to the protection and conservation of this area for its avian diversity. The appropriate conservation efforts of this area will develop it into a thriving habitat for avifauna and a paradise for bird watchers. It is noteworthy that the study is not conclusive itself and more insightful research focusing on nesting behavior, roosting behavior, and perching guild can be done in the future to understand the avian ecology of the region and to design a holistic conservation plan.

#### 5. AUTHOR CONTRIBUTIONS

All the authors have made substantial contributions to the content of the manuscript. MC, PK and VM worked on the concept and design. MC, HK and PK performed data acquisition. MC, HK and VM performed data analysis. MC and VM drafted the manuscript. PK and VM critically revised the manuscript. HK and PK performed statistical analysis. VM supervised and finally approved the manuscript.

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#### 7. CONFLICTS OF INTEREST

The authors report no financial or any other conflicts of interest in this work.

#### 8. ETHICAL APPROVALS

This study does not involve experiments on animals or human subjects.

#### 9. DATA AVAILABILITY

All the data is available with the authors and shall be provided upon request.

#### 10. USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

#### 11. PUBLISHER'S NOTE

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