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Cover: Orange Oakleaf *Kallima inachus* with colour pencils and watercolor wash by Elakshi Mahika Molur adapted from a workshop by Lenin Raj.



Assessing avian diversity and conservation status in Dighal Wetlands, Haryana, India

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Abstract: Birds are considered sensitive indicators of ecosystem health and functionality in freshwater wetlands. Assessment of bird assemblages in wetland habitats is, therefore, emphasised from a sustainable management perspective. Bird surveys were conducted from October 2020 to September 2022. These surveys aimed to assess the community composition and status of avifauna in Dighal wetlands, an important bird area in the Jhajjar District of Haryana, India. Data collection employed point counts and opportunistic encounter methods. A total of 154 bird species belonging to 108 genera, 47 families, and 18 orders were recorded. Of these, 75 species were residents, 60 were winter migrants, and 10 were summer migrants. The greatest species richness was observed for the order Passeriformes (54), followed by Charadriiformes (22), Anseriformes (17), and the rest of the 15 orders. Anatidae was the most dominant family with 17 species, constituting 11% of the bird community in the study area. Data on local abundance revealed that 10 species were common, 23 were fairly common, 83 were uncommon, and 38 were rare in the study area. Among the recorded avifauna, one species is classified as Endangered, three as Vulnerable, and eight as Near Threatened in the IUCN Red List of Threatened Species; 17 species are listed in the Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and 11 are included in Schedule I of the Indian Wildlife (Protection) Act, 1972. These wetlands also support 40 species of birds, which have a declining population trend globally. The occurrence of migrants and species of global conservation priority underscores the importance of these wetlands as a conservation site and wintering ground for avifauna due to the extensive food resources and rich biodiversity they support. The present study provides baseline information for future research on monitoring bird assemblages and proper management of the Dighal wetlands of Haryana.

Keywords: Assemblages, biodiversity, birds, community composition, ecosystem, indicator, migrants, point counts, species richness, threatened species.

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Author contributions: P. Kumar conceived and designed the study as well as wrote the final draft of the manuscript. Parul performed the field surveys, analysed the data and prepared rough draft of the manuscript. Both authors read and approved the final manuscript.

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INTRODUCTION

Wetlands are dynamic ecosystems that link aquatic and terrestrial habitats (Zedler & Kercher 2005; Bassi et al. 2014; Panda et al. 2021; Rajpar et al. 2022; Yashmita-Ulman & Singh 2022). They have specific ecological characteristics, functions, and values. Approximately 5–8% of the Earth's surface is occupied by wetlands (Anand et al. 2023). In addition to providing various ecosystem services, wetlands are reservoirs of incredible biodiversity, including invertebrates, fish, amphibians, reptiles, birds, mammals, and plants. Therefore, wetlands are often viewed as treasuries of biodiversity within a region or landscape (Bhat et al. 2009; Singh & Brraich 2022; Anand et al. 2023; Byju et al. 2023).

Birds occupy several trophic levels in the nutrient cycle of wetland ecosystems (Kumar & Sharma 2018; Chakraborty et al. 2021; Rai & Vanita 2021; Rajpar et al. 2022; Yashmita-Ulman & Singh 2022). Wetlands are important for both resident and migratory birds. They are used by birds for various purposes such as foraging, breeding, roosting, and nesting habitats, and sometimes also as stopover sites (Ganbold et al. 2018; Kumar & Sharma 2018; Panda et al. 2021; Yashmita-Ulman & Singh 2022; Anand et al. 2023; Muralikrishnan et al. 2023). Birds are extremely sensitive to changes in their habitats such as human disturbance, poisoning, pollution, eutrophication, and siltation; therefore, they can be used as an excellent ecological indicator for assessing the quality, productivity, and stability of wetlands (Mistry et al. 2008; Amat & Green 2010).

In India, 4.6% of the geographical area is under wetlands (Bassi et al. 2014; Anand et al. 2023). Of the 1,353 bird species reported from various habitats within the geographical limits of India (Praveen & Jayapal 2023), 310 are recognised to be dependent on wetlands (Kumar et al. 2005). However, wetlands in India, as elsewhere, are facing anthropogenic pressures like conversion of wetlands into agricultural lands or for commercial fishing purposes, industrial pollution, fertilisers run-off from surrounding agricultural fields, hunting, unsustainable harvest of wetland resources, invasion of alien species, eutrophication, and draining of water for agricultural purposes (Ganbold et al. 2018; Kumar & Sharma 2018; Mandal et al. 2021; Panda et al. 2021; Rashiba et al. 2022; Yashmita-Ulman & Singh 2022). This threatens the existing avifaunal diversity of wetlands. Information on species composition and seasonal assemblages of birds in a particular wetland habitat is very helpful in understanding the habitat condition and designing suitable conservation and

management strategies for sustainable biodiversity conservation (Kumar et al. 2016; Ganbold et al. 2018; Mandal et al. 2021; Muralikrishnan et al. 2023).

Dighal wetlands have been identified as an Important Bird and Biodiversity Area (IBA) of India with the IBA code of IN-HR-06 by the ENVIS Centre on Wildlife and Protected Areas (Rahmani et al. 2016). Spread over an area of about 131.5 ha, Dighal wetlands in the Jhajjar District of Haryana are a complex of many small and large ponds along with vast areas of wet fields left for several years because of high water table and water logging conditions in the Dighal Village. These wetlands serve as important wintering sites for large congregations of migratory birds. To understand the anthropogenic impacts on wetland birds and their habitat in the future, it is essential to have information on the species composition, seasonality, and conservation status of bird assemblages. Such information will help in the long-term monitoring of the wetlands and preparing conservation and management strategies for the avifauna as well as their habitat. In this context, the present study was designed to document the community composition and status of avifauna in the Dighal wetlands of Haryana, India.

MATERIAL AND METHODS

Study area

The present study was conducted in the Dighal wetlands, located in the southeastern region of Haryana state, India, with coordinates at 28.222°N and 76.187°E. These wetlands, positioned within Beri Tehsil of Jhajjar District, encompass an area of approximately 131.5 ha, comprising a complex of ponds, both small and large, as well as extensive wet fields that have remained unused for several years due to consistent high water tables and recurrent waterlogging in the village of Dighal. As a critical part of the Central Asian Flyway, the Dighal wetlands serve as crucial wintering grounds for numerous migratory bird species. This research involved selecting eight specific wetland sites for bird surveys, with their key characteristics detailed in Table 1. The study area experiences a subtropical climate featuring three distinct seasons: a rainy period from July to September, a cool dry season from October to February, and a hot dry season from March to June. Temperatures range from a scorching 45°C in summer to a chilly 6°C in winter, with an average annual rainfall of 444 mm recorded in the district.

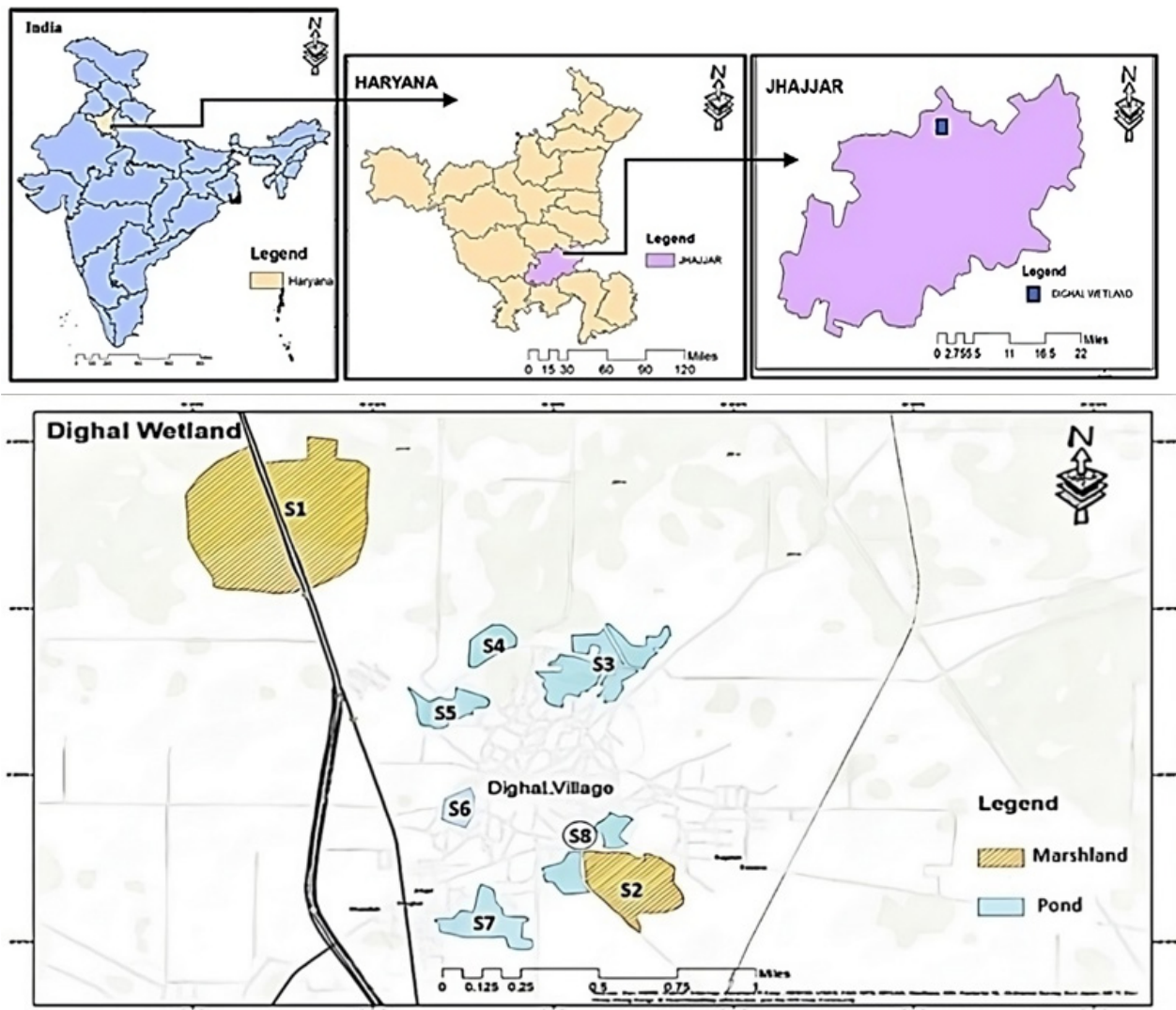


Figure 1. Map of study area showing eight different sites (S1 to S8) of Dighal Wetland in district Jhajjar, Haryana.

Data collection

Avian surveys were conducted using the point count method, following a bi-weekly schedule from October 2020 to September 2022. Four to six counting points, spaced at least 250 m apart, were strategically positioned along the perimeter of the wetlands, totaling 48 surveys at each location over the study period. A five-minute settling period preceded ten minutes of active bird observation, employing Nikon 10x50 field binoculars during peak activity hours (0600–1000 h or 1600–1800 h). Additional opportunistic observations were carried out by scanning the wetlands’ peripheries and banks to compile a comprehensive avifauna checklist. Bird identification followed Grimmett et al. (2011), with Praveen & Jayapal (2023) for taxonomic references. Abundance status relies on sighting frequency, which

can be categorised as common (CO), fairly common (FC), uncommon (UC), or rare (RA) based on Mackinnon & Phillipps (1993). The residential status (resident, summer migrant, or winter migrant) was determined with the presence-absence method (Kumar & Sharma 2018). Conservation status aligned with IWPA (1972) and CITES (2012), while the Red List of the IUCN (2022) guided assessment for conservation status and global population trend.

Relative diversity (RD_i) of bird families was computed as

$$RD_i = \frac{\text{Number of Bird Species in a Family}}{\text{Total Number of Bird Species}} \times 100$$

following the Torre-Cuadros et al. (2007) formula.

Table 1. General features of the selected Dighal wetland sites in Jhajjar District of Haryana, India.

Wetland site	Co-ordinates	General features
S1	28.780°N, 76.620°E	This wetland habitat is comprised of waterlogged agricultural fields spread on both sides of the Jhajjar-Rohtak toll plaza expressway. The roadside plantation was dominated by Eucalyptus trees.
S2	28.762°N, 76.636°E	A water-logged barren land on one side of one of the water houses of Dighal Village. It is comprised of small shrubs and bushy plantations all over the area.
S3	28.772°N, 76.635°E	This site is a complex of four adjoining ponds fragmented by road. It is surrounded by a gaushala, a graveyard, and a water house.
S4	28.772°N, 76.630°E	This pond is located on the back side of the sports stadium building and comprises comparatively less plantation.
S5	28.769°N, 76.627°E	This site is comprised of four ponds fragmented by road in the Dighal Village. An old historical monument is present on the bank of the pond and surrounded by human habitations.
S6	28.764°N, 76.626°E	This site is a single large pond located in front of the central co-operative bank of the Dighal Village and has a community health centre nearby.
S7	28.759°N, 76.629°E	This pond is present in the locality of residential areas and an old well is present on one corner of the pond.
S8	28.761°N, 76.634°E	This is a fragmented large pond in front of a water tank area, a natural small pond, and waterlogged agricultural land nearby.

RESULTS

A total of 154 species of birds belonging to 108 genera, 47 families, and 18 orders were recorded from the study area (Table 2). Passeriformes was the most dominant order with 54 species, followed by Charadriiformes (22), Anseriformes (17), and the rest 15 orders (Figure 2). Analysis of the relative diversity index revealed that Anatidae was the most diverse family (17 species, RDi = 11.03), followed by Scolopacidae (13 species, RDi = 8.44), Muscicapidae (10 species, RDi = 7.46), and Accipitridae (9 species, RDi = 5.84). Whereas 16 families, namely, Phoenicopteridae, Podicipedidae, Anhingidae, Jacanidae, Burhinidae, Strigidae, Bucerotidae, Upupidae, Megalaimidae, Picidae, Coraciidae, Dicuridae, Nectariniidae, Phylloscopidae, Zosteropidae, and Rhipiduridae were least represented (one species each, RDi = 0.64) (Table 3).

Of the total bird species recorded, 75 species (49%) were resident, 69 species (45%) were winter migrants, and only 10 species (6%) were summer visitors (Figure 3). Based on the IUCN Red List of Threatened Species, one species, Egyptian Vulture *Neophron percnopterus* is ‘Endangered’, and three species—Common Pochard *Aythya farina*, Sarus Crane *Antigone antigone*, and River Tern *Sterna aurantia*—are ‘Vulnerable’; eight species—

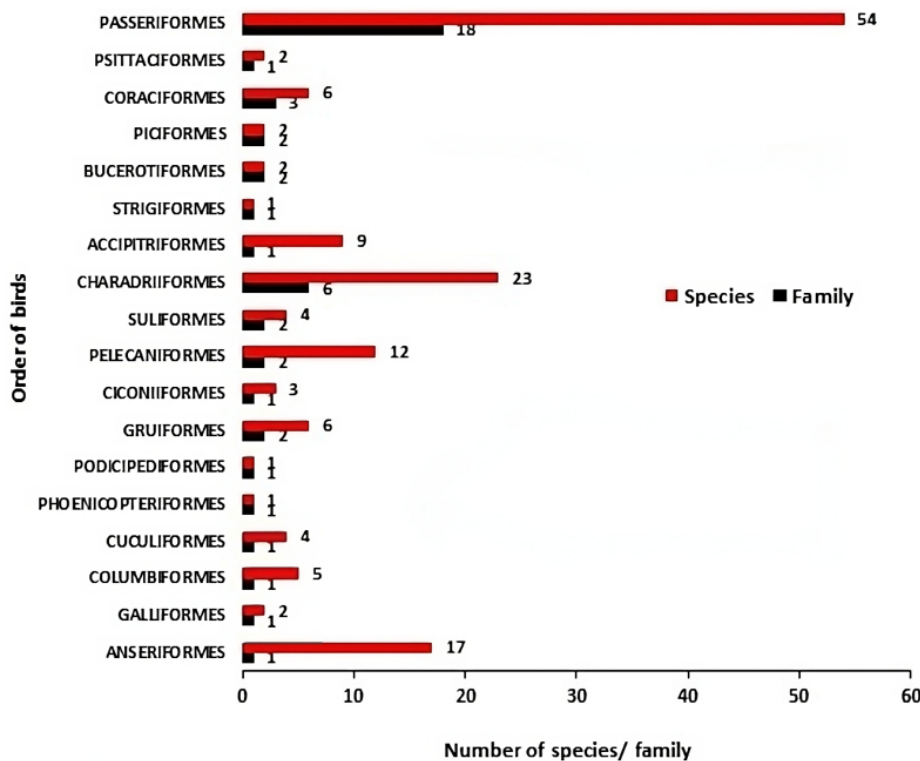


Figure 2. Composition of avian community in Dighal wetlands of Jhajjar District of Haryana, India.

Table 2. List of avian species recorded from Dighal wetlands of Jhajjar District, Haryana, India together with their respective taxonomic position, residential status, local abundance status, conservation status, and global population trend.

	Common name/ Order	Scientific name	Family	Residential status	Local status	Conservation status			Global population trend
						IUCN Red List	IWPA	CITES	
Order ANSERIFORMES									
1	Lesser-whistling Duck	<i>Dendrocygna javanica</i>	Anatidae (17)	S	UC	LC	IV	-	↓
2	Bar-headed Goose	<i>Anser indicus</i>		W	FC	LC	IV	-	↓
3	Greylag Goose	<i>Anser anser</i>		W	UC	LC	IV	-	↑
4	Ruddy Shelduck	<i>Tadorna ferruginea</i>		W	UC	LC	IV	-	?
5	Red-crested Pochard	<i>Netta rufina</i>		W	RA	LC	IV	-	?
6	Common Pochard	<i>Aythya farina</i>		W	UC	VU	IV	-	↓
7	Ferruginous Duck	<i>Aythya nyroca</i>		W	RA	NT	IV	-	↓
8	Tufted Duck	<i>Aythya fuligula</i>		W	UC	LC	IV	-	→
9	Garganey	<i>Spatula querquedula</i>		W	UC	LC	IV	-	↓
10	Northern Shoveler	<i>Spatula clypeata</i>		W	FC	LC	IV	-	↓
11	Gadwall	<i>Mareca strepera</i>		W	UC	LC	IV	-	↑
12	Eurasian Wigeon	<i>Mareca penelope</i>		W	UC	LC	IV	-	↓
13	Indian Spot-billed Duck	<i>Anas poecilorhyncha</i>		R	CO	LC	IV	-	↓
14	Northern Pintail	<i>Anas acuta</i>		W	UC	LC	IV	-	↓
15	Common Teal	<i>Anas crecca</i>		W	UC	LC	IV	-	?
16	Knob-billed Duck	<i>Sarkidiornis melanotos</i>		W*	UC	LC	IV	II	↓
17	Mallard	<i>Anas platyrhynchos</i>		W	RA	LC	IV	-	↑
Order: GALLIFORMES									
18	Indian Peafowl	<i>Pavo cristatus</i>	Phasianidae (2)	R	UC	LC	I	-	→
19	Grey Francolin	<i>Francolinus pondicerianus</i>		R	UC	LC	IV	-	→
Order: COLUMBIFORMES									
20	Rock Pigeon	<i>Columba livia</i>	Columbidae (5)	R	CO	LC	IV	-	↓
21	Eurasian Collared Dove	<i>Streptopelia decaocto</i>		R	FC	LC	IV	-	↑
22	Spotted Dove	<i>Streptopelia chinensis</i>		R	UC	LC	IV	-	↑
23	Laughing Dove	<i>Streptopelia senegalensis</i>		R	FC	LC	IV	-	→
24	Yellow-footed Green Pigeon	<i>Treron phoenicopterus</i>		R	RA	LC	IV	-	↑
Order: CUCULIFORMES									
25	Greater Coucal	<i>Centropus sinensis</i>	Cuculidae (4)	R	FC	LC	IV	-	→
26	Asian Koel	<i>Eudynamis scolopaceus</i>		S	UC	LC	IV	-	→
27	Grey-bellied Cuckoo	<i>Cacomantis passerinus</i>		S	RA	LC	IV	-	→
28	Pied Cuckoo	<i>Clamator jacobinus</i>		S	RA	LC	IV	-	→
Order: PHOENICOPTERIFORMES									
29	Greater Flamingo	<i>Phoenicopterus roseus</i>	Phoenicopteridae (1)	W*	RA	LC	IV	-	↑
Order: PODICIPEDIFORMES									
30	Little Grebe	<i>Tachybaptus ruficollis</i>	Podicipedidae (1)	R	CO	LC	IV	-	↓
Order: GRUIFORMES									
31	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	Rallidae (4)	R	UC	LC	IV	-	?
32	Grey-headed Swampphen	<i>Porphyrio poliocephalus</i>		R	FC	LC	IV	-	?

	Common name/ Order	Scientific name	Family	Residential status	Local status	Conservation status			Global population trend
						IUCN Red List	IWPA	CITES	
33	Common Moorhen	<i>Gallinula chloropus</i>		R	CO	LC	IV	-	→
34	Eurasian Coot	<i>Fulica atra</i>		W	FC	LC	IV	-	↑
35	Sarus Crane	<i>Antigone antigone</i>	Gruidae (2)	R	UC	VU	IV	II	↓
36	Demoiselle Crane	<i>Grus virgo</i>		W	RA	LC	IV	II	↑
Order: CICONIIFORMES									
37	Painted Stork	<i>Mycteria leucocephala</i>	Ciconiidae (3)	R	FC	NT	IV	I	↓
38	Asian Openbill	<i>Anastomus oscitans</i>		R	UC	LC	IV	-	?
39	Woolly-necked Stork	<i>Ciconia episcopus</i>		R	FC	NT	IV	-	↓
40	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	Ardeidae (8)	R	UC	LC	IV	-	↓
41	Indian Pond Heron	<i>Ardeola grayii</i>		R	CO	LC	IV	-	?
42	Cattle Egret	<i>Bubulcus ibis</i>		R	CO	LC	IV	-	↑
43	Grey Heron	<i>Ardea cinerea</i>		R	UC	LC	IV	-	?
44	Purple Heron	<i>Ardea purpurea</i>		R	UC	LC	IV	-	↓
45	Great Egret	<i>Ardea alba</i>		R	UC	LC	IV	-	?
46	Intermediate Egret	<i>Ardea intermedia</i>		R	UC	LC	IV	-	↓
47	Little Egret	<i>Egretta garzetta</i>		R	UC	LC	IV	-	↑
48	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Threskiornithidae (4)	R	FC	NT	IV	-	↓
49	Red-naped Ibis	<i>Pseudibis papillosa</i>		R	UC	LC	IV	-	↓
50	Glossy Ibis	<i>Plegadis falcinellus</i>		W*	UC	LC	IV	-	↓
51	Eurasian Spoonbill	<i>Platalea leucorodia</i>		W*	UC	LC	I	II	?
52	Little Cormorant	<i>Microcarbo niger</i>	Phalacrocoracidae (3)	R	FC	LC	IV	-	?
53	Great Cormorant	<i>Phalacrocorax carbo</i>		W	UC	LC	IV	-	↑
54	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>		R	FC	LC	IV	-	?
55	Oriental Darter	<i>Anhinga melanogaster</i>	Anhingidae (1)	W*	UC	NT	IV	-	↓
56	Pied Avocet	<i>Recurvirostra avosetta</i>	Recurvirostridae (2)	W	UC	LC	IV	-	?
57	Black-winged Stilt	<i>Himantopus himantopus</i>		R	CO	LC	IV	-	→
58	Little-ringed Plover	<i>Charadrius dubius</i>	Charadriidae (4)	W*	RA	LC	IV	-	→
59	Red-wattled Lapwing	<i>Vanellus indicus</i>		R	CO	LC	IV	-	?
60	Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>		W*	RA	LC	IV	-	→
61	White-tailed Lapwing	<i>Vanellus leucurus</i>		W	UC	LC	IV	-	?
62	Black-tailed Godwit	<i>Limosa limosa</i>	Scolopacidae (13)	W	UC	NT	IV	-	↓
63	Marsh Sandpiper	<i>Tringa stagnatilis</i>		W	UC	LC	IV	-	↓
64	Green Sandpiper	<i>Tringa ochropus</i>		W	UC	LC	IV	-	↑
65	Spotted Redshank	<i>Tringa erythropus</i>		W	RA	LC	IV	-	→
66	Little Stint	<i>Calidris minuta</i>		W	UC	LC	IV	-	↑
67	Temminck's Stint	<i>Calidris temminckii</i>		W	UC	LC	IV	-	?
68	Common Snipe	<i>Gallinago gallinago</i>		W	RA	LC	IV	-	→
69	Common Sandpiper	<i>Actitis hypoleucos</i>		W	UC	LC	IV	-	↓

	Common name/ Order	Scientific name	Family	Residential status	Local status	Conservation status			Global population trend
						IUCN Red List	IWPA	CITES	
70	Common Redshank	<i>Tringa totanus</i>		W	UC	LC	IV	-	?
71	Common Greenshank	<i>Tringa nebularia</i>		W	RA	LC	IV	-	→
72	Ruff	<i>Calidris pugnax</i>		W	UC	LC	IV	-	↓
73	Wood Sandpiper	<i>Tringa glareola</i>		W	UC	LC	IV	-	→
74	Eurasian Curlew	<i>Numenius arquata</i>		W	RA	NT	IV	-	↓
75	Black-headed Gull	<i>Chroicocephalus ridibundus</i>	Laridae (2)	W	RA	LC	IV	-	?
76	River Tern	<i>Sterna aurantia</i>		W*	UC	VU	IV	-	↓
77	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	Jacaniidae (1)	S	RA	LC	IV	-	↓
78	Indian Thick-knee	<i>Burhinus indicus</i>	Burhinidae (1)	W*	RA	LC	IV	-	↓
79	Osprey	<i>Pandion haliaetus</i>	Accipitridae (9)	W	RA	LC	I	II	↑
80	Oriental Honey Buzzard	<i>Pernis ptilorhynchus</i>		W*	RA	LC	I	II	↓
81	Black-winged Kite	<i>Elanus caeruleus</i>		R	UC	LC	I	II	→
82	Egyptian Vulture	<i>Neophron percnopterus</i>		W*	UC	EN	I	II	↓
83	Shikra	<i>Accipiter badius</i>		R	UC	LC	I	II	→
84	Brahminy Kite	<i>Haliastur indus</i>		W	RA	LC	I	II	↓
85	Black Kite	<i>Milvus migrans</i>		R	FC	LC	I	II	→
86	Eurasian Sparrowhawk	<i>Accipiter nisus</i>		W	RA	LC	I	II	→
87	Short-toed Snake Eagle	<i>Circaetus gallicus</i>		W	RA	LC	I	II	→
88	Spotted Owlet	<i>Athene brama</i>		Strigidae (1)	R	UC	LC	IV	II
89	Indian Grey Hornbill	<i>Ocyrocus birostris</i>	Bucerotidae (1)	R	UC	LC	IV	-	→
90	Common Hoopoe	<i>Upupa epops</i>	Upupidae (1)	R	UC	LC	IV	-	↓
91	Brown-headed Barbet	<i>Psilopogon zeylanicus</i>	Megalaimidae (1)	R	RA	LC	IV	-	→
92	Black-rumped Flameback	<i>Dinopium benghalense</i>	Picidae (1)	R	RA	LC	IV	-	→
93	Pied Kingfisher	<i>Ceryle rudis</i>	Alcedinidae(3)	R	UC	LC	IV	-	?
94	White-throated Kingfisher	<i>Halcyon smyrnensis</i>		R	FC	LC	IV	-	?
95	Common Kingfisher	<i>Alcedo atthis</i>		W*	RA	LC	IV	-	?
96	Indian Roller	<i>Coracias benghalensis</i>	Coraciidae (1)	R	UC	LC	IV	-	↑
97	Green Bee-eater	<i>Merops orientalis</i>	Meropidae (2)	S	UC	LC	IV	-	↑
98	Blue-cheeked Bee-eater	<i>Merops persicus</i>		S	RA	LC	IV	-	→
99	Alexandrine Parakeet	<i>Psittacula eupatria</i>	Psittaculidae (2)	R	UC	NT	IV	II	↓
100	Rose-ringed Parakeet	<i>Psittacula krameri</i>		R	FC	LC	IV	-	↑
101	Black Drongo	<i>Dicrurus macrocercus</i>	Dicruridae (1)	R	CO	LC	IV	-	?
102	Isabelline Shrike	<i>Lanius isabellinus</i>	Laniidae (2)	W	RA	LC	IV	-	→
103	Long-tailed Shrike	<i>Lanius schach</i>		R	UC	LC	IV	-	?

	Common name/ Order	Scientific name	Family	Residential status	Local status	Conservation status			Global population trend
						IUCN Red List	IWPA	CITES	
104	Rufous Treepie	<i>Dendrocitta vagabunda</i>	Corvidae (3)	R	UC	LC	IV	-	↓
105	House Crow	<i>Corvus splendens</i>		R	CO	LC	V	-	→
106	Large-billed Crow	<i>Corvus macrorhynchos</i>		R	UC	LC	IV	-	→
107	Purple Sunbird	<i>Cinnyris asiaticus</i>	Nectariniidae (1)	R	UC	LC	IV	-	→
108	Indian Silverbill	<i>Euodice malabarica</i>	Estrilidae (3)	R	UC	LC	IV	-	→
109	Scaly-breasted Munia	<i>Lonchura punctulata</i>		R	UC	LC	IV	-	→
110	Red Munia	<i>Amandava amandava</i>		W*	RA	LC	IV	-	→
111	House Sparrow	<i>Passer domesticus</i>	Passeridae (2)	R	FC	LC	IV	-	↓
112	Sind Sparrow	<i>Passer pyrrhonotus</i>		W*	RA	LC	IV	-	→
113	Crested Lark	<i>Galerida cristata</i>	Alaudidae (2)	R	UC	LC	IV	-	↓
114	Bengal Bushlark	<i>Mirafra assamica</i>		S	RA	LC	IV	-	→
115	Plain Prinia	<i>Prinia inornata</i>	Cisticolidae (5)	R	UC	LC	IV	-	→
116	Graceful Prinia	<i>Prinia gracilis</i>		S*	RA	LC	IV	-	→
117	Zitting Cisticola	<i>Cisticola juncidis</i>		R	UC	LC	IV	-	↑
118	Ashy Prinia	<i>Prinia socialis</i>		R	FC	LC	IV	-	→
119	Common Tailorbird	<i>Orthotomus sutorius</i>		R	UC	LC	IV	-	→
120	White-eared Bulbul	<i>Pycnonotus leucotis</i>	Pycnonotidae (2)	W*	RA	LC	IV	-	↓
121	Red-vented Bulbul	<i>Pycnonotus cafer</i>		R	FC	LC	IV	-	↑
122	Common Chiffchaff	<i>Phylloscopus collybita</i>	Phylloscopidae (1)	W	UC	LC	IV	-	↑
123	Brahminy Starling	<i>Sturnia pagodarum</i>	Sturnidae (3)	S*	RA	LC	IV	-	?
124	Common Starling	<i>Sturnus vulgaris</i>		W	RA	LC	IV	-	↓
125	Asian Pied Starling	<i>Gracupica contra</i>		R	FC	LC	IV	-	↑
126	Red-breasted Flycatcher	<i>Ficedula parva</i>	Muscicapidae (10)	W	RA	LC	IV	-	↑
127	Black Redstart	<i>Phoenicurus ochruros</i>		W	RA	LC	IV	-	↑
128	Common Myna	<i>Acridotheres tristis</i>		R	FC	LC	IV	-	↑
129	Bank Myna	<i>Acridotheres ginginianus</i>		R	FC	LC	IV	-	↑
130	Indian Robin	<i>Copsychus fulicatus</i>		R	UC	LC	IV	-	→
131	Oriental Magpie Robin	<i>Copsychus saularis</i>		R	UC	LC	IV	-	→
132	Bluethroat	<i>Luscinia svecica</i>		W	RA	LC	IV	-	→
133	Brown Rock Chat	<i>Oenanthe fusca</i>		R	UC	LC	IV	-	→
134	Siberian Stonechat	<i>Saxicola maurus</i>		W	UC	LC	IV	-	→
135	Pied Bushchat	<i>Saxicola caprata</i>		R	UC	LC	IV	-	→
136	Rosy Pipit	<i>Anthus roseatus</i>		Motacillidae (8)	W	UC	LC	IV	-
137	Tawny Pipit	<i>Anthus campestris</i>		W	UC	LC	IV	-	→
138	Long-billed Pipit	<i>Anthus similis</i>		W	UC	LC	IV	-	→
139	Paddyfield Pipit	<i>Anthus rufulus</i>		R	UC	LC	IV	-	→
140	Western Yellow Wagtail	<i>Motacilla flava</i>		W	UC	LC	IV	-	→
141	Citrine Wagtail	<i>Motacilla citreola</i>		W	UC	LC	IV	-	↑
142	White-browed Wagtail	<i>Motacilla maderaspatensis</i>		W*	FC	LC	IV	-	→
143	White Wagtail	<i>Motacilla alba</i>		W	UC	LC	IV	-	→
144	Streak-throated Swallow	<i>Petrochelidon fluvicola</i>	Hirundinidae (4)	R	UC	LC	IV	-	↑

	Common name/ Order	Scientific name	Family	Residential status	Local status	Conservation status			Global population trend
						IUCN Red List	IWPA	CITES	
145	Wire-tailed Swallow	<i>Hirundo smithii</i>		R	FC	LC	IV	-	↑
146	Barn Swallow	<i>Hirundo rustica</i>		W	UC	LC	IV	-	↓
147	Grey-throated Martin	<i>Riparia chinensis</i>		W*	UC	LC	IV	-	↓
148	Indian White-eye	<i>Zosterops palpebrosus</i>	Zosteropidae (1)	R	UC	LC	IV	-	↓
149	Jungle Babbler	<i>Argya striata</i>	Leiothrichidae (2)	R	UC	LC	IV	-	→
150	Large grey Babbler	<i>Argya malcolmi</i>		R	UC	LC	IV	-	→
151	Streaked Weaver	<i>Ploceus manyar</i>	Ploceidae (3)	R	UC	LC	IV	-	→
152	Baya Weaver	<i>Ploceus philippinus</i>		R	UC	LC	IV	-	→
153	Black-breasted Weaver	<i>Ploceus benghalensis</i>		R	UC	LC	IV	-	→
154	White-browed Fantail	<i>Rhipidura aureola</i>	Rhipiduridae (1)	W*	RA	LC	IV	-	→

Residential Status: R—Resident | S—Summer Migrant | W—Winter Migrant.
 Local Abundance Status: CO—Common | FC—Fairly Common | UC—Uncommon | RA—Rare.
 IUCN Red List: LC—Least Concern | NT—Near Threatened | VU—Vulnerable | EN—Endangered.
 IWPA (Indian Wildlife Protection Act, 1972): I—Schedule I | IV—Schedule IV,
 Global Population Trend: ↑—Increasing | ↓—Decreasing | →—Stable | ?—Unknown.
 *—Species that are resident in Haryana but recorded only in winter or summer in the study area.

Table 3. Relative diversity index (RDi) of various bird families in Dighal wetlands of Jhajjar District of Haryana.

Bird families	Number of species	RDi value
Anatidae	17	11.03
Scolopacidae	13	8.44
Muscicapidae	10	7.46
Accipitridae	9	5.84
Ardeidae, Motacillidae	8	5.19
Columbidae, Cisticolidae	5	3.24
Cuculidae, Rallidae, Threskiornithidae, Charadriidae, Hirundinidae	4	2.59
Ciconiidae, Phalacrocoracidae, Alcedinidae, Corvidae, Estrildidae, Sturnidae, Ploceidae	3	1.94
Phasianidae, Gruidae, Recurvirostridae, Laridae, Meropidae, Psittaculidae, Laniidae, Passeridae, Alaudidae, Pycnonotidae, Leiothrichidae	2	1.29
Phoenicopteridae, Podicipedidae, Anhingidae, Jacanidae, Burhinidae, Strigidae, Bucerotidae, Upupidae, Megalaimidae, Picidae, Coraciidae, Dicruridae, Nectariniidae, Phylloscopidae, Zosteropidae, Rhipiduridae	1	0.64

Ferruginous Duck *Aythya nyroca*, Painted Stork *Mycteria leucocephala*, Woolly-necked Stork *Ciconia episcopus*, Black-headed Ibis *Threskiornis melanocephalus*, Oriental Darter *Anhinga melanogaster*, Black-tailed Godwit *Limosa limosa*, Eurasian Curlew *Numenius arquata*, and Alexandrine Parakeet *Psittacula eupatria*—are ‘Near Threatened’; and the rest 142 species are Least Concern (Table 2). About the global population trend, the wetlands supported 62 globally stable species, 40 globally decreasing species, 29 globally increasing

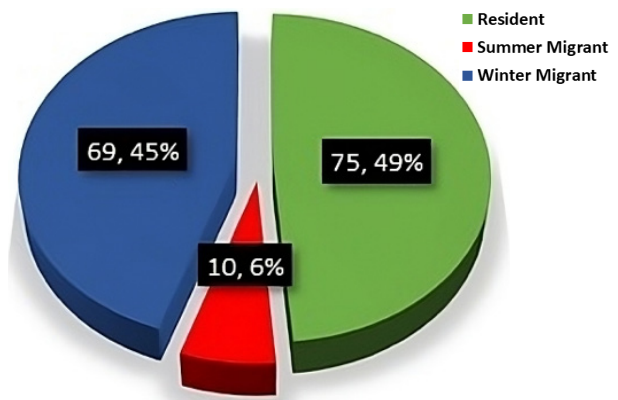


Figure 3. Residential status of avian species recorded from Dighal wetlands of Haryana, India.

species, and 23 species whose global trend was unknown (Table 2). Data on local abundance revealed that 10 species were common, 23 species were fairly common, 83 species were uncommon, and 38 species were rare in the study area. It is pertinent here to mention that among the 38 species recorded rarely in the study area, 12 species—Ferruginous Duck *Aythya nyroca*, Mallard *Anas platyrhynchos*, Greater Flamingo *Phoenicopterus roseus*, Demoiselle Crane *Grus virgo*, Common Snipe *Gallinago gallinago*, Common Kingfisher *Alcedo atthis*, Isabelline Shrike *Lanius isabellinus*, White-eared Bulbul *Pycnonotus leucotis*, Red-breasted Flycatcher *Ficedula parva*, Osprey *Pandion haliaetus*, Oriental Honey Buzzard *Pernis ptilorhynchus*, and White-browed Fantail *Rhipidura aureola*—were spotted only once or

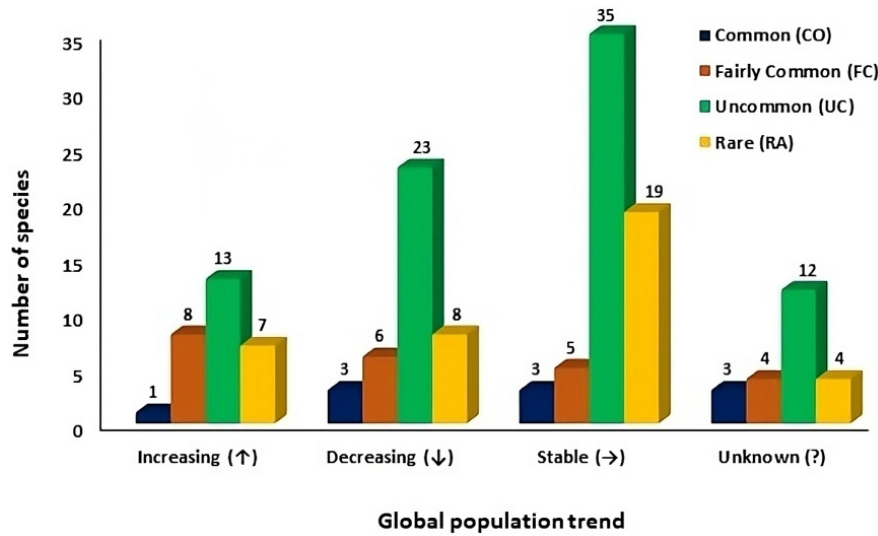


Figure 4. Comparison of local abundance status and global population trend of avian species recorded from Dighal wetlands of Jhajjar District, Haryana, India.

twice during the study period. Comparison of the local abundance status of recorded avian species with their global population trend revealed that three species—Indian Spot-billed Duck *Anas poecilorhyncha*, Rock Pigeon *Columba livia*, and Little Grebe *Tachybaptus ruficollis*—had a globally declining population trend and were found to be common in the study area (Figure 4). In addition to this, one species recorded from these wetlands was listed in Appendix I, and 16 species were listed in Appendix II of CITES (Table 1). According to the IWPA (1972), out of 154 recorded species, 11 were under Schedule I, one was in Schedule V, and the rest (n = 142) were in Schedule IV (Table 1).

DISCUSSION

The study area boasts an impressive avian diversity, contributing to approximately 29% of the bird species recorded in Haryana (Kalsi et al. 2020) and 11% of India’s avifauna (Praveen & Jayapal 2023). The findings suggest that the avifaunal richness observed in the studied wetlands aligns with previous research conducted in various regions of Haryana (Table 4). Nevertheless, it is important to note that Alfred et al. (2001) documented 216 wetland bird species in the more expansive Sub-Himalayan Terai and Indo-Gangetic Plains of northern India. In the survey, Passeriformes were identified as the dominant order, with 54 species representing 18 families. These results corroborate earlier records highlighting Passeriformes as the primary avian taxa in India (Praveen & Jayapal 2023).

Table 4. A comparison of avifauna recorded from different study areas of Haryana, India.

	Study area	Recorded avifauna			Reference
		Species	Family	Order	
1	Khaparwas Bird Sanctuary, district Jhajjar	164	44	16	Gupta et al. 2012
2	Sultanpur National Park, district Gurugram	161	47	16	Kaushik & Gupta 2016
3	Kalesar National Park, district Yamunanagar	126	51	14	Rai et al. 2017
4	Basai Wetland, district Gurugram	171	51	17	Rai et al. 2019
5	Bhindawas Bird Sanctuary, district Jhajjar	119	43	17	Singh & Malik 2019
6	Sultanpur National Park, district Gurugram	111	42	17	Singh et al. 2021
7	Ottu Reservoir, district Sirsa	114	47	18	Rai & Vanita 2021

Among the documented bird families in the selected wetlands of Jhajjar District, Anatidae emerged as the most diverse. This observation aligns with prior studies demonstrating Anatidae as a prevalent bird family in various freshwater wetlands across India (Tak et al. 2010; Kumar & Sharma 2018; Rai et al. 2019; Kaur & Brraich 2021; Singh & Brraich 2022; Yashmita-Ulman & Singh 2022). The findings indicate that the majority of recorded species are residents, followed by winter and summer visitors, consistent with earlier reports on freshwater wetlands in Haryana (Kumar & Gupta 2013; Kumar et al. 2016; Rai et al. 2019). It is worth noting that 20 bird species recorded as migrants in the study area are considered residents of Haryana (Kalsi et al. 2020),

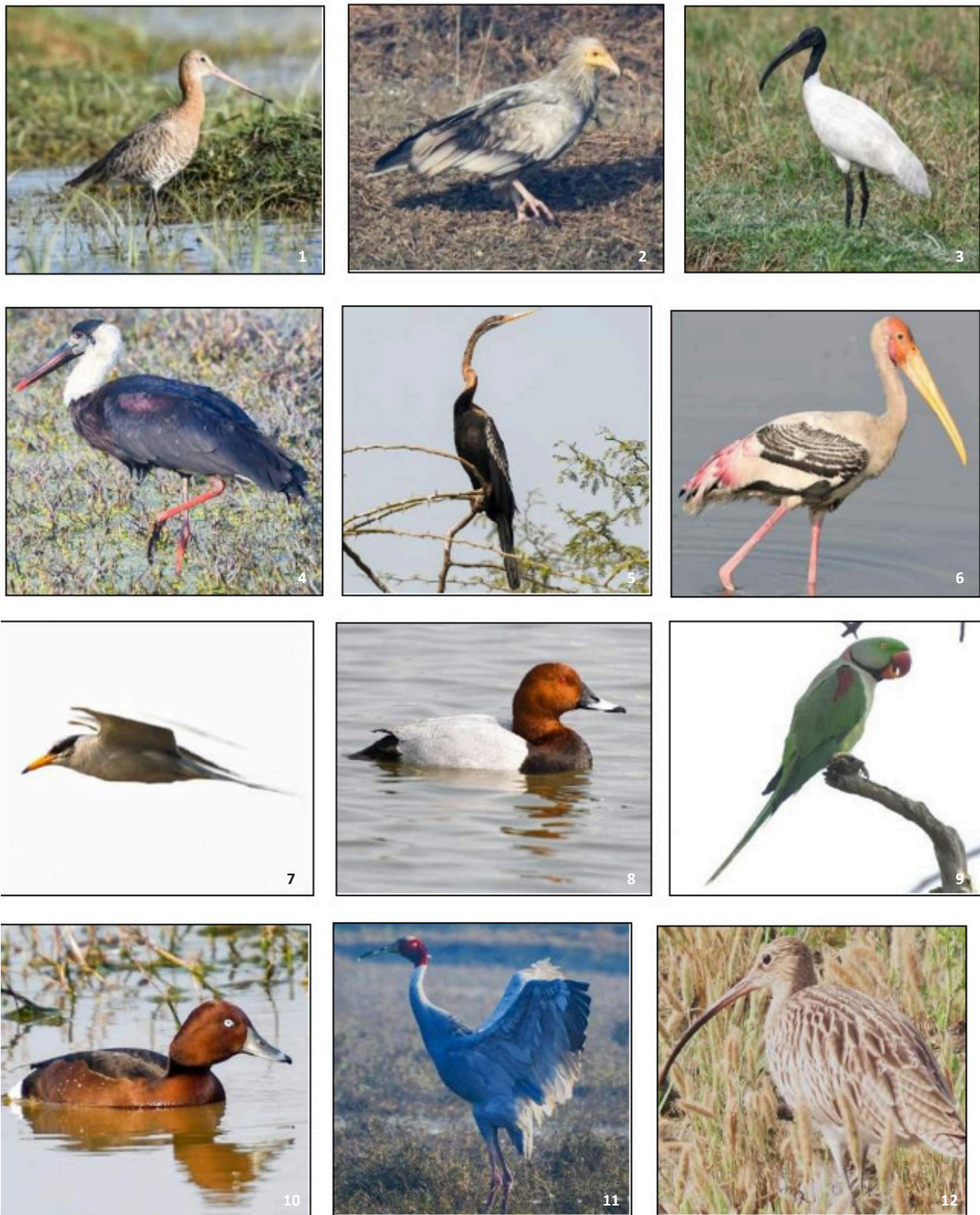


Image 1–12. Threatened Birds in Dighal wetlands of district Jhajjar, Haryana.

1—Black Tailed Godwit *Limosa limosa* | 2—Egyptian Vulture *Neophron percnopterus* | 3—Black-headed Ibis *Threskiornis melanocephalus* | 4—Woolly Necked Stork *Ciconia episcopus* | 5—Oriental Darter *Anhinga melanogaster* | 6—Painted Stork *Mycteria leucocephala* | 7—River Tern *Sterna aurantia* | 8—Common Pochard *Aythya farina* | 9—Alexandrine Parakeet *Psittacula eupatria* | 10—Ferruginous Duck *Aythya nyroca* | 11—Sarus Crane *Antigone antigone* | 12—Eurasian Curlew *Numenius arquata*. © Parul.

as outlined in Table 2. Given Haryana's location within the Central Asian Flyway, it serves as a crucial wintering ground for migratory birds travelling from northern Asia and parts of Europe (Kumar et al. 2016; Kumar & Sharma 2018; Rai & Vanita 2021).

The suitability of the Dighal wetlands, surrounded by irrigated agricultural fields featuring wheat and paddy crops, as well as tree species like Safeda (*Eucalyptus* spp.), Kikar (*Acacia* spp.), and Ber (*Ziziphus* spp.) along the wetland edges, provides ample resources for migratory birds during the winter months. This resource availability contributes to the rich avian diversity, particularly during the winter season.

The survey identified 12 bird species of global conservation significance, including one Endangered species, three Vulnerable species, and eight Near Threatened species. Furthermore, 17 species listed in the CITES appendices inhabit these wetlands. All the recorded bird species are also protected under various Schedules of the Indian Wildlife (Protection) Act, 1972. Notably, the study identified three species with declining global populations as common in the study area, indicating the continued availability of suitable resources for these species in the wetlands.

The presence of a substantial number of winter migrants and species of global conservation concern underscores the importance of these wetlands for avian conservation in Haryana.

However, wetland habitats across India face significant threats, including habitat loss, fragmentation, and degradation; water quality deterioration due to contamination; recreational pressures; and developmental activities (Kumar & Sharma 2018; Chakraborty et al. 2021; Kaur & Braich 2021; Mandal et al. 2021; Yashmita-Ulman & Singh 2022; Anand et al. 2023; Muralikrishnan et al. 2023). The Dighal wetlands are no exception, as they support a diverse community of winter migrants and species of global conservation concern, all of which are vulnerable to various anthropogenic pressures. These threats include extensive fishing activities, electrocution, construction near ponds, domestic waste dumping, water drainage during the winter, and plastic pollution in ponds.

The study serves as a valuable baseline for future research on bird population monitoring and the effective management of the Dighal wetlands in the Jhajjar District of Haryana.

CONCLUSION

The documentation of 12 bird species of global conservation importance and 40 species of birds with a declining population trend globally emphasises the importance of studied wetlands from a global bird conservation perspective. These wetlands, along with surrounding agricultural fields and plantations, provide a congenial habitat for both resident and migratory avian species. Therefore, these wetlands should be given conservation and research priorities and regularly assessed for their existing bird diversity. This study provides valuable information on the ecological health and status of these wetlands and will be useful for increasing awareness regarding their conservation value.

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