sciendo

Ornis Hungarica 2025. 33(2): 1–21.
DOI: 10.2478/orhu-2025-0017

Seasonal variations and migration phenology of the avifauna of Mandothi wetlands, India

Aruna Yadav & Deepak Rai*

Received: January 07, 2025 – Revised: August 12, 2025 – Accepted: August 14, 2025

Yadav, A. & Rai, D. 2025. Seasonal variations and migration phenology of the avifauna of Mandothi wetlands, India. – Ornis Hungarica 33(2): 1–21. DOI: 10.2478/orhu-2025-0017

Abstract The Mandothi wetlands, a lesser-known but ecologically significant ecosystem in Haryana, India, serve as an excellent habitat for diverse flora and fauna. This wetland plays a vital role in groundwater recharge, flood control, and climate regulation while supporting livelihood for local communities. Using scan sampling and point-cum-line transect techniques, the region was surveyed fortnightly from April 2022 to March 2024. A total of 79 migratory bird species were identified, classified into 12 orders, 25 families, and 48 genera. Out of these, 20 species were summer migrants and 59 were winter migrants. The order Charadriiformes exhibits the highest diversity of avian fauna with 24 migratory species. Among all guilds, insectivores were the most prevalent, according to the classification into feeding guilds. As per the IUCN Red List criteria, 71 species were classified as Least Concern (LC) whereas five species were classified as Near Threatened (NT) [Ferruginous Duck *(Aythya nyroca)*, Black-tailed Godwit *(Limosa limosa),* Eurasian Curlew *(Numenius arquata),* Curlew Sandpiper *(Calidris ferruginea)*, Black-necked Stork *(Ephippiorhynchus asiaticus)* and three species were classified as Vulnerable (VU) such as Eastern Imperial Eagle *(Aquila heliaca)*, Greater Spotted Eagle *(Clanga clanga)* and Common Pochard *(Aythya ferina)*]. The study area plays a significant role in sustaining the diversity of birds and facing various stress factors, thus, it needs to be conserved effectively.

Keywords: ecological interactions, habitat preferences, population dynamics, summer migrant, winter migrant

Összefoglalás A Mandothi vizesélőhely-rendszer, mely India Haryana tartományának kevéssé ismert, de ökológiai értelemben jelentős ökoszisztémája, változatos növény- és állatvilág számára ad otthont. Ez a vizesélőhely-rendszer kulcsfontosságú szerepet játszik a talajvíz megőrzésében, az áradások szabályzásában és a klímaregulációban, valamint hozzájárul helyi közösségek létfenntartásához. Szkenneléses és pont-transzekt számlálásos felmérési módszerek alkalmazásával a térség madárvilágát mintáztuk 2022 áprilisa és 2024 márciusa között. Ebben az időszakban 79 madárfaj jelenlétét rögzítettük, melyek 12 rendbe, 25 családba és 48 nembe tartoztak. Ezek közül 20 faj nyári vonuló, 59 faj téli vonuló. A Charadriiformes rend volt a legnagyobb fajszámmal jelen, 24 vonuló fajjal. Az összes táplálkozási guild közül a rovarevők alkották a legnagyobb halmazt. Az IUCN Vörös Listájának kritériumrendszere szerint 71 faj volt Nem Fenyegetett (LC), míg öt faj bizonyult Közel Veszélyeztetettnek (NT), mint a cigányréce *(Aythya nyroca)*, nagy goda *(Limosa limosa)*, nagy póling *(Numenius arquata)*, sarlós partfutó *(Calidris ferruginea)*, feketenyakú gólya *(Ephippiorhynchus asiaticus)*; emellett három faj tartozott a Sérülékeny (VU) kategóriába: parlagi sas *(Aquila heliaca)*, fekete sas *(Clanga clanga)* és barátréce *(Aythya ferina)*.

Kulcsszavak: élőhelypreferencia, nyári vonuló, ökológiai interakciók, populációdinamika, téli vonuló

Animal Behaviour and Wildlife Conservation Laboratory, Department of Zoology, Kurukshetra University, Kurukshetra-136119, Haryana, India
** corresponding author, e-mail: drbkuk@kuk.ac.in*

Introduction

India's biodiversity is vast and multifaceted, largely due to the heterogeneity of its physical features, distinctive ecological history, and extreme eco-climatic variations (Chakraborty *et al*. 2023). It is one of the world's 17 mega-bio-diverse countries, with abundant biodiversity and distinctive environments. Preserving avian diversity requires resources like wetlands, which are home to a variety of bird species as well as a wide variety of animals, plants and invertebrates (Weller 1999). Wetlands are complex ecosystems that integrate aquatic and terrestrial environments (Torell *et al*. 2001, Zedler & Kercher 2005, Kumar *et al*. 2006). Birds also use wetlands as a source of drinking water and habitats for feeding, resting, shelter and social interactions (Stewart 2001). Wetlands are defined as "an area of fen, marsh, peat land or water, either natural or artificial, temporary or permanent, static or flowing fresh, marine, brackish or saltwater along with a depth of six meters at low tide", according to the Ramsar Convention Secretariat (2013). According to Ministry of Environment, Forest and Climate Change (MoEFCC 2024), India harbours 1,309 wetlands in total; 91 Ramsar sites, 110 significant wetlands and 1,108 other wetlands.

Birds classified as migratory are those that make regular, seasonal, large-scale, long-distance movement of a population between a designated breeding area and a fixed non-breeding area (Lack 1954, 1968, Sutherland 1998, Alerstam *et al*. 2003, Greenberg & Marra 2005, Somveille 2016, Tapia Harris 2022). Since migratory birds occupy multiple trophic levels in the wetland food web, they constitute an important biotic component of the ecosystem (Rai *et al*. 2017). A number of bird species migrate seasonally and regularly throughout the globe. Approximately 200 migratory species are currently considered globally threatened, and more than 40% of them are on the verge of decline (Rai *et al*. 2017). The sites of key conservation concern which are important for migratory avifauna needs to be managed adequately. Ornithological surveys are frequently utilized as archives of fundamental data, and they also function as a biodiversity catalogue for species presence, distribution, ecological condition, conservation status and adaptations to climate change (Gardner *et al*. 2011, Rai & Vanita 2022, Rai & Yadav 2023).

However, due to paucity of research data, the present study aims to address the diversity assessment, seasonal variations and migration phenology of the avifauna of Mandothi wetlands, India. Furthermore, the research highlights the need for integrating role of local communities and various stakeholders in conservation initiatives to ensure the long-term protection of such wetlands.

Material and Methods

Study area

The study was carried out in the Mandothi wetlands in District Jhajjar, Haryana, India, located between the latitudes of 28°22'49" N and the longitudes of 76°18'59" E *(Figure 1)*. A section of the Indo-Gangetic Plain is represented by the district Jhajjar. Village Mandothi,

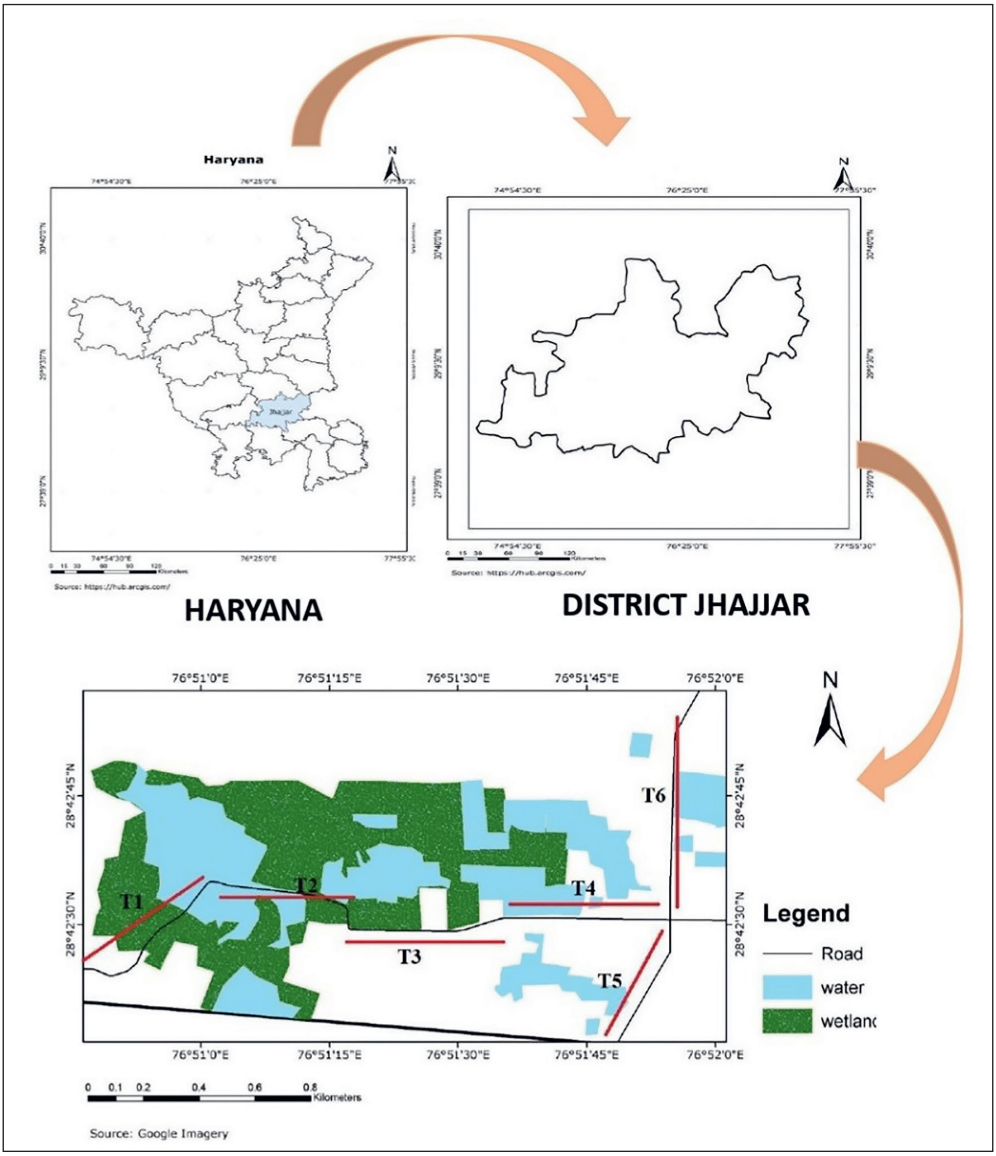

Figure 1. Map showing the location of Mandothi wetlands, Haryana
1. ábra A Hariyana-beli Mandothi wetlands földrajzi elhelyezkedése

located at 28°70'585" N and 76°81'225" E, is situated on the NH-9 in the Bahadurgarh assembly and Rohtak parliamentary constituencies. The region experiences extreme climatic conditions, typical of northwestern India, with hot summers (temperature often exceeding 40 °C) and cool winters (temperature dropping to around 5 °C) (Yadav & Rai 2024). A total of 6 transects with different habitats were selected in the study area *(Table 1)*. This area acts as a catchment for rainwater and supports local groundwater recharge.

Table 1. Selected transects with different lengths and habitats of Mandothi wetlands, India
1. táblázat Az indiai Mandothi wetlands területén kiválasztott transzektek, illetve ezek hossza és élőhelytípusa

S. N.	Transects	Transects length (km)	Coordinates	Habitats observed nearby at transect
1.	Transect T1	2.3	28.7262° N, 76.8470° E	Aquatic, Littoral Zone, Roadside railing, Fallow land
2.	Transect T2	1.2	28.7141° N, 76.8485° E	Aquatic, Littoral zone, Agricultural fields
3.	Transect T3	1.3	28.7096° N, 76.8513° E	Aquatic, Littoral zone, Roadside Plantation, Agricultural fields
4.	Transect T4	1.0	28.7080° N, 76.8502° E	Littoral zone, Roadside Plantation, Industrial area, Fallow land
5.	Transect T5	1.1	28.7016° N, 76.8501° E	Agricultural fields, Industrial area, Fallow land
	Transect T6	2.0	28.7105° N, 76.8643° E	Industrial area, Roadside Plantation, Fallow land

Field methods

From April 2022 to March 2024, fortnightly periodic visits were made at the study site using various techniques such as scan sampling and point-cum-line transect (Altmann 1974, Gaston 1975, Sutherland *et al*. 2005). Migratory status of the reported avian species was assigned as per Rai and Yadav (2023) *(Table 2)*. Equipment such as binoculars and Nikon COOLPIX P1000 were used to observe the diversity of avian fauna. Merlin Bird ID and field guides such as Grimmett *et al*. (2015), Arlott (2015), Grimmett and Inskipp (2019), Kalsi *et al*. (2019) were used to identify the birds. Using Praveen *et al*. (2019), Praveen and Jayapal (2022), and IUCN (2024), a checklist of reported bird species was made and categorized based on common name, scientific name, order, family and genus. Evaluation of the species, conservation status and population trends (increasing ↑, decreasing ↓, stable →, and unknown?) were done with the help of IWPA (1972), CITES (2012) and IUCN (2024). Based on in-depth research and literature (Ali & Ripley 1987, Grimmett *et al*. 1999), avian feeding guilds were divided into seven groups: carnivores, insectivores, omnivores, herbivores, frugivores, granivores and piscivores. The Percent occurrence of reported avian orders and Relative Diversity index (RDi) of bird families was assessed using the following formulas:

$$Percent\ occurence = \frac{Number\ of\ bird\ species\ in\ an\ order}{Total\ number\ of\ bird\ species} \times 100$$

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

Table 2. Criteria for status of migratory avian species (Rai & Yadav 2023)
2. táblázat A vonuló madárfajok státuszának kritériumai (Rai & Yadav 2023)

Residential status	Consideration criteria
Summer Migratory (SM)	Reports of species over the summer only (April–September)
Winter Migratory (WM)	Species seen in the winter months only (October–March)
Along with the migratory status, the tentative schedule including arrival and departure of the migratory avian species will also be recorded in selected area.	

Results and Discussion

The Mandothi wetlands located in the state of Haryana, India, are well-known for their remarkable bird diversity (Rai & Yadav 2023). The present two-year study documented 79 migratory bird species including 59 winter and 20 summer migratory species classified into 48 genera, 25 families and 12 orders (from April 2022 to March 2024) in selected transects of Mandothi wetlands, Haryana. A checklist of recorded avian species with their taxonomy and IUCN status is presented in *Table 3*. Findings of the study also revealed that during the first year (April 2022 – March 2023), a total of 65 migratory species were reported in which 49 species were winter migrants and 16 species were summer migrants, and during the second year (April 2023 – March 2024), out of total reported 66 migratory species, 51 species were winter migrants and 15 species were summer migrants, respectively. Along with these, 8 winter and 5 summer migrant species were different in the first year of the study period whereas 10 winter and 4 summer migrant species were different during the second year of the study *(Table 4)*.

Results of the study revealed that order Charadriiformes dominate the current study area consisting of 24 species and 7 families with 15 genera, followed by Passeriformes (17 species, 7 families and 12 genera), Anseriformes (15 species, 1 family and 8 genera), Accipitriformes and Pelecaniformes (5 species each; 2 and 1 families respectively and 5 genera each), Coraciiformes and Cuculiformes (3 species, 1 family and 1 genera each), Podicipediformes and Suliformes (consist of 2 species each and both with single family and genera), whereas Ciconiiformes, Gruiformes and Piciformes with one species, single family and genera (*Table 5*). Among the 25 families, the maximum number of species were recorded in the Scolopacidae with 16 species followed by Anatidae with 15 species, Motacillidae (7 species), Ardeidae (5 species), Accipitridae (4 species), Meropidae, Cuculidae, Alaudidae and Muscicapidae (3 species each), Charadriidae, Laridae, Podicipedidae and Phalacrocoracidae consist of 2 species each, while families like Pandionidae, Recurvirostridae, Jacanidae, Rostratulidae, Glareolidae, Ciconiidae, Rallidae, Laniidae, Oriolidae, Phylloscopidae, Sylviidae, Picidae observed with one species each.

During the study, it was observed that insectivores were the dominant feeding guilds with 41% of the species, whereas carnivores were the second dominant with 25%, followed by omnivores (22%) and herbivores (13%). To maximise food sources and extend their lifespan, birds employ a range of feeding techniques (Nudds & Bowlby 1984). Since the wetlands offer a wet climate and a wide variety of plants, the existence of a significant percentage of

Table 3. List and status of migratory avifauna recorded in Mandothi wetlands, India
3. táblázat Az indiai Mandothi wetlands területén megfigyelt madárfajok listája és státusza

S. No.	Order/ Family/ Common name	Scientific name with Authority	Feeding guild	IUCN Global population trends	Conservation status			Migratory Status	Local Abundance Status
					IUCN (2022)	CITES (2012)	IWPA (1972)		
1. ORDER ANSERIFORMES (No. of species = 15, No. of family = 1, Percent occurrence = 18.99)									
1.1. Family Anatidae (No. of species = 15, RDi value = 18.99)									
1.	Bar-headed Goose	*Anser indicus* (Latham, 1790)	H	↓	LC	-	IV	WM	A
2.	Greylag Goose	*Anser anser* (Linnaeus, 1758)	H	↑	LC	-	IV	WM	A
3.	Greater White-fronted Goose	*Anser albifrons* (Scopoli, 1769)	O	?	LC	-	IV	WM	RA
4.	Common Pochard	*Aythya ferina* (Linnaeus, 1758)	O	↓	VU	-	IV	WM	C
5.	Tufted Duck	*Aythya fuligula* (Linnaeus, 1758)	H	→	LC	-	IV	WM	RA
6.	Ferruginous Duck	*Aythya nyroca* (Güldenstädt, 1770)	O	↓	NT	-	IV	WM	FC
7.	Eurasian Wigeon	*Mareca penelope* (Linnaeus, 1758)	H	↓	LC	-	IV	WM	C
8.	Gadwall	*Mareca strepera* (Linnaeus, 1758)	H	↑	LC	-	IV	WM	C
9.	Garganey	*Spatula querquedula* (Linnaeus, 1758)	H	↓	LC	-	IV	WM	A
10.	Northern Shoveler	*Spatula clypeata* (Linnaeus, 1758)	O	↓	LC	-	IV	WM	A
11.	Common Teal	*Anas crecca* Linnaeus, 1758	O	?	LC	-	IV	WM	C
12.	Northern Pintail	*Anas acuta* Linnaeus, 1758	Cv	↓	LC	-	IV	WM	A
13.	Lesser Whistling-Duck	*Dendrocygna javanica* (Horsfield, 1821)	O	↓	LC	-	IV	SM	FC
14.	Ruddy Shelduck	*Tadorna ferruginea* (Pallas, 1764)	O	?	LC	-	IV	WM	C
15.	Cotton Pygmy-goose	*Nettapus coromandelianus* (Gmelin, JF, 1789)	O	→	LC	-	IV	WM	RA

S. No.	Order/ Family/ Common name	Scientific name with Authority	Feeding guild	IUCN Global population trends	Conservation status			Migratory Status	Local Abundance Status
					IUCN (2022)	CITES (2012)	IWPA (1972)		
2. ORDER CUCULIFORMES (No. of species = 3, No. of family=1, Percent occurrence = 3.80)									
2.1. Family Cuculidae (No. of species = 3, RDi value = 3.80)									
16.	Western Koel	*Eudynamys scolopaceus* (Linnaeus, 1758)	O	→	LC	-	IV	SM	C
17.	Common Hawk Cuckoo	*Hierococcyx varius* (Vahl, 1797)	In	→	LC	-	IV	SM	FC
18.	Jacobin Cuckoo	*Clamator jacobinus* (Boddaert, 1783)	In	→	LC	-	IV	SM	C
3. ORDER GRUIFORMES (No. of species = 1, No. of family = 1, Percent occurrence = 1.27)									
3.1. Family Rallidae (No. of species = 1), RDi value = 1.27									
19.	Eurasian Coot	*Fulica atra* Linnaeus, 1758	H	↑	LC	-	IV	WM	A
4. ORDER PODICIPEDIFORMES (No. of species = 2, No. of family = 1, Percent occurrence = 2.53)									
4.1. Family Podicipedidae (No. of species = 2, RDi value = 2.53)									
20.	Great Crested Grebe	*Podiceps cristatus* (Linnaeus, 1758)	Cv	?	LC	-	IV	WM	RA
21.	Black-necked Grebe	*Podiceps nigricollis* Brehm, CL, 1831	Cv	?	LC	-	IV	WM	RA
5. ORDER CHARADRIIFORMES (No. of species = 24, No. of families = 7, Percent occurrence = 30.38)									
5.1 Family Scolopacidae (No. of species = 16, RDi value = 20.25)									
22.	Black-tailed Godwit	*Limosa limosa* (Linnaeus, 1758)	In	↓	NT	-	IV	WM	FC
23.	Common Greenshank	*Tringa nebularia* (Gunnerus, 1767)	Cv	→	LC	-	IV	WM	FC
24.	Common Redshank	*Tringa totanus* (Linnaeus, 1758)	In	?	LC	-	IV	WM	FC
25.	Spotted Redshank	*Tringa erythropus* (Pallas, 1764)	In	→	LC	-	IV	WM	FC
26.	Green Sandpiper	*Tringa ochropus* Linnaeus, 1758	In	↑	LC	-	IV	WM	C
27.	Wood Sandpiper	*Tringa glareola* Linnaeus, 1758	In	→	LC	-	IV	WM	C
28.	Marsh Sandpiper	*Tringa stagnatilis* (Bechstein, 1803)	In	↓	LC	-	IV	WM	C
29.	Ruff	*Calidris pugnax* (Linnaeus, 1758)	In	↓	LC	-	IV	WM	FC

S. No.	Order/ Family/ Common name	Scientific name with Authority	Feeding guild	IUCN Global population trends	Conservation status			Migratory Status	Local Abundance Status
					IUCN (2022)	CITES (2012)	IWPA (1972)		
30.	Temminck's Stint	*Calidris temminckii* (Leisler, 1812)	In	?	LC	-	IV	WM	FC
31.	Little Stint	*Calidris minuta* (Leisler, 1812)	In	↑	LC	-	IV	WM	FC
32.	Curlew Sandpiper	*Calidris ferruginea* (Pontoppidan, 1763)	In	↓	NT	-	IV	WM	RA
33.	Common Sandpiper	*Actitis hypoleucos* (Linnaeus, 1758)	In	↓	LC	-	IV	WM	C
34.	Common Snipe	*Gallinago gallinago* (Linnaeus, 1758)	Cv	↓	LC	-	IV	WM	RA
35.	Eurasian Curlew	*Numenius arquata* (Linnaeus, 1758)	In	↓	NT	-	IV	WM	RA
36.	Jack Snipe	*Lymnocryptes minimus* (Brünnich, 1764)	Cv	→	LC	-	IV	WM	RA
37.	Ruddy Turnstone	*Arenaria interpres* (Linnaeus, 1758)	In	↓	LC	-	IV	SM	RA
5.2. Family Recurvirostridae (No. of species = 1, RDi value = 1.27)									
38.	Pied Avocet	*Recurvirostra avosetta* Linnaeus, 1758	Cv	?	LC	-	IV	WM	C
5.3. Family Jacanidae (No. of species = 1, RDi value = 1.27)									
39.	Pheasant-tailed Jacana	*Hydrophasianus chirurgus* (Scopoli, 1786)	O	↓	LC	-	IV	SM	C
5.4. Family Rostratulidae (No. of species = 1, RDi value = 1.27)									
40.	Greater Painted-snipe	*Rostratula benghalensis* (Linnaeus, 1758)	O	↓	LC	-	IV	SM	FC
5.5. Family Glareolidae (No. of species = 1, RDi value =1.27)									
41.	Oriental Pratincole	*Glareola maldivarum* J.R. Forster, 1795	In	↓	LC	-	IV	SM	FC
5.6. Family Charadriidae (No. of species = 2, RDi value = 2.53)									
42.	Pacific Golden Plover	*Pluvialis fulva* (Gmelin, JF, 1789)	Cv	↓	LC	-	IV	SM	FC
43.	White-tailed Lapwing	*Vanellus leucurus* (M.H.C. Lichtenstein, 1823)	Cv	?	LC	-	IV	WM	C

S. No.	Order/ Family/ Common name	Scientific name with Authority	Feeding guild	IUCN Global population trends	Conservation status			Migratory Status	Local Abundance Status
					IUCN (2022)	CITES (2012)	IWPA (1972)		
5.7 Family Laridae (No. of species = 2, RDi value = 2.53)									
44.	Brown-headed Gull	*Chroicocephalus brunnicephalus* (Jerdon, 1840)	Cv	→	LC	-	IV	WM	RA
45.	Black-headed Gull	*Chroicocephalus ridibundus* (Linnaeus, 1766)	Cv	?	LC	-	IV	WM	RA
6. ORDER CICONIIFORMES (No. of species = 1, No. of family = 1, Percent occurrence = 1.27)									
6.1. Family Ciconiidae (No. of species = 1, RDi value = 1.27)									
46.	Black-necked Stork	*Ephippiorhynchus asiaticus* (Latham, 1790)	Cv	↓	NT	-	IV	WM	C
7. ORDER SULIFORMES (No. of species = 2, No. of family = 1, Percent occurrence = 2.53)									
7.1. Family Phalacrocoracidae (No. of species = 2, RDi value = 2.53)									
47.	Great Cormorant	*Phalacrocorax carbo* (Linnaeus, 1758)	Cv	↑	LC	-	IV	WM	C
48.	Indian Cormorant	*Phalacrocorax fuscicollis* Stephens, 1826	Cv	?	LC	-	IV	WM	C
8. ORDER PELECANIFORMES (No. of species = 5, No. of families = 1, Percent occurrence = 6.33)									
8.1. Family Ardeidae (No. of species = 5, RDi value = 6.33)									
49.	Western Reef Egret	*Egretta gularis* (Bosc, 1792)	Cv	→	LC	-	IV	WM	RA
50.	Black Bittern	*Ixobrychus flavicollis* (Latham, 1790)	Cv	↓	LC	-	IV	SM	RA
51.	Cinnamon Bittern	*Ixobrychus cinnamomeus* (Gmelin, JF, 1789)	Cv	→	LC	-	IV	SM	RA
52.	Yellow Bittern	*Ixobrychus sinensis* (Gmelin, JF, 1789)	Cv	?	LC	-	IV	SM	RA
53.	Common Little Bittern	*Ixobrychus minutus* (Linnaeus, 1766)	Cv	↓	LC	-	IV	SM	FC
9. ORDER ACCIPITRIFORMES (No. of species = 5, No. of family = 2, Percent occurrence = 6.33)									
9.1. Family Accipitridae (No. of species = 4, RDi value = 5.06)									
54.	Brahminy Kite	*Haliastur indus* (Boddaert, 1783)	Cv	↓	LC	II	I	WM	RA

S. No.	Order/ Family/ Common name	Scientific name with Authority	Feeding guild	IUCN Global population trends	Conservation status			Migratory Status	Local Abundance Status
					IUCN (2022)	CITES (2012)	IWPA (1972)		
55.	Eastern Imperial Eagle	*Aquila heliaca* Savigny, 1809	Cv	↓	VU	I	I	WM	RA
56.	Western Marsh Harrier	*Circus aeruginosus* (Linnaeus, 1758)	Cv	→	LC	II	I	WM	FC
57.	Greater Spotted Eagle	*Clanga clanga* (Pallas, 1811)	Cv	↓	VU	II	I	WM	RA
9.2. Family Pandionidae (No. of species = 1, RDi value = 1.27)									
58.	Osprey	*Pandion haliaetus* (Linnaeus, 1758)	Cv	↑	LC	II	I	WM	FC
10. ORDER CORACIIFORMES (No. of species = 3, No. of families = 1, Percent occurrence = 3.80)									
10.1. Family Meropidae (No. of species = 3, RDi value = 3.80)									
59.	Asian Green Bee-eater	*Merops orientalis* Latham, 1801	In	↑	LC	-	IV	SM	A
60.	Blue-cheeked Bee-eater	*Merops persicus* Pallas, 1773	In	→	LC	-	IV	SM	FC
61.	Blue-tailed Bee-eater	*Merops philippinus* Linnaeus, 1767	In	→	LC	-	IV	SM	FC
11. ORDER PICIFORMES (No. of species = 1, No. of families = 1, Percent occurrence = 1.27)									
11.1. Family Picidae (No. of species = 1, RDi value = 1.27)									
62.	Eurasian Wryneck	*Jynx torquilla* Linnaeus, 1758	In	↓	LC	-	IV	WM	RA
12. ORDER PASSERIFORMES (No. of species =17, No. of families = 7, Percent occurrence = 21.52)									
12.1. Family Alaudidae (No. of species = 3, RDi value = 3.80)									
63.	Ashy-crowned Sparrow-lark	*Eremopterix griseus* (Scopoli, 1786)	O	→	LC	-	IV	SM	FC
64.	Bengal Bushlark	*Mirafra assamica* Horsfield, 1840	O	→	LC	-	IV	SM	FC
65.	Sand Lark	*Alaudala raytal* (Blyth, 1845)	O	→	LC	-	IV	SM	FC
12.2. Family Laniidae (No. of species = 1, RDi value = 1.27)									
66.	Isabelline Shrike	*Lanius isabellinus* Hemprich & Ehrenberg, 1833	In	→	LC	-	IV	WM	RA

S. No.	Order/ Family/ Common name	Scientific name with Authority	Feeding guild	IUCN Global population trends	Conservation status			Migratory Status	Local Abundance Status
					IUCN (2022)	CITES (2012)	IWPA (1972)		
12.3. Family Motacillidae (No. of species = 7, RDi value = 8.86)									
67.	Western Yellow Wagtail	*Motacilla flava* Linnaeus, 1758	In	↓	LC	-	IV	WM	C
68.	White Wagtail	*Motacilla alba* Linnaeus, 1758	In	→	LC	-	IV	WM	A
69.	Grey Wagtail	*Motacilla cinerea* Tunstall, 1771	In	→	LC	-	IV	WM	C
70.	Citrine Wagtail	*Motacilla citreola* Pallas, 1776	In	↑	LC	-	IV	WM	C
71.	Eastern Yellow Wagtail	*Motacilla tschutschensis* Gmelin, JF, 1789	In	↓	LC	-	IV	WM	FC
72.	Tawny Pipit	*Anthus campestris* (Linnaeus, 1758)	In	→	LC	-	IV	WM	FC
73.	Tree Pipit	*Anthus trivialis* (Linnaeus, 1758)	In	↓	LC	-	IV	WM	C
12.4. Family Oriolidae (No. of species = 1, RDi value = 1.27)									
74.	Indian Golden Oriole	*Oriolus kundoo* Sykes, 1832	O	?	LC	-	IV	SM	RA
12.5. Family Phylloscopidae (No. of species = 1, RDi value = 1.27)									
75.	Common Chiffchaff	*Phylloscopus collybita* (Vieillot, 1817)	In	↑	LC	-	IV	WM	FC
12.6. Family Sylviidae (No. of species = 1, RDi value = 1.27)									
76.	Lesser Whitethroat	*Curruca curruca* (Linnaeus, 1758)	O	→	LC	-	IV	WM	FC
12.7. Family Muscicapidae (No. of species = 3, RDi value = 3.80)									
77.	Bluethroat	*Luscinia svecica* (Linnaeus, 1758)	In	→	LC	III	IV	WM	C
78	Red-breasted Flycatcher	*Ficedula parva* (Bechstein, 1792)	In	↑	LC	III	IV	WM	RA
79.	Siberian Stonechat	*Saxicola maurus* (Pallas, 1773)	In	→	LC	-	IV	WM	FC

Abbreviations: **Feeding guilds:** H- Herbivore/ O-Omnivore/ In-Insectivor/ Cv-Carnivore/ G-Grainivore/ F-Frugivore/ P-Piscivore/ In/N-Insectivore/Nectarivore;
Conservation status: LC- Least Concern/ NT- Near threatened/ VU-Vulnerable;
Population trends: ↑ – Increasing/ ↓ – Decreasing/ → Stable/ ?- Unknown;
CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora;
IWPA – Indian Wildlife Protection Act/ I- Schedule I of IWPA (highly preferred species)/ IV- Schedule IV of IWPA (moderately preferred species);
M status: Migratory status: WM-Winter Migrant/ **SM**-Summer Migrant;
LA status–Local Abundance status: **A**-Abundant/ **C**-Common/ **FC**-Fairly Common/ **RA**-Rare.

Table 4. Variations in the number of seasonal migrant species at Mandothi wetlands, India from April, 2022 to March, 2024

4. táblázat Az indiai Mandothi wetlands területén megfigyelt szezonálisan vonuló madárfajok száma

Mandothi wetlands			
Migratory Status	April 2022–March 2023	April 2023–March 2024	Total Richness
Winter Migrants	49 (8)	51 (10)	59
Summer Migrants	16 (5)	15 (4)	20
Overall reported migratory avian species from April 2022-March 2024			79

Table 5. Number of Species, families, genera per reported avian order of Mandothi wetlands, India from April, 2022 to March, 2024

5. táblázat Az indiai Mandothi wetlands területén 2022 áprilisa és 2024 márciusa között megfigyelt madárrendek faj-, család- és nemszáma

S. No.	Order Name	Number of Species/ Order	Number of Families/ Order	Number of Genera/ Order
1.	Charadriiformes	24	7	15
2.	Passeriformes	17	7	12
3.	Anseriformes	15	1	8
4.	Accipitriformes	5	2	5
5.	Pelecaniformes	5	1	5
6.	Coraciiformes	3	1	1
7.	Cuculiformes	3	1	1
8.	Podicipediformes	2	1	1
9.	Suliformes	2	1	1
10.	Ciconiiformes	1	1	1
11.	Gruiformes	1	1	1
12.	Piciformes	1	1	1

insectivorous birds in the area suggests that the insect assemblage is diverse (Gregory *et al.* 2001, Sohil & Sharma 2020, Rai & Vanita 2023). Insectivores were shown to be prevalent across all guilds based on the feeding guild study similarly to the results of Rai and Vanita (2023). As per the IUCN Red List criteria (IUCN 2024) 71 species were classified as Least Concern (LC), whereas 5 species were classified as Near Threatened (NT) i.e. Ferruginous Duck *(Aythya nyroca)*, Black-tailed Godwit *(Limosa limosa),* Eurasian Curlew *(Numenius arquata)*, Curlew Sandpiper *(Calidris ferruginea)*, Black-necked Stork *(Ephippiorhynchus asiaticus),* and 3 species were classified as Vulnerable (VU) such as Eastern Imperial Eagle *(Aquila heliaca)*, Greater Spotted Eagle *(Clanga clanga)*, Common Pochard *(Aythya ferina)* in the study area. The IUCN Red List (IUCN 2024) of recorded avian species indicates that 11 species have an increasing trend, 30 species have decreasing trend, 25 species have stable trend, and the trend of 13 species is unknown.

The relationship between the documented bird species' local abundance and their migratory status at the study site shows the ecological significance of this habitat, as it supports migrants

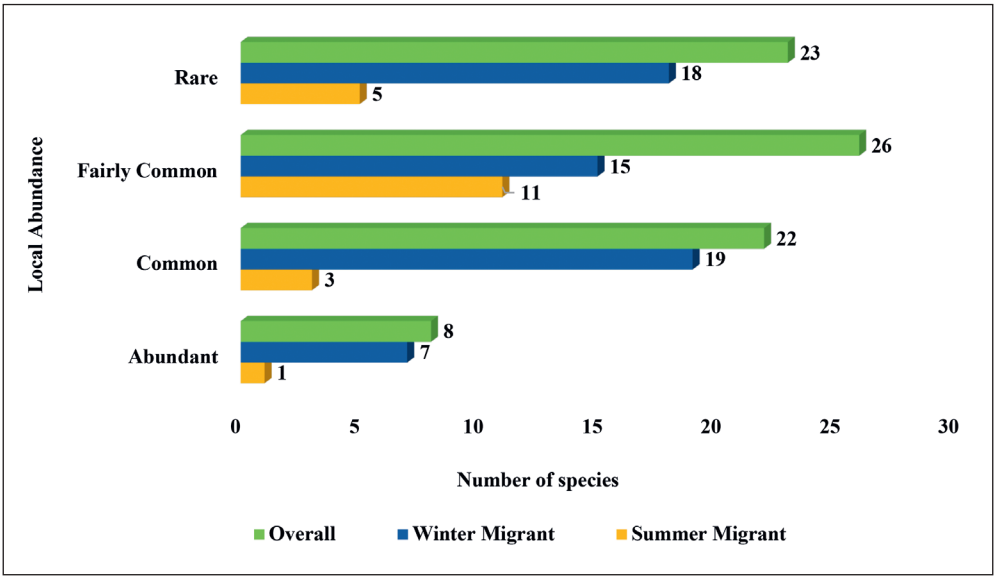

Figure 2. Relationship between documented bird species' local abundance and migratory status at Mandothi wetlands, India from April 2022 to March 2024

2. ábra Az indiai Mandothi Wetlands területén 2022 áprilisa és 2024 márciusa között megfigyelt madárfajok lokális abundanciája és vonulási stratégiája közötti kapcsolat

from both seasons. Out of the total summer migrants, 25% species were rare, 55% species were fairly common, 15% species were common and 5% species was abundant. Similarly, for winter migrants, 30.5% species were rare, 25.4% species were fairly common, 32.2% species were common and 11.9% species were abundant *(Figure 2)*.

The IUCN global population trends of avian species provide valuable insights into their conservation status and vulnerability, which can be linked to their local abundance at the study site. Out of the total avifauna with increasing population trend, 27.3% species were abundant, 36.4% were common, 27.3% were fairly common and 9.1% were rare. Out of species with decreasing population trend, 13.3% species were abundant, 26.7% were common, 30.0% were fairly common and 30.0% were rare. Out of species with stable population trends, 4.0% species were abundant, 20.0% were common, 48.0% were fairly common and 28.0% were rare. Similarly, out of species with unknown population trends, 38.5% were common, 15.4% were fairly common and 46.2% were rare *(Figure 3)*.

Unlike resident or wintering birds, passage migrants do not remain in one location for extended periods, instead, they use such stopover sites as resting and refuelling stations to recover energy for the next part of their journey (Beauchamp 2024). The Mandothi wetlands serve as an important stopover site for passage migrant birds, which use the area during their seasonal migrations. These birds pause at the study site to rest and refuel before continuing their long journeys between breeding and wintering grounds. Some species are passage migrants often include shorebirds, waders and waterfowl, whose presence highlights the wetlands' role in supporting migratory routes and maintaining avian biodiversity. Species like Cotton Pygmy-goose *(Nettapus coromandelianus)* (Anseriformes), Jacobin Cuckoo *(Clamator*

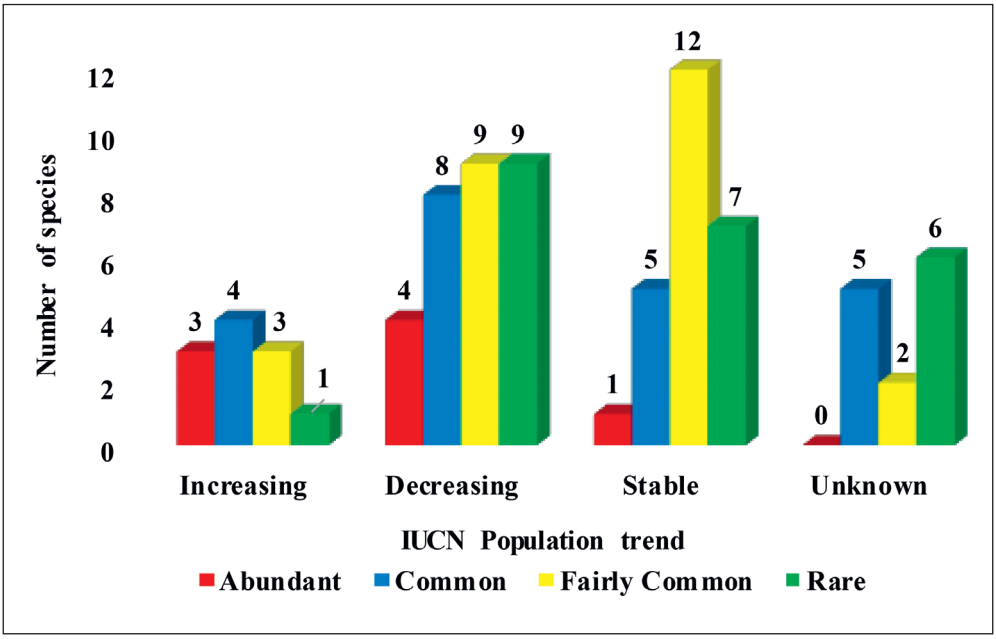

Figure 3. IUCN population trend and its relationship with local abundance status of reported avian species at Mandothi wetlands, India from April 2022 to March 2024

3. ábra Az indiai Mandothi wetlands területén 2022 áprilisa és 2024 márciusa között megfigyelt madárfajok lokális abundanciája és IUCN-alapú populációs trendjei közötti kapcsolat

jacobinus), Common Hawk Cuckoo *(Hierococcyx varius)* (Cuculiformes), Black-necked Grebe *(Podiceps nigricollis)* (Podicipediformes), Curlew Sandpiper *(Calidris ferruginea)*, Eurasian Curlew *(Numenius arquata)*, Jack Snipe *(Lymnocryptes minimus)*, Brown-headed Gull *(Chroicocephalus brunnicephalus)*, Black-headed Gull *(Chroicocephalus ridibundus)* (Charadriiformes), Western Reef Egret *(Egretta gularis)*, Cinnamon Bittern *(Ixobrychus cinnamomeus)* (Pelecaniformes), Osprey *(Pandion haliaetus)*, (Accipitriformes), Eurasian Wryneck *(Jynx torquilla)* (Piciformes), Bengal Bushlark *(Mirafra assamica)*, Sand Lark *(Alaudala raytal)*, Indian Golden Oriole *(Oriolus kundoo)*, Lesser Whitethroat *(Curruca curruca)* (Passeriformes) are significant passage migrants in the study area *(Table 6)*.

Monitoring these species provides insights into migration patterns and ecosystem health, emphasizing the need for conservation measures to protect this vital habitat. Further monitoring is also recommended for migratory patterns and to assess the area's ability to sustain its avifauna in the long-term conservation initiatives. Other researchers also reported variable number of migratory avian species from other studied locations of the state of Haryana *(Table 7)*.

Table 6. Monthly migration phenology of avian species reported at Mandothi wetlands, India from April, 2022 to March, 2024

6. táblázat Az indiai Mandothi wetlands területén 2022 áprilisa és 2024 márciusa között megfigyelt madárfajok havi vonulási fenológiája

S. No.	Common Name	Y/M	A	M	J	J	A	S	O	N	D	J	F	M
1.	Bar-headed Goose	1st												
		2nd												
2.	Greylag Goose	1st												
		2nd												
3.	Greater White-fronted Goose	1st												
		2nd												
4.	Common Pochard	1st												
		2nd												
5.	Tufted Duck	1st												
		2nd												
6.	Ferruginous Duck	1st												
		2nd												
7.	Eurasian Wigeon	1st												
		2nd												
8.	Gadwall	1st												
		2nd												
9.	Garganey	1st												
		2nd												
10.	Northern Shoveler	1st												
		2nd												
11.	Common Teal	1st												
		2nd												
12.	Northern Pintail	1st												
		2nd												
13.	Lesser Whistling-Duck	1st												
		2nd												
14.	Ruddy Shelduck	1st												
		2nd												
15.	Cotton Pygmy-goose	2nd												
		1st												
16.	Western Koel	2nd												
		1st												
17.	Common Hawk Cuckoo	1st												
		2nd												
18.	Jacobin Cuckoo	1st												
		2nd												

S. No.	Common Name	Y/M	A	M	J	J	A	S	O	N	D	J	F	M
19.	Eurasian Coot	1st												
		2nd												
20.	Great Crested Grebe	1st												
		2nd												
21.	Black-necked Grebe	1st												
		2nd												
22.	Black-tailed Godwit	1st												
		2nd												
23.	Common Greenshank	1st												
		2nd												
24.	Common Redshank	1st												
		2nd												
25.	Spotted Redshank	1st												
		2nd												
26.	Green Sandpiper	1st												
		2nd												
27.	Wood Sandpiper	1st												
		2nd												
28.	Marsh Sandpiper	1st												
		2nd												
29.	Ruff	1st												
		2nd												
30.	Temminck's Stint	1st												
		2nd												
31.	Little Stint	1st												
		2nd												
32.	Curlew Sandpiper	1st												
		2nd												
33.	Common Sandpiper	1st												
		2nd												
34.	Common Snipe	1st												
		2nd												
35.	Eurasian Curlew	1st												
		2nd												
36.	Jack Snipe	1st												
		2nd												
37.	Ruddy Turnstone	1st												
		2nd												

S. No.	Common Name	Y/M	A	M	J	J	A	S	O	N	D	J	F	M
38.	Pied Avocet	1st												
		2nd												
39.	Pheasant-tailed Jacana	1st												
		2nd												
40.	Greater Painted-snipe	1st												
		2nd												
41.	Oriental Pratincole	1st												
		2nd												
42.	Pacific Golden Plover	1st												
		2nd												
43.	White-tailed Lapwing	1st												
		2nd												
44.	Brown-headed Gull	1st												
		2nd												
45.	Black-headed Gull	1st												
		2nd												
46.	Black-necked Stork	1st												
		2nd												
47.	Great Cormorant	1st												
		2nd												
48.	Indian Cormorant	1st												
		2nd												
49.	Western Reef-Egret	1st												
		2nd												
50.	Black Bittern	1st												
		2nd												
51.	Cinnamon Bittern	1st												
		2nd												
52.	Yellow Bittern	1st												
		2nd												
53.	Common Little Bittern	1st												
		2nd												
54.	Brahminy Kite	1st												
		2nd												
55.	Eastern Imperial Eagle	1st												
		2nd												
56.	Western Marsh Harrier	1st												
		2nd												

S. No.	Common Name	Y/M	A	M	J	J	A	S	O	N	D	J	F	M
57.	Greater Spotted Eagle	1st												
		2nd												
58.	Osprey	1st												
		2nd												
59.	Asian Green Bee-eater	1st												
		2nd												
60.	Blue-cheeked Bee-eater	1st												
		2nd												
61.	Blue-tailed Bee-eater	1st												
		2nd												
62.	Eurasian Wryneck	1st												
		2nd												
63.	Ashy-crowned Sparrow-lark	1st												
		2nd												
64.	Bengal Bushlark	1st												
		2nd												
65.	Sand Lark	1st												
		2nd												
66.	Isabelline Shrike	1st												
		2nd												
67.	Western Yellow Wagtail	1st												
		2nd												
68.	White Wagtail	1st												
		2nd												
69.	Grey Wagtail	1st												
		2nd												
70.	Citrine Wagtail	1st												
		2nd												
71.	Eastern Yellow Wagtail	1st												
		2nd												
72.	Tawny Pipit	1st												
		2nd												
73.	Tree Pipit	1st												
		2nd												
74.	Indian Golden Oriole	1st												
		2nd												
75.	Common Chiffchaff	1st												
		2nd												

S. No.	Common Name	Y/M	A	M	J	J	A	S	O	N	D	J	F	M
76.	Lesser Whitethroat	1st												
		2nd												
77.	Bluethroat	1st												
		2nd												
78.	Red-breasted Flycatcher	1st												
		2nd												
79.	Siberian Stonechat	1st												
		2nd												

Table 7. Number of migratory bird species reported at various locations of Haryana, India by various researchers in different studies

7. táblázat India Haryana tartományában megfigyelt vonuló madárfajok száma és ezek irodalmi hivatkozása

Author	Study location	Number of migratory bird species reported
Gupta *et al.* 2012	Khaparwas Wildlife Sanctuary, Haryana	50
Chopra *et al.* 2017	Bhindwas Wildlife Sanctuary, Haryana	37
Rai *et al.* 2017	Basai Wetlands, Haryana	49
Rai *et al.* 2019	Basai Wetlands, Haryana	62
Parul & Kumar 2023	Dighal Wetlands, Haryana	70
Rai & Vanita 2023	Ottu Lake, Sirsa, Haryana	46
Rai & Yadav 2023	Mandothi Wetlands, Haryana	51
Yadav & Rai 2024	Mandothi Wetlands, Haryana	54
Vanita & Kumar 2024	District Rewari, Haryana	56

Conclusion

The study site provides an ideal environment for migratory as well as passage migrant avian species due to abundant food resources, freshwater availability, and safe roosting areas. This information can be used as an important point for evaluating suitable management strategies for preserving wetlands and their sustainable use. So, long-term monitoring is required, to assess the consequences of anthropogenic pressures and other stress factors and execute conservation plans for the area's avifaunal diversity.

Acknowledgements

The authors are very grateful to the Kurukshetra University, Kurukshetra, for providing all the necessary research facilities and also thankful to the Council of Scientific and Industrial Research, New Delhi, for funding this research with the SRF.

References

Alerstam, T., Hedenström, A. & Akesson, S. 2003. Long-distance migration: evolution and determinants. – Oikos 103(2): 247–260. DOI: 10.1034/j.1600-0706.2003.12559.x

Ali, S. & Ripley, S. D. 1987. Compact Handbook of the Birds of India and Pakistan. – Oxford University Press, New Delhi

Altmann, J. 1974. Observational study of behavior: sampling methods. – Behaviour 49(3–4): 227–267. DOI: 10.1163/156853974x00534

Arlott, N. 2015. Birds of India, Pakistan, Nepal, Bhutan, Bangladesh, and Srilanka. – William Collins Publishers, London

Beauchamp, A. T. 2024. Ecological drivers of songbird stopover behaviour during autumn migration in eastern New Brunswick. – Electronic Thesis and Dissertation Repository, 10104. https://ir.lib.uwo.ca/etd/10104

Chakraborty, S. K., Sanyal, P. & Ray, R. 2023. Conclusion on eco-biological uniqueness of wetland ecosystem with special reference with East Kolkata Wetlands, India. – In: Wetlands Ecology: Eco-biological Uniqueness of a Ramsar Site (East Kolkata Wetlands, India). – Cham, Springer International Publishing, pp. 679–705.

Chopra, G., Rai, D. & Jyoti, J. 2017. Avian diversity and their status in and around Bhindawas bird sanctuary, Haryana (India). – Journal of Applied and Natural Science 9(3): 1475–1481. DOI: 10.31018/jans.v9i3.1387

CITES 2012. Checklist of Conventon on International Trade in Endangered Species of Wild Fauna & Flora. – CITES, Geneva, Switzerland http://www.cites.org. Downloaded on 06 April 2021

Gardner, J. L., Peters, A., Kearney, M. R., Joseph, L. & Heinsohn, R. 2011. Declining body size: third universal response to warming? – Trends in Ecology & Evolution 26(6): 285–291. DOI: 10.1016/j.tree.2011.03.005

Gaston, A. J. 1975. Methods for estimating bird population. – The Journal of the Bombay Natural History Society 69(3): 591–615.

Greenberg, R. & Marra, P. P. 2005. The renaissance of migratory bird biology: a synthesis. – In: Greenberg R. & Marra P. P. (eds.) Birds of Two Worlds: The Ecology and Evolution of Temperate-tropical Migration Systems. – Johns Hopkins University Press, Baltimore, MD., pp. 437–443.

Gregory, N. C., Sensenig, R. L. & Wilcove, D. S. 2001. Effects of controlled fire and livestock grazing on bird communities in East African savannas. – Conservation Biology 24(6): 1606–1616. DOI: 10.1111/j.1523-1739.2010.01533.x

Grimmett, R. & Inskipp, T. 2019. Birds of Northern India. – Christopher Helm London

Grimmett, R., Inskipp, C. & Inskipp, T. 1999. Pocket Guide to the Birds of the Indian Subcontinent. – Oxford University Press, New Delhi, India

Grimmett, R., Inskipp, C. & Inskipp, T. 2015. Birds of Indian Subcontinent 2nd ed. – Oxford University Press, India

Gupta, R. C., Parasher, M. & Kaushik, T. K. 2012. Documentation of avian diversity of Khaparwas Bird Sanctuary in Jhajjar district in Haryana, India. – International Journal of Life Sciences 6(1): 10–20.

IUCN 2024. The IUCN Red List of Threatened Species. Version 2023-1. – https://www.iucnredlist.org.

IWPA 1972. – http://www.wiienvis.nic.in/Database/Schedule Species Database_7969.aspx (update dt. 28/4/2014)

Kalsi, R. S., Sharma, S. C. & Choudhary, J. R. 2019. Birds of Haryana – A Field Guide. – Unique Publications, Haryana, India

Kumar, J. I. N., Soni, H. & Kumar, R. N. 2006. Biomonitoring of selected freshwater macrophytes to assess lake trace element contamination: a case study of Nal Sarovar Bird Sanctuary, Gujarat, India. – Journal of Limnology 65(1): 9–16.

Lack, D. 1954. The Natural Regulation of Animal Numbers. – Oxford University Press, Oxford

Lack, D. 1968. Bird migration and natural selection. – Oikos 19(1): 1–9. DOI: 10.2307/3564725

Ministry of Environment, Forest and Climate Change 2024. Ramsar Sites of India. – Government of India https://moef.gov.in/uploads/2024/03/85-Ramsar-sites-of-India-14-08-2024.pdf

Nudds, T. D. & Bowlby, J. N. 1984. Predator-prey relationship in North American dabbling ducks. – Canadian Journal of Zoology 62(10): 2002–2008. DOI: 10.1139/z84-293

Parul & Kumar, P. 2023. Assessing avian diversity and conservation status in Dighal Wetlands, Haryana, India. – Journal of Threatened Taxa 15(10): 23996–24008. DOI: 10.11609/jott.8283.15.10.23996-24008

Praveen, J., Jayapal, R. & Pittie, A. 2019. Updates to the checklists of birds of India, and the South Asian region. – Indian Birds 15(1): 1–9.

Praveen, J. & Jayapal, R. 2022. Checklist of the Birds of India (v6.0). – http://www.indianbirds.in/india/
Rai, D., Chopra, G. & Gulia, R. 2017. Status of migratory avifaunal diversity of Basai wetlands, Haryana (India). – Journal of Experimental Zoology, India 20(2): 981–985.
Rai, D., Chopra, G., Gulia, R. & Vats, P. 2017. Avian diversity of Basai Wetlands, Haryana (India): An IBA Site. – Journal of Experimental Zoology, India 20(1): 109–117.
Rai, D., Gulia, R., Chopra, G. & Kumar, P. 2019. Avifaunal community composition and current status in Basai Wetlands: An important bird area in Haryana, India. – Indian Forester 145(10): 971–985.
Rai, D. & Vanita, V. 2022. Bird community composition and current status in and around selected wetlands of District Sirsa, Haryana (India). – Indian Forester 148(2): 223–230. DOI: 10.36808/if/2022/v148i2/160962
Rai, D. & Vanita 2023. Structural assemblages of avian community in and around Ottu Reservoir Sirsa, Haryana (India). – Indian Forester 149(10): 1048–1060. DOI: 10.36808/if/2023/v149i10/169258
Rai, D. & Yadav, A. 2023. Avian community composition in and around Mandothi Wetlands, Haryana, India. – Journal of Applied and Natural Science 15(1): 408–421. DOI: 10.31018/jans.v15i1.4385
Ramsar Convention Secretariat 2013. The Ramsar Convention Manual: A Guide to the Convention on Wetlands (Ramsar, Iran, 1971). 6th ed. – Ramsar Convention Secretariat, Gland, Switzerland
Sharma, K. K. & Saini, M. 2014. Community structure and population dynamics of aquatic avifauna of Gharana Wetland (Reserve), Jammu, India. – International Research Journal of Biological Sciences 3(2): 1–8.
Sohil, A. & Sharma, N. 2020. Bird diversity and distribution in mosaic landscapes around Jammu, Jammu and Kashmir. – Acta Ecologica Sinica 40(4): 323–338. DOI: 10.1016/j.chnaes.2020.02.005
Somveille, M. 2016. The global ecology of bird migration: patterns and processes. – Frontiers of Biogeography 8(3): e32694. DOI: 10.21425/F58332694
Stewart, R. E. Jr. 2001. Technical Aspects of Wetland: Wetlands as Bird Habitats. – National Water Summary on Wetland Resources, United States Geological Survey Water Supply Paperhttp://water.usgs.gov/nwsum/WSP2425/birdhabitat.html Assessed September 09, 2015
Sundar, K. S. G. & Kittur, S. 2013. Can wetlands maintained for human use also help conserve biodiversity? Landscape-scale patterns of bird use of wetlands in an agricultural landscape in north India. – Biological Conservation 168: 49–56. DOI: 10.1016/j.biocon.2013.09.016
Sutherland, W. J. 1998. Evidence for flexibility and constraintin migration systems. – Journal of Avian Biology 29: 441–446. DOI: 10.2307/3677163
Sutherland, W. J., Newton, I. & Green, R. E. 2005. Bird Ecology and Conservation: A Handbook of Techniques. – Oxford University Press
Tapia Harris, C. 2022. The non-breeding ecology of Common Whitethroats *Curruca communis* in central Nigeria. – Doctoral Dissertation, The University of St Andrews
Torell, M., Salamanca, A. M. & Ahmed, M. 2001. Management of wetland resources in the Lower Mekong Basin: issues and future directions. – Naga, the ICLARM Quarterly 24(3–4): 4–10.
Ullah., Qing-Ming, W. U., Xue-Ying, S., Khan, M. S., Ullah, S., Khan, T. U. & Nawaz, R. M. 2021. Diversity, abundance, status and endangered habitats of avifauna in Sheikh Badin National Park, Dera Ismail Khan, Khyber. – The Journal of Animal & Plant Sciences 31(1): 307–316. DOI: 10.36899/JAPS.2021.1.0218
Vanita & Kumar, A. 2024. Avifaunal species richness and composition at Masani Barrage, District Rewari, Haryana. – Environment and Ecology 42(3A): 1128–1144. DOI: 10.60151/envec/LMFC9656
Weller, M. W. 1999. Wetland Birds: Habitat Resources and Conservation Implications. – Cambridge University Press
Yadav, A. & Rai, D. 2024. Diversity and IUCN status of winter migratory avifauna of Mandothi Wetlands, Haryana (India). – Biology Bulletin 51(4): 1197–1205. DOI: 10.1134/S1062359023606572
Zedler, J. B. & Kercher, S. 2005. Wetland resources: status, trends, ecosystem services, and restorability. – Annual Review of Environment and Resources 30: 39–74. DOI: 10.1146/annurev.energy.30.050504.144248