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Research Article

Avian diversity and conservation status in Bhindawas Bird Sanctuary, Jhajjar (Haryana), India

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Abstract
Bhindawas Bird Sanctuary is a Ramsar site located in Haryana, India, which falls in the Central Asian flyway zone of the migratory birds. Its diverse ecological resources sustain a rich diversity of migratory and threatened birds.The species diversity, threat status, population trend and feeding guild of the avifauna in Bhindawas Bird Sanctuary, Haryana, India, was explored from October 2021 to October 2023.The data was collected every fortnightly using the line transects method. A total of 129 bird species belonging to 98 genera, 47 families and 17 orders were recorded. Order Passeriformes, with 45 species in 20 families, dominated the avifauna, followed by Anseriformes with 16 species, Charadriformes with 12 species and the rest of 15 orders. Anatidae was the most dominant family representing 12.40% (n=16). Among the reported species, 81 were residents, 36 were winter migrants and, 10 were summer migrants and 2 were passage migrants. One species was endangered and vulnerable in the threat status, while six were classified as near threatened as per the International Union for Conservation of Nature (INUC) Red List, 2022. The bird sanctuary also supported 35 bird species with a declining population trend globally. The omnivorous and carnivorous feeding habits were equally dominant, followed by insectivorous and, nectarivorous and herbivorous birds, which were the least numerous. The presence of both resident and migrant birds of global conservation priority confirms the importance and conservation of Bhindawas Bird Sanctuary as a rich avifauna diversity habitat.

Keywords: Avian fauna, Bhindawas Bird Sanctuary, Biodiversity, Conservation, Threat status

INTRODUCTION

Birds are considered among the most beautiful and pleasing creatures of faunal diversity, adding to the richness of ecosystems by inhabiting a wide range of habitats. Birds play an important role in the ecosystem by supporting and regulating various activities like pollination, nutrient cycling, controlling rodents and various pests, etc. (Wenny *et al*., 2011; Rai and Vanita, 2021; Mariyappan *et al.,* 2023). The ecological role and various services provided by birds are crucial for maintaining the healthy functioning of ecosystem and are of great importance for human welfare (Whelan *et al*., 2015). Numerous studies have emphasized the significance of birds as a barometer of habitat health and integrity (Gregory and Strien, 2010; Schmeller *et al*., 2012 and Brotherton *et al*., 2020). Their presence provides insights into the species richness, unique habitat patterns, resource availability and the region's overall health.

Waterbodies are highly productive regions and can support a vast array of biodiversity, including inverte-

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brates, fishes, amphibians, reptiles, birds and mammals; and often considered as repositories of biodiversity (Singh and Brraich, 2022; Anand *et al*., 2023 and-Parul and Kumar, 2023). Birds make wide use of these aquatic environments for activities such as nourishment, breeding, nesting, roosting, and sometimes as stopover sites (Ganbold *et al*., 2018; Panda *et al*., 2021; Yashmita-Ulman and Singh, 2022; Anand *et al*., 2023 and Muralikrishnan *et al*., 2023). The Ministry of Environment, Forest and Climate Changes recently increased India's Ramsar sites to 75 by incorporating 21 more wetlands covering a total surface area of 13,26,677 hectares. In India, wetlands cover around 4.6% of the country's geographical area (Parul and Kumar, 2023; Anand *et al*., 2023). Among about 10,000 bird species found worldwide, India harbours approximately 1353 species (Praveen and Jayapal, 2023). About 310 were identified as wetland-dependent species, nearly half migratory, arriving during the winter (Kumar *et al*., 2005; Harisha and Hosetti, 2018). Within Haryana, approximately 1441 wetlands are found and among them, a total of 936 comprising a total area of 21.94 sq. km are found in Jhajjar district alone as per National Wetland Atlas, 2010. Bhindawas is the largest wetland in Haryana hosting numerous migratory and resident bird species. This sanctuary is a significant stopover for birds enroute to Keoladeo National Park, Bharatpur. As this wetland is a critical part of the Central Asian Flyway, which provides a resting and roosting site for a variety of winter migratory bird species. Annually, around 30,000 migratory birds from approximately 250 species visit this site (Saluja and Garg, 2017).

The earlier studies on the avian population at Bhindawas recorded varying numbers of species: Gupta *et al*. (2011) documented 192, Chopra *et al*. (2017) identified 104 and more recently, Singh *et al*. (2019) spotted 119 species. These findings point to a large decline in avian diversity compared to the initial finding, highlighting the necessity for regular and repeated assessments of the Bhindawas Bird Sanctuary. The present study aimed to provide an updated analysis of the diversity and status of bird species within the Bhindawas Bird Sanctuary, Jhajjar (Haryana).

MATERIALS AND METHODS

Study site

The avian survey was conducted in the Bhindawas Bird Sanctuary, which spread over an area of 4.12 sq. km in Jhajjar district, Haryana (Fig. 1). Its geographical coordinates are 28° 28' 00' to 28° 36' 00" N; 76° 38' 00" E. It is located roughly 80 kms west of Delhi and 15 kms southwest of Jhajjar district. Bhindawas was initially designated as an eco-sensitive zone in 2011 (Saluja and Garg, 2017). On May 25, 2021, this wetland achieved the official status of a Ramsar Conservation site, identified as number 2459. This site is remarkably important as it is home for 1% of the global population of the Bar-headed goose. Additionally, this site is a habitat for more than 10 globally threatened species, including the critically endangered Egyptian vulture, Steppe eagle, Pallas's fish eagle, and the Black-bellied tern; indicating its global significance inthe field of bird diversity. The climate of Bhindawas is semi-arid, hot and dry. In summers, the maximum temperature reaches upto 45° C while in winters, the minimum temperature falls to 3° C. Large number of tree species of semi-arid mix deciduous type like *Cassia fistula*, *Albizia lebbeck*, *Acacia arabica*, *Acacia nilotica*, *Eucalyptus camaldulensis*, *Ficus glomerata*, *Azadirachta indica* and *Melia azedarach* surrounds the periphery of sanctuary. Towards the south end of the lake is a huge patch of Babul that forms a good roosting and nesting site for some water bird species. There is a man-made lake with stagnant fresh water with a low depth of 2-3 metres, providing habitat to many water birds. Monsoon rains and the Jawahar Lal Canal serve as the primary water source for this man-made lake. Seven peripheral

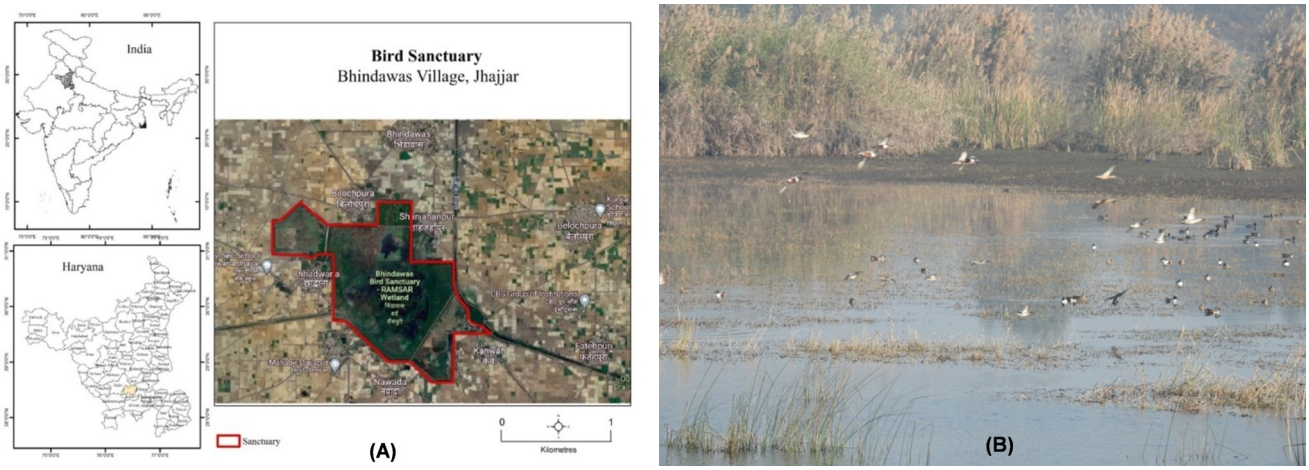

Fig. 1. *Study site (**A**) Location and outline map; (**B**) Landscape of Bhindawas Bird Sanctuary, Jhajjar, Haryana*

villages of human settlement surround the study site.

Sampling

Regular fortnightly visits were conducted for two years from October 2021 to October 2023 to record bird species. During winter, the birds were observed from 07:00 -10:00 in the morning and 04:00 - 07:00 in the evening. In summer, birds were observed from 06:00 - 09:00 in the morning and 05:00 - 08:00 in the evening. The Line transects method, which has variable length and width was adopted in the study during each visit (Shekhawat and Bhatnagar, 2014). Observations of birds were made using Olympus binoculars (8X40) and birds were photographed using a Nikon P950 Cool Pix camera. Identification of observed bird species was done with the help of the field guides(Grimmett *et al*., 2013; Kalsi *et al*., 2019). The documented bird's classification, population trends and conservation status were assessed using IUCN Red Data List version 15.1 (July 2022). Based on local observation at the study site, the residence status of the birds was categorized as Resident (throughout year), summer visitors (April- September), winter visitors (October- March) and passage visitors (July - September). Feeding guilds were assessed according to observations and relevant literature sources (Ali and Ripley, 1987; Grimmett *et al*., 1999; Singh *et al*., 2021) and categorised into seven major categories: CV (Carnivorous), GV (Granivorous), IV (Insectivorous), NV (Nectarivorous), OV(Omnivorous), HV (Herbivorous), FV (Frugivorous). The Relative Diversity Index (RDi) was calculated following the methodology of Singh et al. (2021):

$$RDi = \frac{Total\ no.of\ species\ in\ a\ family}{Total\ no.of\ species}\ X\ 100 \quad \text{Eq.1}$$

RESULTS AND DISCUSSION

One hundred twenty-nine bird species were documented from Bhindawas Bird Sanctuary, Jhajjar, belonging to 98 genera, 47 families and 17 orders from October 2021 to October 2023 (Table 1).

Among the recorded bird species, non-passerine birds (n=84) exhibited higher dominance than passerine birds (n=45). Previous studies by Gupta et al. (2011) noted 76 passerine birds out of 192 bird species, while Chopra et al. (2017) documented 33 passerine birds out of 104 species, and most recently, Singh et al. (2019) reported 46 passerine birds out of 119 species. However, the Passeriformes order stood as the most abundant and dominant, comprising a total of 45 species in 20 families. This was followed by Anseriformes (n=16 species) Charadriiformes (n=12 species), while Podicipediformes and Strigiformes order were least represented by one species each (Table 1). Similar results were found by other studies, highlighting the dominance of the Passeriformes order as the primary avian taxa in Bhindawas Bird Sanctuary, Sultanpur National Park, Dighal wetlands Haryana (Singh *et al*., 2019; Singh *et al*., 2021 and Parul and Kumar, 2023).

The analysis of relative diversity revealed Anatidae (16 species, RDi =12.40%) as the most dominant family, followed by Muscicapidae and Ardeidae (8 species, RDi =6.20%); Acciptridae (7 species, RDi = 5.43%); Columbidae, Motacillidae and Scolopacidae (6 species each, RDi = 4.65%); Cuculidae (5 species, RDi = 3.88%); Rallidae, Leiothrichidae and Sturnidae (4 species each, RDi = 3.10%); Ciconiidae, Phalacrocoracidae, Cicticolidae and Threskiornithidae (3 species each, RDi = 2.33 %); Charadriidae, Alcedinidae, Meropidae, Phasianidae, Corvidae, Hirudinidae, Laniidae, Jacanidae, Estrildidae, Ploceidae and Psittacidae (2 species each, RDi = 1.55 %).While families with the least relative diversity (1species each, RDi = 0.78%) were represented by Pandionidae, Bucertidae, Upupidae, Recurvirostridae, Coraciidae, Acrocephalidae, Josteropidae, Monarchidae, Passeridae, Paradoxonithidae, Phyloscopidae, Vangidae, Rostratulidae, Anhingidae, Dicruridae, Nectariniidae, Pycnonotidae, Megalaimidae, Picidae, Podicipedidae, Strigidae (Table 2). Notably, Anatidae emerged as the most diverse among the documented bird families, following earlier studies demonstrating Anatidae's prevalence in the avian community of Bhindawas. However, Gupta *et al*. (2011) and Chopra *et al*. (2017) found Muscicapidae the most diverse.

Investigating seasonal migration data from the 129 recorded species revealed that 81 were resident species, while 48 exhibited migratory behaviour. Of the migratory birds, 36 species were identified as winter visitors, 10 as summer visitors and 2 as passage migratory species (Fig. 2). A prior study conducted by Singh *et al.* (2019) at the Bhindawas Bird Sanctuary identified 82 resident species and 37 migrants, with 30 species identified as winter migrants, 6 as summer migrants, and 1 as passage migrants, aligning with the present study's findings.

The threat status analysis found that the majority of 121 species are least concerned, one species Steppe Eagle as an endangered species, one species Greater Spotted Eagle as a vulnerable species and six species Wolley- Necked Stork, Ferruginous Duck, Painted Stork, Black Headed Ibis, Oriental Darter and Alexandrine Parakeet were categorized as near threatened species (Fig. 3). Among the Near-Threatened species Wolley-Necked Stork and Painted Stork are associated with the family Ciconiidae of the Ciconiiformes order. Black-Headed Ibis is associated with the Threskiornithidae family of the order Pelecaniformes, Alexandrine Parakeetis is associated with the family Psittacidae of the Psittaciformes order, Oriental Darterisassociated with the family Anhingidae of the Suliformes order and Fer-

Table 1. Status and Checklist of birds recorded from study site Bhindawas, Haryana from October 2021 to October 2023

S. No.	Scientific name	Common name	Residential Status	IUCN Status	Population Trend	Feeding Guild
Order: Accipitriformes						
Family: Accipitridae						
1	*Circus aeruginosus*	Eurasian Marsh Harrier	WM	LC	Stable	CV
2	*Accipiter badius*	Shikra	R	LC	Stable	CV
3	*Elanus caeruleus*	Black Winged Kite	R	LC	Stable	CV
4	*Aquila nipalensis*	Steppe Eagle	WM	EN	Decreasing	CV
5	*Aquila clanga*	Greater Spotted Eagle	WM	V	Decreasing	CV
6	*Pernis ptilorhynchus*	Oriental Honey-buzzard	R	LC	Decreasing	CV
7	*Spilornis cheela*	Crested Serpent Eagle	R	LC	Stable	CV
Fmily: Pandionidae						
8	Pandion haliaetus	Osprey	WM	LC	Increasing	CV
Order: Anseriformes						
Family: Anatidae						
9	*Anser indicus*	Bar-Headed Goose	WM	LC	Decreasing	HV
10	*Dendrocygna javanica*	Lesser Whistling Duck	SM	LC	Decreasing	OV
11	*Sarkidiornis melanotos*	Knob Billed Duck	R	LC	Decreasing	OV
12	*Anas poecilorhyncha*	Spot-Billed Duck	R	LC	Decreasing	OV
13	*Anas acuta*	Northern Pintail	WM	LC	Decreasing	OV
14	*Anas clypeata*	Northern Shoveler	WM	LC	Decreasing	OV
15	*Anas strepera*	Gadwall	WM	LC	Increasing	OV
16	*Tadorna ferruginea*	Rudddy Shelduck	WM	LC	Unknown	OV
17	*Anser anser*	Greylag Goose	WM	LC	Increasing	OV
18	*Anas penelope*	Eurasian Wigeon	WM	LC	Decreasing	HV
19	*Anas crecca*	Common Teal	WM	LC	Unknown	OV
20	*Anas platyrhynchos*	Mallard	WM	LC	Increasing	OV
21	*Netta rufina*	Red-Crested Pochard	WM	LC	Unknown	OV
22	*Aythya marila*	Greater Scaup	WM	LC	Decreasing	OV
23	*Nettapus coromandelianus*	Cotton Pygmy-Goose	R	LC	Stable	OV
24	*Aythya nyroca*	Ferruginous Duck	WM	NT	Decreasing	OV
Order: Bucerotidae						
Family: Upupidae						
25	*Upupa epops*	Common Hoopoe	R	LC	Decreasing	IV
Family: Bucertidae						
26	*Ocyceros birostris*	Indian Grey Hornbill	R	LC	Stable	FV
Order: Charadriiformes						
Family: Charadriidae						
27	*Vanellus indicus*	Red-Wattled Lapwing	R	LC	Unknown	CV
28	*Charadrius dubius*	Little Ringed Plover	R	LC	Stable	CV
Family: Jacanidae						
29	*Metopidius indicus*	Bronze-winged Jacana	SM	LC	Unknown	OV
30	*Hydrophasianus chirurgus*	Pheasant- Tailed Jacana	SM	LC	Decreasing	OV

Contd….

Table 1. Contd.

Family: Recurvirostridae						
31	*Himantopus himantopus*	Black-Winged Stilt	R	LC	Increasing	CV
Family: Rostratulidae						
32	*Rostratula benghalensis*	Greater Painted Snipe	R	LC	Decreasing	OV
Family: Scolopacidae						
33	*Tringa tetanus*	Common Redshank	WM	LC	Unknown	CV
34	*Tringa glareola*	Wood Sandpiper	WM	LC	Stable	IV
35	*Tringa ochropus*	Green Sandpiper	WM	LC	Increasing	IV
36	*Actitis hypoleucos*	Common Sandpiper	WM	LC	Decreasing	CV
37	*Gallinago gallinago*	Common Snipe	WM	LC	Decreasing	CV
38	*Tringa stagnatilis*	Marsh Sandpiper	WM	LC	Decreasing	CV
Order: Ciconiiformes						
Family: Ciconiidae						
39	*Mycteria leucocephala*	Painted Stork	R	NT	Decreasing	CV
40	*Anastomus oscitans*	Asian Openbill Stork	R	LC	Unknown	CV
41	*Ciconia episcopus*	Wooly- Necked Stork	R	NT	Decreasing	CV
Order: Columbiformes						
Family: Columbidae						
42	*Columba livia*	Blue Rock Pigeon	R	LC	Decreasing	GV
43	*Stigmatopelia chinesis*	Spotted Dove	R	LC	Increasing	GV
44	*Stigmatopelia senegalensis*	Laughing Dove	R	LC	Stable	GV
45	*Streptopelia decaocto*	Eurasian Collared Dove	R	LC	Increasing	GV
46	*Treron phoenicopterus*	Yellow Footed Green Pigeon	R	LC	Increasing	FV
47	*Streptopelia orientalis*	Oriental Turtle Dove	WM	LC	Stable	GV
Order: Coraciiformes						
Family: Alcedinidae						
48	*Halcyon smyrnensis*	White Throated Kingfisher	R	LC	Increasing	CV
49	*Ceryl erudis*	Lesser Pied Kingfisher	R	LC	Unknown	CV
Family: Meropidae						
50	*Merops orientalis*	Green Bee Eater	SM	LC	Increasing	IV
51	*Merops philippinus*	Blue-Tailed Bee Eater	SM	LC	Stable	IV
Family: Coraciidae						
52	*Coracias benghalensis*	Indian Roller	R	LC	Increasing	CV
Order: Cuculiformes						
Family: Cuculidae						
53	*Centropus sinensis*	Greater Coucal	R	LC	Stable	OV
54	*Clamator jacobinus*	Jacobin Cuckoo	SM	LC	Stable	OV
55	*Eudynamys scolopaceus*	Asian Koel	SM	LC	Stable	OV
56	*Hierococcyx varius*	Common Hawk Cuckoo	PM	LC	Stable	IV
57	*Cuculus canorus*	Eurasian (Common) Cuckoo	SM	LC	Decreasing	IV
Order: Galliformes						
Family: Phasianidae						
58	*Francolinus pondicerianus*	Grey Francolin	R	LC	Stable	OV
59	*Pavo cristatus*	Indian Peafowl	R	LC	Stable	OV

Contd….

Table 1. Contd.

Order: Gruiformes						
Family: Rallidae						
60	*Amaurornis phoenicurus*	White-Breasted Waterhen	R	LC	Unknown	OV
61	*Fulica atra*	Common Coot	WM	LC	Increasing	OV
62	*Gallinula chloropus*	Common Moorhen	WM	LC	Stable	OV
63	*Porphyrio porphyrio*	Purple Swamphen	R	LC	Unknown	OV
Order: Passeriformes						
Family: Acrocephalide						
64	*Acrocephalus dumetorum*	Blyth's Reed Warbler	PM	LC	Increasing	IV
Family: Cisticolidae						
65	*Prinia inornate*	Plain Prinia	R	LC	Stable	IV
66	*Prinia socialis*	Ashy Prinia	R	LC	Stable	IV
67	*Orthotomus sutorius*	Common Tailorbird	R	LC	Stable	IV
Family: Corvidae						
68	*Corvus splendens*	House Crow	R	LC	Stable	OV
69	*Dendrocitta vagabunda*	Rufous Treepie	R	LC	Decreasing	OV
Family: Dicruridae						
70	*Dicrurus macrocercus*	Black Drongo	R	LC	Unknown	CV
Family: Estrildidae						
71	*Lonchura punctulate*	Scaly Breasted Munia	R	LC	Stable	GV
72	*Euodice malabarica*	Indian Silver Bill	R	LC	Stable	GV
Family: Hirundinidae						
73	*Hirundo smithii*	Wire Tailed Swallow	SM	LC	Increasing	IV
74	*Petrochelidon fluvicola*	Streak-Throated Swallow	R	LC	Increasing	IV
Family: Zosteropidae						
75	*Zosterops palpebrosus*	Orientalis (Indian) White –eye	R	LC	Decreasing	IV/NV
Family:Laniidae						
76	*Lanius schach*	Long Tailed Shrike	R	LC	Unknown	CV
77	*Lanius vittatus*	Bay –Backed Shrike	R	LC	Stable	CV
Family: Leiothrichidae						
78	*Turdoides caudata*	Common Babbler	R	LC	Stable	OV
79	*Turdoides earlei*	Striated Babbler	R	LC	Decreasing	OV
80	*Turdoides malcolmi*	Large Grey Babbler	R	LC	Stable	OV
81	*Turdoides striata*	Jungle Babbler	R	LC	Stable	OV
Family: Muscicapidae						
82	*Copsychus saularis*	Oriental Magpie-Robin	R	LC	Stable	IV
83	*Luscinia svecica*	Bluethroat	WM	LC	Stable	IV
84	*Cercomela fusca*	Brown Rock Chat	R	LC	Stable	IV
85	*Saxicola caprata*	Pied Bushchat	R	LC	Stable	IV
86	*Saxicoloides fulicatus*	Indian Robin	R	LC	Stable	IV
87	*Phoenicurus ochruros*	Black Redstart	WM	LC	Increasing	IV
88	*Ficedula parva*	Red-Breasted Flycatcher	WM	LC	Increasing	IV
89	*Saxicola torquatus*	Common Stonechat	WM	LC	Stable	IV

Contd….

Table 1. Contd.

Family: Motacillidae						
90	*Anthus rufulus*	Paddyfield Pipit	R	LC	Stable	IV
91	*Motacilla alba*	White Wagtail	WM	LC	Stable	IV
92	*Motacilla citreola*	Citrine Wagtail	WM	LC	Increasing	IV
93	*Motacilla flava*	Yellow Wagtail	WM	LC	Decreasing	IV
94	*Motacilla cinerea*	Grey Wagtail	WM	LC	Stable	IV
95	*Motacilla maderaspatensis*	White- Browed Wagtail	R	LC	Stable	IV
Family: Monarchidae						
96	*Terpsiphone paradisi*	Asian-Paradise Flycatcher	SM	LC	Stable	IV
Family: Nectariniidae						
97	*Cinnyris asiaticus*	Purple Sunbird	R	LC	Stable	NV
Family: Passeridae						
98	*Passer domesticus*	House Sparrow	R	LC	Decreasing	GV
Family: Paradoxonithidae						
99	*Chrysomma sinense*	Yellow-Eyed Babbler	R	LC	Stable	OV
Family: Ploceidae						
100	*Ploceus philippinus*	Baya Weaver	R	LC	Stable	OV
101	*Ploceus manyar*	Streaked Weaver	R	LC	Stable	OV
Family: Pycnonotidae						
102	*Pycnonotus cafer*	Red-Vented Bulbul	R	LC	Increasing	OV
Family: Phylloscopidae						
103	*Phylloscopus collybita*	Common Chiffchaff	WM	LC	Increasing	IV
Family: Sturnidae						
104	*Acridotheres ginginianus*	Bank Myna	R	LC	Increasing	OV
105	*Acridotheres tristis*	Common Myna	R	LC	Increasing	OV
106	*Gracupica contra*	Asian Pied Starling	R	LC	Increasing	OV
107	*Sturnus vulgaris*	Common Starling	WM	LC	Decreasing	OV
Family: Vangidae						
108	*Tephrodornis pondicerianus*	Common Wood Shrike	R	LC	Stable	IV
Order: Pelecaniformes						
Family: Ardeidae						
109	*Ardea cinerea*	Grey Heron	R	LC	Unknown	CV
110	*Ardea purpurea*	Purple Heron	R	LC	Increasing	CV
111	*Ardeola grayii*	Indian Pond Heron	R	LC	Unknown	CV
112	*Bubulcus ibis*	Cattle Egret	R	LC	Increasing	CV
113	*Casmerodius albus*	Large Egret	R	LC	Unknown	CV
114	*Egretta garzetta*	Little Egret	R	LC	Increasing	CV
115	*Mesophoyx intermedia*	Median Egret	R	LC	Decreasing	CV
116	*Nycticorax nycticorax*	Night Heron	R	LC	Decreasing	CV
Family: Threskiornithidae						
117	*Pseudibis papillosa*	Red Naped Ibis	R	LC	Decreasing	CV
118	*Plegadis falcinellus*	Glossy Ibis	WM	LC	Increasing	CV
119	*Threskiornis melanocephalus*	Black Headed Ibis	R	NT	Decreasing	CV

Contd….

Table 1. Contd.

Order: Piciformes						
Family: Megalaimidae						
120	*Megalaima haemacephala*	Coppersmith Barbet	R	LC	Increasing	FV
Family: Picidae						
121	*Dinopium benghalense*	Lesser Goldenback	R	LC	Stable	IV
Order: Podicipediformes						
Family: Podicipedidae						
122	*Tachybaptus ruficollis*	Little Grebe	R	LC	Decreasing	OV
Order: Psittaciformes						
Family: Psittacidae						
123	*Psittacula eupatria*	Alexandrine Parakeet	R	NT	Decreasing	FV
124	*Psittacula krameria*	Rose Ringed Parakeet	R	LC	Increasing	FV
Order: Strigiformes						
Family: Strigidae						
125	*Athene brama*	Spotted Owlet	R	LC	Stable	CV
Order: Suliformes						
Family: Anhingidae						
126	*Anhinga melanogaster*	Oriental Darter	R	NT	Decreasing	CV
Order: Phalacrocoracidae						
127	*Phalacrocorax carbo*	Great Cormorant	R	LC	Increasing	CV
128	*Phalacrocorax fuscicollis*	Indian Cormorant	R	LC	Unknown	CV
129	*Phalacrocorax niger*	Little Cormorant	R	LC	Unknown	CV

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

ruginous Duck associated to the family Anatidae of the Anseriformes order. In an earlier study, 119 avian species spotted by Singh *et al*. (2019) at Bhindawas Bird Sanctuary revealed 6 near threatened and 1 vulnerable species. Among the near-threatened species, 5 species were commonly spotted in the study, while 1 species Wolley- Necked Stork was not spotted in their study and 1 species Black- Necked Stork was not spotted in this study. Chopra *et al*. (2017) found 4 near threatened, 2 vulnerable species and 98 were least concerned out of 104 avian species. However, none of the earlier studies reported the presence of endangered species, whereas this study identified Steppe Eagle (*Aquila nipalensis)* as a single endangered species, emphasizing the necessity for conservation efforts and regular assessments of avian diversity at the study site.

The assessment of global population trends within the study area revealed that the most dominant trend was stable with 46 species, 35 species with a decreasing global population trend, 31 species with an increasing trend and 17 species with an unknown global trend (Fig. 4). The significant number of species showing a declining trend highlights the continued availability of suitable resources for these species within the study site.

The guild-wise analysis of the 129 bird species showed that the highest number of species belonged to the omnivorous (n=41) followed by carnivorous (n = 40), insectivorous (n = 32), granivorous (n = 8), frugivorous (n = 5) and the least represented guild were nectarivorous and herbivorous (n = 2). The significant number of car-

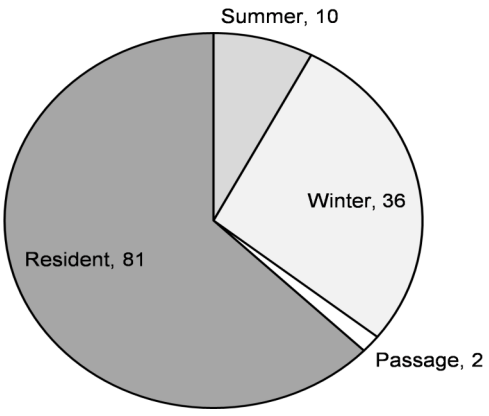

Fig. 2. *Migratory status observed in avian community recorded at Bhindawas Bird Sanctuary, Jhajjar, Haryana (Numbers represent the number of species classified in different categories)*

Table 2. Relative diversity of avian diversity documented at Bhindawas Bird Sanctuary, Jhajjar, Haryana

No.	Family	No. of Genera	No. of Species	Relative Diversity
1	Anatidae	8	16	12.4
2	Ardeidae	7	8	6.2
3	Muscicapidae	7		
4	Accipitridae	6	7	5.43
5	Scolopacidae	3	6	4.65
6	Motacillidae	2		
7	Columbidae	4	5	3.88
8	Cuculidae	5		
9	Sturnidae	3	4	3.1
10	Rallidae	4		
11	Leiothrichidae	1		
12	Cisticolidae	2		
13	Threskiornithidae	3	3	2.33
14	Ciconiidae	3		
15	Phalacrocoracidae	1		
16	Hirundinidae	2	2	1.55
17	Corvidae	2		
18	Estrildidae	2		
19	Charadriidae	2		
20	Alcedinidae	2		
21	Phasianidae	2		
22	Laniidae	1		
23	Ploceidae	1		
24	Psittaculidae	1		
25	Jacanidae	2		
26	Meropidae	1		
27	Recurvirostridae	1		
28	Acrocephalidae	1		
29	Passeridae	1		
30	Upupidae	1		
31	Coraciidae	1		
32	Rostratulidae	1		
33	Bucertidae	1		
34	Dicruridae	1		
35	Nectariniidae	1		
36	Pycnonotidae	1		
37	Pandionidae	1	1	0.78
38	Megalaimidae	1		
39	Picidae	1		
40	Podicipedidae	1		
41	Strigidae	1		
42	Anhingidae	1		
43	Josteropidae	1		
44	Monarchidae	1		
45	Phylloscopidae	1		
46	Paradoxonithidae	1		
47	Vangidae	1		

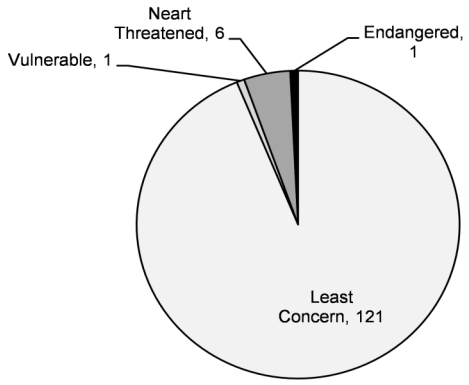

Fig. 3. *Threat status (IUCN) of avian diversity recorded at Bhindawas Bird Sanctuary, Jhajjar, Haryana (Numbers represent the number of species classified in different categories)*

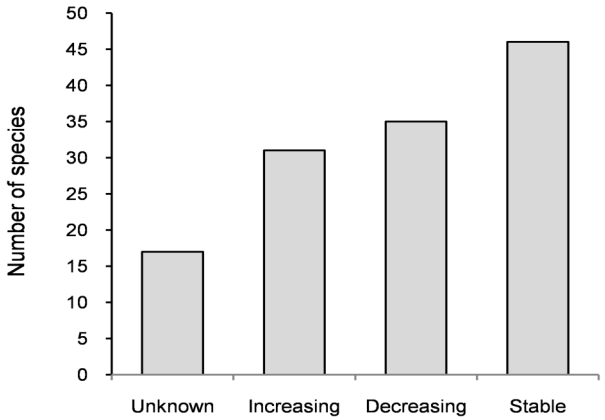

Fig. 4. *Population trends (IUCN) of avian community recorded at Bhindawas Bird Sanctuary, Jhajjar, Haryana (Numbers represent the number of species classified in different categories)*

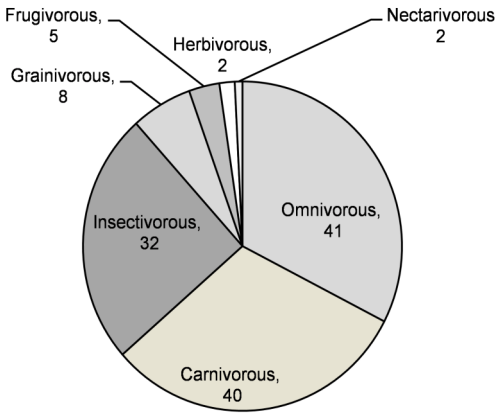

Fig. 5. *Feeding habits observed in avian community observed at Bhindawas Bird Sanctuary, Jhajjar, Haryana (Numbers represent the number of species classified in different categories)*

nivorous, omnivorous, and insectivorous species suggests an abundant food supply in the study site, attracting a large population of migratory birds (Fig. 5). Notably, all the threatened, vulnerable and endangered species identified at the study site were non-passerine, likely due to their specialized diet, mainly feeding on aquatic fauna and flora. The substantial number of passerine birds in the study area indicates a broad spectrum of feeding guilds due to the presence of irrigated agricultural fields, fallow land and shrubby vegetation around the lake periphery, making them less susceptible to habitat destruction.Therefore, analyzing feeding guilds can be essential in understanding threats and biodiversity composition.

Conclusion

The presence of 48 migratory bird species, 08 bird species of global conservation importance and 35 bird species with a globally declining population trend indicated the importance of conservation of the Bhindawas Bird Sanctuary, Jhajjar, Haryana. The major threat to avian diversity in the study site was the overgrowth of exotic weeds and water hyacinths, which spread over the entire wetland and the intrusion of human beings, disturbing the bird's natural habitat and affecting the feeding and breeding ground. The present study suggests regular monitoring and effective management for the conservation of the Bhindawas Bird Sanctuary.

Conflict of Interest

The authors declare that they have no conflict of interest.

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