

Avifaunal diversity and status of Chhilchhila Wildlife Sanctuary, India

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Abstract Chhilchhila Wildlife Sanctuary, located in Haryana, India, represents a vital habitat for diverse avifaunal species. This study systematically documents the avifaunal diversity of the sanctuary, emphasizing its ecological significance and conservation status. Field surveys, conducted fortnightly using line transect and point count methods from October 2022 to September 2024, recorded a total of 162 species belonging to 18 orders, 56 families and 118 genera. The order Passeriformes exhibited the highest species richness (66 species), followed by Charadriiformes (18 species) and Anseriformes (13 species). Anatidae was the most diverse family with 13 species ($RD_i = 8.02$), followed by Muscipidae with 11 species ($RD_i = 6.80$) and Scolopacidae with 10 species ($RD_i = 6.17$). Of the recorded species, 88 species (54.32%) were resident, 12 (7.4%) were summer migrant and 62 (38.28%) were winter migrant, highlighting the sanctuary's importance as a critical migratory stopover. Local abundance assessments classified 27.16% of the species as abundant, 19.75% as common, 16.67% as fairly common and 36.42% as rare. Conservation status analysis revealed that Common Pochard (*Aythya ferina*) and River Tern (*Sterna aurantia*) classified under Vulnerable and Asian Woolly-necked Stork (*Ciconia episcopus*) and Alexandrine Parakeet (*Psittacula eupatria*) under Near Threatened categories by the IUCN Red List, with 46 species (28.40%) showing declining population trends globally. These findings underscore the sanctuary's role as a biodiversity hotspot, necessitating continued monitoring and conservation efforts.

Keywords: avian biodiversity, conservation biology, ecological indicator, migratory birds, seasonal variations

Összefoglalás Az indiai Haryanában található Chhilchhila Wildlife Sanctuary létfontosságú élőhelyet jelent a különböző madárfajok számára. Ez a tanulmány dokumentálja a terület madárvilágának sokféleségét, kiemelve annak ökológiai jelentőségét és természetvédelmi helyzetét. A 2022 októberé és 2024 szeptemberé között kéthetente végzett terepi felmérések során transzekt mentén és pontszámlálást alkalmazva összesen 162 fajt figyeltünk meg, amelyek 18 rendhez, 56 családhoz és 118 nemzetséghez tartoztak. A legnagyobb fajgazdagságot a Passeriformes rend mutatta (66 faj), amelyet a Charadriiformes (18 faj) és az Anseriformes (13 faj) követett. Az Anatidae volt a legváltozatosabb család 13 fajjal ($RD_i = 8,02$), amelyet a Muscipidae 11 fajjal ($RD_i = 6,80$) és a Scolopacidae 10 fajjal ($RD_i = 6,17$) követett. A megfigyelt fajok közül 88 (54,32%) rezidens, 12 (7,4%) nyári vonuló és 62 (38,28%) téli vonuló volt, ami rávilágít a terület fontosságára, mint kritikus vonulási megállóhelyre. A lokális abundancia értékelése szerint a fajok 27,16%-a tömeges, 19,75%-a gyakori, 16,67%-a meglehetősen gyakori és 36,42%-a ritka volt. A természetvédelmi helyzetelemzés kimutatta, hogy a barátréce (*Aythya ferina*) és a folyómenti csér (*Sterna aurantia*) a veszélyeztetett, az ázsiai gyapjasnyakúgólya (*Ciconia episcopus*) és a Nagy Sándor-papagáj (*Psittacula eupatria*) pedig a közel veszélyeztetett kategóriába tartozik az IUCN vörös listája szerint. 46 faj (28,40%) populációja csökkenő tendenciát mutat világszerte. Ezek az eredmények kiemelik, hogy a védett terület a biológiai sokféleség egyik forró pontjaként működik, ami folyamatos megfigyelést és védelmi erőfeszítéseket igényel.

Kulcsszavak: madarak diverzitása, természetvédelmi biológia, ökológiai indikátor, vonuló madarak, szezonális variációk

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Introduction

Biodiversity plays a pivotal role in maintaining the balance and health of ecosystems, providing ecological services, and supporting human well-being. Among the various components of biodiversity, avifaunal diversity plays a crucial role in maintaining ecological balance and serves as an important bioindicator of environmental health (Bibby *et al.* 2000, Gregory *et al.* 2009). Birds occupy diverse trophic levels, exhibit wide-ranging habitat preferences, and are highly sensitive to environmental changes, making them ideal subjects for biodiversity and conservation studies (Sekercioglu 2006). Studying avifaunal diversity not only enhances our understanding of ecosystem functioning but also provides insights into the impacts of anthropogenic pressures, such as habitat loss, climate change and pollution (Chace & Walsh 2006, Jetz *et al.* 2007). Documenting and analyzing avifaunal diversity is therefore crucial for understanding ecosystem dynamics and formulating effective conservation strategies. Globally, more than 11,000 bird species have been recorded, with their distribution influenced by geographical, climatic, and ecological factors (BirdLife International 2024). Regions with higher habitat heterogeneity often exhibit greater bird diversity due to the availability of resources and niche opportunities (MacArthur & MacArthur 1961). In tropical and subtropical regions, where biodiversity is at its peak, bird species play essential roles in seed dispersal, pollination and pest control (Sekercioglu *et al.* 2004). Despite their ecological significance, many bird populations are declining at alarming rates. Studies report that approximately 1 in 8 bird species is threatened with extinction due to deforestation, agricultural expansion and urbanization (IPBES 2019, BirdLife International 2024). Documenting and monitoring avifaunal diversity are, therefore, crucial to inform conservation efforts and assess the effectiveness of policies aimed at safeguarding biodiversity (Ceballos *et al.* 2017).

India, renowned for its rich biodiversity, is home to an incredible variety of avian species, owing to its diverse landscapes and climates. Stretching from the towering Himalayas in the north to the tropical rainforests in the south, the country features a wide range of habitats, including wetlands, grasslands, forests, deserts and mangroves. India is considered as one of the 17 mega-biodiverse countries and also acts as a hotspot for avian diversity by hosting 1,364 bird species that covers 26 orders, 115 families and 497 genera including several endemic and migratory bird species (Praveen & Jayapal 2024). Haryana, a north Indian state, complements this national diversity with its unique blend of landscapes. Despite its relatively small geographical size and only 3.65% (1,613.74 km²) of its area under forest and tree cover (ISFR 2023), Haryana's landscapes dominated by plains, also includes Shivalik foothills in the north and semi-arid regions in the south. Haryana's wetlands, particularly Ramsar sites such as Sultanpur National Park and Bhindawas Bird Sanctuary, serve as crucial stopover sites for migratory birds, attracting species from Central Asia and Europe. The state's agricultural fields, forests and river systems further enhance its importance for both resident and migratory bird species, contributing significantly to India's overall avian diversity.

Chhilchhila Wildlife Sanctuary, located in Haryana, encompasses a variety of habitats, including wetlands and forested areas, making it a significant refuge for numerous bird species. Previous research has documented the presence of 57 species of wetland birds in Chhilchhila Wildlife Sanctuary, spanning 37 genera and 16 families, with notable species

including the Oriental Darter (*Anhinga melanogaster*) and the Painted Stork (*Mycteria leucocephala*), both were classified as Near Threatened (Kumar & Gupta 2013). However, there is a paucity of recent data on the current status of avifaunal diversity in the sanctuary.

The present study aims to address this gap by providing an updated assessment of the avifaunal diversity in Chhilchhila Wildlife Sanctuary, focusing on species composition, abundance and conservation status. The findings from this study are anticipated to have broader implications for biodiversity conservation, particularly in the context of increasing habitat degradation and climate change. Furthermore, the research highlights the need for integrating local communities and stakeholders in conservation initiatives to ensure the long-term protection of such ecologically valuable areas.

Material and Methods

Study area

The study was conducted in Chhilchhila Wildlife Sanctuary, located between 29°52'–30°00' N latitudes and 76°36'–76°46' E longitudes, in Kurukshetra district of Haryana, India (Figure 1). It was designated as a bird sanctuary in November 1986. The sanctuary covers an area of approximately 28.92 hectares and features diverse habitats, including

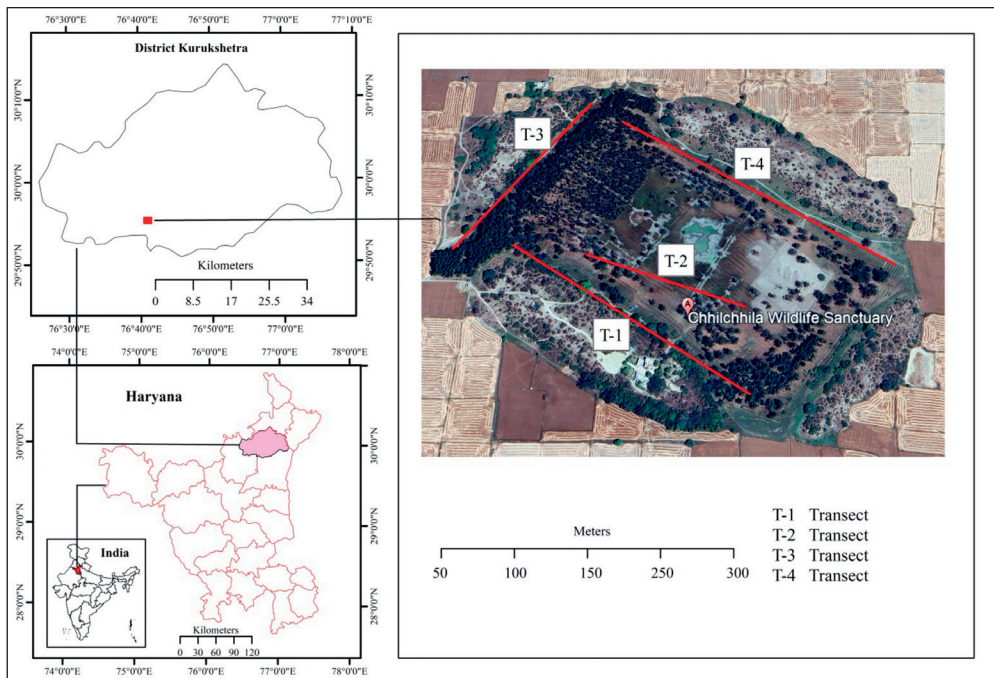


Figure 1. Map of study area showing four transects (T1 to T4) of Chhilchhila Wildlife Sanctuary, India
 1. ábra Az indiai Chhilchhila Wildlife Sanctuary területén található kutatási terület térképe a négy transzekttel (T1-től T4-ig)

wetlands, grasslands, and scattered woodland patches. The sanctuary features a shallow, rain-fed lake whose water levels fluctuate seasonally, ranging from about 4.5 meters during the monsoon to 1.8–2.7 meters in the summer (Kumar & Gupta 2013). The climate of the region is subtropical, characterized by hot summers, monsoon rains and cool winters.

The sanctuary's vegetation structure is dominated by dry deciduous communities, supporting a variety of plant species. The vegetation plays a critical role in sustaining diverse wildlife, especially birds. Major tree species includes babool (*Acacia arabica*), neem (*Azadirachta indica*), khejri (*Prosopis cineraria*), shisham (*Dalbergia sissoo*), banyan (*Ficus benghalensis*), peepal (*Ficus religiosa*), safeda (*Eucalyptus hybrida*) and vilayati kikar (*Prosopis juliflora*), shrubs and herbs include karir (*Capparis decidua*), aak (*Calotropis procera*) and vasaka (*Adhatoda vasica*), while aquatic and wetland plants include *Hydrilla* sp., *Typha* sp., *Cyperus* sp., *Azolla* sp. and various native grass species that support herbivorous wildlife and prevent soil erosion.

Methodology

Avifaunal surveys were carried out fortnightly from October 2022 to September 2024, using line transect and point count methods (Gaston 1975, Sutherland *et al.* 2005), which are recognised as standard techniques for bird population studies. Observations were conducted during the early morning hours (6:00 AM to 10:00 AM) and late afternoon hours (4:00 PM to 6:00 PM) when bird activity is highest. Four line transects, each varying in length and traversing distinct habitats, were established in different directions to ensure thorough coverage of the sanctuary (Table 1). Birds were observed while walking slowly along a fixed path, recording all birds seen or heard over the transect line. Binoculars (Nikon 10×50) were used for observing and identifying birds from a distance, while a digital camera (Nikon Coolpix P1000) was used to capture photographs of the birds for documentation. Identification was confirmed using standard field guides (Grimmett *et al.* 2016, Kalsi *et al.* 2019), and re-verified by smartphone applications like eBird and Merlin Bird ID. Records of species presence were cross-checked with historical bird records for the sanctuary, and species not previously documented were confirmed with regional ornithological experts.

Table 1. Depiction of transects with varying lengths and habitats in Chhilchhila Wildlife Sanctuary, India

1. táblázat A különböző hosszúságú és élőhelyeken áthaladó transzektek leírása az indiai Chhilchhila Wildlife Sanctuary területén

Sr. No.	Transects number	Transects length	Habitats
1.	T1	0.52 km	Agricultural fields, Fallow land, Forest Patches
2.	T2	0.38 km	Aquatic, Littoral zone, Forest Patches
3.	T3	0.64 km	Littoral Zone, Fallow land, Tree Plantations
4.	T4	0.55 km	Aquatic, Littoral zone, Agricultural fields, Forest Patches, Fallow land

A checklist of observed avian species was compiled, including their scientific name, common name, family, order and genus as per IOC World Bird List (v14.2) and other relevant sources (Praveen & Jayapal 2022, Gill *et al.* 2024, IUCN 2024). Residential/migratory status was assessed based on available literature, observations and seasonal variations in species presence. Birds were categorized strictly with reference to the study area as resident (species present year-round), winter migrant (species that visit the sanctuary during October–March months), or summer migrant (species that visit the sanctuary during April–September months). The local abundance status of each bird species was calculated based on the number of surveys during which each species was observed. Different categories assigned were abundant, common, fairly common, or rare according to the frequency of their sightings. The conservation status (Least Concern, Near Threatened, Vulnerable) and global population trends (increasing ↑, decreasing ↓, stable → and unknown ?) of reported bird species were assessed as per IUCN Red List (IUCN 2024). The Relative Diversity index (RDi) of bird families was assessed using the formula provided by Torre-Cuadros *et al.* (2007):

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

Results

A total of 162 bird species were recorded in the study area during the study period, representing 118 genera, 56 families and 18 orders (*Table 2*). The highest species richness was observed in the order Passeriformes (songbirds), with 66 species, accounting for 40.74% of the total bird species recorded. This was followed by Charadriiformes (shorebirds and seabirds) with 18 species (11.11%), Anseriformes (waterfowls) with 13 species (8.02%), Pelecaniformes (pelicans and relatives) with 12 species (7.4%), Accipitriformes (hawks, eagles and allies) with eight species (4.94%), Columbiformes (pigeons and doves) with seven species (4.32%) and others (Caprimulgiformes and Podicipediformes, each represented by only a single species). The diverse order-wise composition reflects the sanctuary's varied habitats, which support a broad spectrum of avian species. The assessment of Relative Diversity index of the 56 families showed that Anatidae was the most diverse (13 species, RDi = 8.02), followed by Muscicapidae (11 species, RDi = 6.80), Scolopacidae (10 species, RDi = 6.17), Ardeidae (eight species, RDi = 4.94), Accipitridae, Columbidae and Motacillidae (seven species each, RDi = 4.32) and others. However, many families (25 in total) such as Pandionidae, Upupidae, Bucerotidae, Glareolidae, Jacanidae, Recurvirostridae, Burhinidae, Laridae, Coraciidae, Apodidae, Acrocephalidae, Fringillidae, Nectariniidae, Pycnonotidae, Ploceidae, Leiothrichidae, Monarchidae, Oriolidae, Paridae, Stenostiridae, Zosteropidae, Podicipedidae, Strigidae, Tytonidae and Anhingidae had the lowest representation metrics (one species each, RDi = 0.62). The analysis of RDi values revealed that the study area supports a diverse avian community, with a major representation of waterfowls, songbirds, and shorebirds (*Table 2*, *Figure 2*). While some families dominated due to habitat suitability, many are under-represented, indicating potential areas for conservation focus and underscore the sanctuary's ecological importance.

Table 2. List of avian species recorded from October 2022 to September 2024 in Chhilchhila Wildlife Sanctuary, India

2. táblázat Az indiai Chhilchhila Wildlife Sanctuary területén 2022 októbere és 2024 szeptembere között megfigyelt madárfajok listája

Sr. No.	Common name	Scientific name with Authority	Residential Status	Local Abundance Status	IUCN Status	Population Trend
ORDER GALLIFORMES (No. of Species = 3 and No. of Families = 1)						
Family Phasianidae (3), RDi = 1.85						
1	Indian Peafowl	<i>Pavo cristatus</i> Linnaeus, 1758	R	A	LC	→
2	Grey Francolin	<i>Ortygornis pondicerianus</i> (Gmelin, JF, 1789)	R	A	LC	→
3	Black Francolin	<i>Francolinus francolinus</i> (Linnaeus, 1766)	R	RA	LC	→
ORDER ANSERIFORMES (No. of Species = 13 and No. of Families = 1)						
Family Anatidae (13), RDi = 8.02						
4	Knob-billed Duck	<i>Sarkidiornis melanotos</i> (Pennant, 1769)	R	C	LC	↓
5	Common Pochard	<i>Aythya ferina</i> (Linnaeus, 1758)	WM	RA	VU	↓
6	Eurasian Wigeon	<i>Mareca penelope</i> (Linnaeus, 1758)	WM	C	LC	↓
7	Gadwall	<i>Mareca strepera</i> (Linnaeus, 1758)	WM	C	LC	↑
8	Eurasian Teal	<i>Anas crecca</i> Linnaeus, 1758	WM	A	LC	?
9	Indian Spot-billed Duck	<i>Anas poecilorhyncha</i> Forster, JR, 1781	R	A	LC	↓
10	Northern Pintail	<i>Anas acuta</i> Linnaeus, 1758	WM	A	LC	↓
11	Lesser Whistling Duck	<i>Dendrocygna javanica</i> (Horsfield, 1821)	SM	A	LC	↓
12	Northern Shoveler	<i>Spatula clypeata</i> (Linnaeus, 1758)	WM	A	LC	↓
13	Garganey	<i>Spatula querquedula</i> (Linnaeus, 1758)	WM	RA	LC	↓
14	Greylag Goose	<i>Anser anser</i> (Linnaeus, 1758)	WM	FC	LC	↑
15	Ruddy Shelduck	<i>Tadorna ferruginea</i> (Pallas, 1764)	WM	RA	LC	?
16	Cotton Pygmy Goose	<i>Nettapus coromandelianus</i> (Gmelin, JF, 1789)	WM	RA	LC	?
ORDER CAPRIMULGIFORMES (No. of Species = 1 and No. of Families = 1)						
Family Apodidae (1), RDi = 0.62						
17	Little Swift	<i>Apus affinis</i> (Gray, JE, 1830)	R	RA	LC	↑
ORDER CUCULIFORMES (No. of Species = 5 and No. of Families = 1)						
Family Cuculidae (5), RDi = 3.08						
18	Greater Coucal	<i>Centropus sinensis</i> (Stephens, 1815)	R	A	LC	→
19	Asian Koel	<i>Eudynamis scolopaceus</i> (Linnaeus, 1758)	SM	A	LC	→
20	Jacobin Cuckoo	<i>Clamator jacobinus</i> (Boddaert, 1783)	SM	C	LC	→
21	Common Hawk-Cuckoo	<i>Hierococcyx varius</i> (Vahl, 1797)	SM	C	LC	↓
22	Grey-bellied Cuckoo	<i>Cacomantis passerinus</i> (Vahl, 1797)	SM	RA	LC	→

Sr. No.	Common name	Scientific name with Authority	Residential Status	Local Abundance Status	IUCN Status	Population Trend
ORDER COLUMBIFORMES (No. of Species = 7 and No. of Families = 1)						
Family Columbidae (7), RDi = 4.32						
23	Rock Dove	<i>Columba livia</i> Gmelin, JF, 1789	R	A	LC	↓
24	Yellow-footed Green Pigeon	<i>Treron phoenicopterus</i> (Latham, 1790)	R	A	LC	↑
25	Eurasian Collared Dove	<i>Streptopelia decaocto</i> (Fridvaldszky, 1838)	R	A	LC	↑
26	Oriental Turtle Dove	<i>Streptopelia orientalis</i> (Latham, 1790)	WM	RA	LC	↓
27	Red Collared Dove	<i>Streptopelia tranquebarica</i> (Hermann, 1804)	R	RA	LC	↓
28	Laughing Dove	<i>Spilopelia senegalensis</i> (Linnaeus, 1766)	R	A	LC	→
29	Spotted Dove	<i>Spilopelia chinensis</i> (Scopoli, 1786)	R	A	LC	↑
ORDER GRUIFORMES (No. of Species = 4 and No. of Families = 1)						
Family Rallidae (4), RDi = 2.47						
30	Common Moorhen	<i>Gallinula chloropus</i> (Linnaeus, 1758)	R	A	LC	→
31	Eurasian Coot	<i>Fulica atra</i> Linnaeus, 1758	WM	C	LC	↑
32	Purple Swampphen	<i>Porphyrio porphyrio</i> (Linnaeus, 1758)	R	C	LC	?
33	White-breasted Waterhen	<i>Amaurornis phoenicurus</i> (Pennant, 1769)	R	A	LC	?
ORDER PODICIPEDIFORMES (No. of Species = 1 and No. of Families = 1)						
Family Podicipedidae (1), RDi = 0.62						
34	Little Grebe	<i>Tachybaptus ruficollis</i> (Pallas, 1764)	R	C	LC	↓
ORDER CHARADRIIFORMES (No. of Species = 18 and No. of Families = 7)						
Family Charadriidae (3), RDi = 1.85						
35	Red-wattled Lapwing	<i>Vanellus indicus</i> (Boddaert, 1783)	R	A	LC	?
36	White-tailed Lapwing	<i>Vanellus leucurus</i> (Lichtenstein, MHC, 1823)	WM	RA	LC	?
37	Little Ringed Plover	<i>Charadrius dubius</i> Scopoli, 1786	WM	RA	LC	→
Family Glareolidae (1), RDi = 0.62						
38	Oriental Pratincole	<i>Glareola maldivarum</i> Forster, JR, 1795	SM	RA	LC	→
Family Jacanidae (1), RDi = 0.62						
39	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i> (Scopoli, 1786)	SM	FC	LC	?
Family Recurvirostridae (1), RDi = 0.62						
40	Black-winged Stilt	<i>Himantopus himantopus</i> (Linnaeus, 1758)	R	A	LC	↑
Family Burhinidae (1), RDi = 0.62						
41	Indian Thick-Knee or Indian Stone-curlew	<i>Burhinus indicus</i> (Salvadori, 1866)	R	RA	LC	?

Sr. No.	Common name	Scientific name with Authority	Residential Status	Local Abundance Status	IUCN Status	Population Trend
Family Scolopacidae (10), RDi = 6.17						
42	Temminck's Stint	<i>Calidris temminckii</i> (Leisler, 1812)	WM	RA	LC	?
43	Ruff	<i>Calidris pugnax</i> (Linnaeus, 1758)	WM	FC	LC	↓
44	Little Stint	<i>Calidris minuta</i> (Leisler, 1812)	WM	RA	LC	↑
45	Spotted Redshank	<i>Tringa erythropus</i> (Pallas, 1764)	WM	FC	LC	→
46	Common Greenshank	<i>Tringa nebularia</i> (Gunnerus, 1767)	WM	FC	LC	→
47	Green Sandpiper	<i>Tringa ochropus</i> Linnaeus, 1758	WM	A	LC	↑
48	Common Redshank	<i>Tringa totanus</i> (Linnaeus, 1758)	WM	FC	LC	?
49	Wood Sandpiper	<i>Tringa glareola</i> Linnaeus, 1758	WM	C	LC	→
50	Common Snipe	<i>Gallinago gallinago</i> (Linnaeus, 1758)	WM	RA	LC	↓
51	Common Sandpiper	<i>Actitis hypoleucos</i> (Linnaeus, 1758)	WM	C	LC	↓
Family Laridae (1), RDi = 0.62						
52	River Tern	<i>Sterna aurantia</i> Gray, JE, 1831	R	RA	VU	↓
ORDER CICONIIFORMES (No. of Species = 3 and No. of Families = 1)						
Family Ciconiidae (3), RDi = 1.85						
53	Asian Woolly-necked Stork	<i>Ciconia episcopus</i> (Boddaert, 1783)	R	C	NT	↓
54	Painted Stork	<i>Mycteria leucocephala</i> (Pennant, 1769)	R	C	LC	↑
55	Asian Openbill	<i>Anastomus oscitans</i> (Boddaert, 1783)	R	RA	LC	?
ORDER SULIFORMES (No. of Species = 4 and No. of Families = 2)						
Family Anhingidae (1), RDi = 0.62						
56	Oriental Darter	<i>Anhinga melanogaster</i> Pennant, 1769	WM	FC	LC	↑
Family Phalacrocoracidae (3), RDi = 1.85						
57	Little Cormorant	<i>Microcarbo niger</i> (Vieillot, 1817)	R	A	LC	?
58	Great Comorant	<i>Phalacrocorax carbo</i> (Linnaeus, 1758)	WM	A	LC	↑
59	Indian Cormorant	<i>Phalacrocorax fuscicollis</i> Stephens, 1826	R	FC	LC	?
ORDER PELECANIFORMES (No. of Species = 12 and No. of Families = 2)						
Family Ardeidae (8), RDi = 4.94						
60	Purple Heron	<i>Ardea purpurea</i> Linnaeus, 1766	R	A	LC	↓
61	Grey Heron	<i>Ardea cinerea</i> Linnaeus, 1758	R	A	LC	?
62	Great White Egret	<i>Ardea alba</i> Linnaeus, 1758	R	C	LC	?
63	Intermediate Egret	<i>Ardea intermedia</i> Wagler, 1829	R	A	LC	↓
64	Indian Pond Heron	<i>Ardeola grayii</i> (Sykes, 1832)	R	A	LC	?
65	Cattle Egret	<i>Bubulcus ibis</i> (Linnaeus, 1758)	R	A	LC	↑
66	Little Egret	<i>Egretta garzetta</i> (Linnaeus, 1766)	R	C	LC	↑
67	Black-crowned Night Heron	<i>Nycticorax nycticorax</i> (Linnaeus, 1758)	R	FC	LC	↓

Sr. No.	Common name	Scientific name with Authority	Residential Status	Local Abundance Status	IUCN Status	Population Trend
Family Threskiornithidae (4), RDi = 2.47						
68	Black-headed Ibis	<i>Threskiornis melanocephalus</i> (Latham, 1790)	R	FC	LC	↑
69	Eurasian Spoonbill	<i>Platalea leucorodia</i> Linnaeus, 1758	WM	RA	LC	?
70	Red-naped Ibis	<i>Pseudibis papillosa</i> (Temminck, 1824)	R	FC	LC	↓
71	Glossy Ibis	<i>Plegadis falcinellus</i> (Linnaeus, 1766)	R	RA	LC	↓
ORDER ACCIPITRIFORMES (No. of Species = 8 and No. of Families = 2)						
Family Accipitridae (7), RDi = 4.32						
72	Black Kite	<i>Milvus migrans</i> (Boddaert, 1783)	R	C	LC	→
73	Brahminy Kite	<i>Haliastur indus</i> (Boddaert, 1783)	WM	C	LC	↓
74	Black-winged Kite	<i>Elanus caeruleus</i> (Desfontaines, 1789)	R	FC	LC	→
75	Crested Serpent Eagle	<i>Spilornis cheela</i> (Latham, 1790)	R	RA	LC	→
76	Oriental Honey-Buzzard	<i>Pernis ptilorhynchus</i> (Temminck, 1821)	R	RA	LC	↓
77	Shikra	<i>Accipiter badius</i> (Gmelin, JF, 1788)	R	A	LC	→
78	Western Marsh Harrier	<i>Circus aeruginosus</i> (Linnaeus, 1758)	WM	RA	LC	→
Family Pandionidae (1), RDi = 0.62						
79	Osprey	<i>Pandion haliaetus</i> (Linnaeus, 1758)	WM	RA	LC	↑
ORDER STRIGIFORMES (No. of Species = 2 and No. of Families = 2)						
Family Strigidae (1), RDi = 0.62						
80	Spotted Owlet	<i>Athene brama</i> (Temminck, 1821)	R	A	LC	→
Family Tytonidae (1), RDi = 0.62						
81	Common Barn Owl	<i>Tyto alba</i> (Scopoli, 1769)	R	RA	LC	→
ORDER BUCEROTIFORMES (No. of Species = 2 and No. of Families = 2)						
Family Upupidae (1), RDi = 0.62						
82	Common Hoopoe	<i>Upupa epops</i> Linnaeus, 1758	R	C	LC	↓
Family Bucerotidae (1), RDi = 0.62						
83	Indian Grey Hornbill	<i>Ocyrceros birostris</i> (Scopoli, 1786)	R	C	LC	→
ORDER CORACIIFORMES (No. of Species = 5 and No. of Families = 3)						
Family Alcedinidae (2), RDi = 1.23						
84	White-throated Kingfisher	<i>Halcyon smyrnensis</i> (Linnaeus, 1758)	R	A	LC	↑
85	Pied Kingfisher	<i>Ceryle rudis</i> (Linnaeus, 1758)	R	RA	LC	?
Family Meropidae (2), RDi = 1.23						
86	Green Bee-eater	<i>Merops orientalis</i> Latham, 1801	SM	A	LC	↑
87	Blue-tailed Bee-eater	<i>Merops philippinus</i> Linnaeus, 1767	SM	C	LC	→
Family Coraciidae (1), RDi = 0.62						
88	Indian Roller	<i>Coracias benghalensis</i> (Linnaeus, 1758)	R	RA	LC	↑

Sr. No.	Common name	Scientific name with Authority	Residential Status	Local Abundance Status	IUCN Status	Population Trend
ORDER PICIFORMES (No. of Species = 5 and No. of Families = 2)						
Family Megalaimidae (2), RDi = 1.23						
89	Brown-headed Barbet	<i>Psilopogon zeylanicus</i> (Gmelin, JF, 1788)	R	C	LC	↓
90	Coppersmith Barbet	<i>Psilopogon haemacephalus</i> (Müller, PLS, 1776)	R	RA	LC	↑
Family Picidae (3), RDi = 1.85						
91	Black-rumped Flameback	<i>Dinopium benghalense</i> (Linnaeus, 1758)	R	C	LC	↓
92	Eurasian Wryneck	<i>Jynx torquilla</i> Linnaeus, 1758	WM	RA	LC	↓
93	Yellow-crowned Woodpecker	<i>Leiopicus mahrattensis</i> (Latham, 1801)	R	RA	LC	→
ORDER PSITTACIFORMES (No. of Species = 3 and No. of Families = 1)						
Family Psittaculidae (3), RDi = 1.85						
94	Alexandrine Parakeet	<i>Psittacula eupatria</i> (Linnaeus, 1766)	R	C	NT	↓
95	Rose-ringed Parakeet	<i>Psittacula krameri</i> (Scopoli, 1769)	R	A	LC	↑
96	Plum-headed Parakeet	<i>Psittacula cyanocephala</i> (Linnaeus, 1766)	WM	RA	LC	↓
ORDER PASSERIFORMES (No. of Species = 66 and No. of Families = 25)						
Family Acrocephalidae (1), RDi = 0.62						
97	Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i> Blyth, 1849	WM	RA	LC	↑
Family Campephagidae (2), RDi = 1.23						
98	Small Minivet	<i>Pericrocotus cinnamomeus</i> (Linnaeus, 1766)	R	RA	LC	↓
99	Scarlet Minivet	<i>Pericrocotus flammeus</i> (Forster, JR, 1781)	WM	RA	LC	↓
Family Cisticolidae (4), RDi = 2.47						
100	Zitting Cisticola	<i>Cisticola juncidis</i> (Rafinesque, 1810)	R	FC	LC	?
101	Common Tailorbird	<i>Orthotomus sutorius</i> (Pennant, 1769)	R	FC	LC	→
102	Plain Prinia	<i>Prinia inornata</i> Sykes, 1832	R	C	LC	→
103	Ashy Prinia	<i>Prinia socialis</i> Sykes, 1832	R	A	LC	→
Family Corvidae (2), RDi = 1.23						
104	House Crow	<i>Corvus splendens</i> Vieillot, 1817	R	C	LC	→
105	Rufous Treepie	<i>Dendrocitta vagabunda</i> (Latham, 1790)	R	A	LC	↓
Family Dicruridae (3), RDi = 1.85						
106	Black Drongo	<i>Dicrurus macrocercus</i> Vieillot, 1817	R	A	LC	?
107	Ashy Drongo	<i>Dicrurus leucophaeus</i> Vieillot, 1817	WM	RA	LC	?
108	Hair-crested Drongo	<i>Dicrurus hottentottus</i> (Linnaeus, 1766)	WM	RA	LC	↓

Sr. No.	Common name	Scientific name with Authority	Residential Status	Local Abundance Status	IUCN Status	Population Trend
Family Estrildidae (3), RDi = 1.85						
109	Indian Silverbill	<i>Euodice malabarica</i> (Linnaeus, 1758)	R	A	LC	→
110	Scaly-breasted Munia	<i>Lonchura punctulata</i> (Linnaeus, 1758)	R	FC	LC	→
111	Red Avadavat	<i>Amandava amandava</i> (Linnaeus, 1758)	R	RA	LC	→
Family Emberizidae (2), RDi = 1.23						
112	White-capped Bunting	<i>Emberiza stewarti</i> (Blyth, 1854)	WM	RA	LC	→
113	Rock Bunting	<i>Emberiza cia</i> Linnaeus, 1766	WM	RA	LC	→
Family Fringillidae (1), RDi = 0.62						
114	Common Rosefinch	<i>Carpodacus erythrinus</i> (Pallas, 1770)	WM	RA	LC	↓
Family Hirundinidae (5), RDi = 3.08						
115	Asian Plain Martin/ Grey-throated Martin	<i>Riparia chinensis</i> (Gray, JE, 1830)	R	FC	LC	↓
116	Streak-throated Swallow	<i>Petrochelidon fluvicola</i> (Blyth, 1855)	R	FC	LC	↑
117	Wire-tailed Swallow	<i>Hirundo smithii</i> Leach, 1818	R	FC	LC	↑
118	Barn Swallow	<i>Hirundo rustica</i> Linnaeus, 1758	WM	RA	LC	↓
119	Red-rumped Swallow	<i>Cecropis daurica</i> (Laxmann, 1769)	R	RA	LC	↑
Family Laniidae (2), RDi = 1.23						
120	Long-tailed Shrike	<i>Lanius schach</i> Linnaeus, 1758	R	A	LC	?
121	Bay-backed Shrike	<i>Lanius vittatus</i> Valenciennes, 1826	WM	RA	LC	→
Family Leiothrichidae (1), RDi = 0.62						
122	Jungle Babbler	<i>Argya striata</i> (Dumont, 1823)	R	A	LC	→
Family Monarchidae (1), RDi = 0.62						
123	Indian Paradise-Flycatcher	<i>Terpsiphone paradisi</i> (Linnaeus, 1758)	SM	FC	LC	→
Family Motacillidae (7), RDi = 4.32						
124	Western Yellow Wagtail	<i>Motacilla flava</i> Linnaeus, 1758	WM	C	LC	↓
125	White Wagtail	<i>Motacilla alba</i> Linnaeus, 1758	WM	C	LC	→
126	Grey Wagtail	<i>Motacilla cinerea</i> Tunstall, 1771	WM	FC	LC	→
127	Citrine Wagtail	<i>Motacilla citreola</i> Pallas, 1776	WM	FC	LC	↑
128	White-browed Wagtail	<i>Motacilla maderaspatensis</i> Gmelin, JF, 1789	R	RA	LC	→
129	Tree Pipit	<i>Anthus trivialis</i> (Linnaeus, 1758)	WM	FC	LC	↓
130	Paddyfield Pipit	<i>Anthus rufulus</i> Vieillot, 1818	R	FC	LC	→
Family Nectariniidae (1), RDi = 0.62						
131	Purple Sunbird	<i>Cinnyris asiaticus</i> (Latham, 1790)	R	A	LC	→
Family Oriolidae (1), RDi = 0.62						
132	Indian Golden Oriole	<i>Oriolus kundoo</i> Sykes, 1832	SM	A	LC	?

Sr. No.	Common name	Scientific name with Authority	Residential Status	Local Abundance Status	IUCN Status	Population Trend
Family Passeridae (3), RDi = 1.85						
133	House Sparrow	<i>Passer domesticus</i> (Linnaeus, 1758)	R	FC	LC	↓
134	Sind Sparrow	<i>Passer pyrrhonotus</i> Blyth, 1845	R	RA	LC	→
135	Chestnut-shouldered Bush-Sparrow	<i>Gymnoris xanthocollis</i> (Burton, E, 1838)	WM	RA	LC	→
Family Paridae (1), RDi = 0.62						
136	Fire-capped Tit	<i>Cephalopyrus flammiceps</i> (Burton, E, 1838)	WM	RA	LC	↓
Family Muscicapidae (11), RDi = 6.80						
137	Pied Bushchat	<i>Saxicola caprata</i> (Linnaeus, 1766)	R	A	LC	→
138	Siberian Stonechat	<i>Saxicola maurus</i> (Pallas, 1773)	WM	C	LC	→
139	Grey Bush Chat	<i>Saxicola ferreus</i> Gray, JE & Gray, GR, 1847	WM	RA	LC	→
140	Bluethroat	<i>Luscinia svecica</i> (Linnaeus, 1758)	WM	FC	LC	→
141	Indian Robin	<i>Copsychus fulcatus</i> (Linnaeus, 1766)	R	A	LC	→
142	Oriental Magpie Robin	<i>Copsychus saularis</i> (Linnaeus, 1758)	R	C	LC	→
143	Brown Rock Chat	<i>Oenanthe fusca</i> (Blyth, 1851)	R	C	LC	→
144	Black Redstart	<i>Phoenicurus ochruros</i> (Gmelin, SG, 1774)	WM	RA	LC	↑
145	Red-breasted Flycatcher	<i>Ficedula parva</i> (Bechstein, 1792)	WM	FC	LC	↑
146	Ultramarine Flycatcher	<i>Ficedula superciliaris</i> (Jerdon, 1840)	WM	RA	LC	→
147	Verditer Flycatcher	<i>Eumyias thalassinus</i> (Swainson, 1838)	WM	RA	LC	↓
Family Phylloscopidae (5), RDi = 3.08						
148	Common Chiffchaff	<i>Phylloscopus collybita</i> (Vieillot, 1817)	WM	A	LC	→
149	Greenish Warbler	<i>Phylloscopus trochiloides</i> (Sundevall, 1837)	WM	C	LC	↑
150	Grey-hooded Warbler	<i>Phylloscopus xanthoschistos</i> Gray, JE & Gray, GR, 1847	WM	RA	LC	↓
151	Sulphur-bellied Warbler	<i>Phylloscopus griseolus</i> Blyth, 1847	WM	RA	LC	→
152	Hume's Leaf Warbler	<i>Phylloscopus humei</i> (Brooks, WE, 1878)	WM	RA	LC	→
Family Ploceidae (1), RDi = 0.62						
153	Baya Weaver	<i>Ploceus philippinus</i> (Linnaeus, 1766)	SM	C	LC	→
Family Pycnonotidae (1), RDi = 0.62						
154	Red-vented Bulbul	<i>Pycnonotus cafer</i> (Linnaeus, 1766)	R	A	LC	↑
Family Sturnidae (4), RDi = 2.47						
155	Brahminy Starling	<i>Sturnia pagodarum</i> (Gmelin, JF, 1789)	R	RA	LC	?

Sr. No.	Common name	Scientific name with Authority	Residential Status	Local Abundance Status	IUCN Status	Population Trend
156	Common Myna	<i>Acridotheres tristis</i> (Linnaeus, 1766)	R	A	LC	↑
157	Bank Myna	<i>Acridotheres ginginianus</i> (Latham, 1790)	R	RA	LC	↑
158	Asian Pied Starling	<i>Gracupica contra</i> (Linnaeus, 1758)	R	C	LC	↑
Family Sylviidae (2), RDi = 1.23						
159	Lesser Whitethroat	<i>Curruca curruca</i> (Linnaeus, 1758)	WM	FC	LC	→
160	Yellow-eyed Babbler	<i>Chrysomma sinense</i> (Gmelin, JF, 1789)	R	RA	LC	→
Family Stenostiridae (1), RDi = 0.62						
161	Grey-headed Canary-Flycatcher	<i>Culicicapa ceylonensis</i> (Swainson, 1820)	WM	RA	LC	↓
Family Zosteropidae (1), RDi = 0.62						
162	Indian White-Eye	<i>Zosterops palpebrosus</i> (Temminck, 1824)	R	RA	LC	↓

Abbreviations:
Residential Status: **R** – Resident, **SM** – Summer Migrant, **WM** – Winter Migrant
Local Abundance Status: **A** – Abundant, **C** – Common, **FC** – Fairly Common, **RA** – Rare
IUCN Status: **LC** – Least Concern, **NT** – Near Threatened, **VU** – Vulnerable
Population Trend: ↑ – Increasing, ↓ – Decreasing, → – Stable, ? – Unknown
RDi – Relative Diversity index values of families
IUCN – International Union for Conservation of Nature and Natural Resources

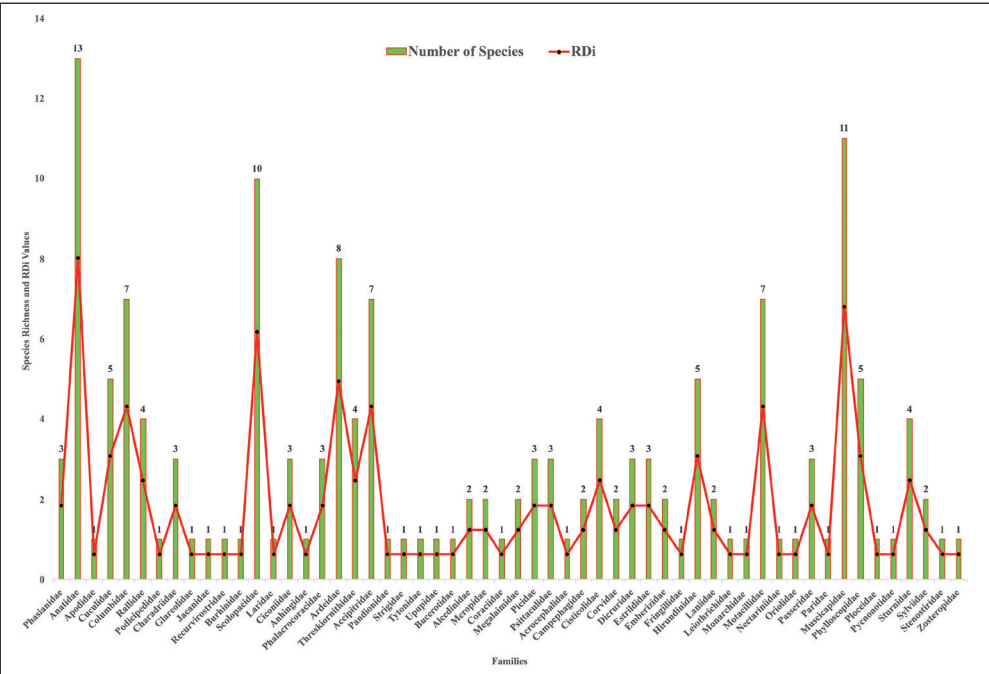


Figure 2. Species richness and RDi values of families recorded in Chhlichhila Wildlife Sanctuary, India
2. ábra Az indiai Chhlichhila Wildlife Sanctuary területén megfigyelt fajgazdagság és a madárcsaládok RDi értékei

Of the 162 species recorded, 88 species (54.32%) were classified as resident birds, while 74 species (45.68%) were migratory. Among the migratory species, 62 species (83.78%) were winter migrants, while 12 species (16.22%) were summer migrants (Table 2). Notable migratory species included the Ruddy Shelduck (*Tadorna ferruginea*), Garganey (*Spatula querquedula*), Common Snipe (*Gallinago gallinago*), Oriental Turtle Dove (*Streptopelia orientalis*), Ashy Drongo (*Dicrurus leucophaeus*), Eurasian Wryneck (*Jynx torquilla*), Oriental Pratincole (*Glareola maldivarum*), Indian Paradise Flycatcher (*Terpsiphone paradisi*) and Grey-bellied Cuckoo (*Cacomantis passerinus*), which use the sanctuary as an important stopover during their migration. The local abundance status of bird species was assessed based on encounter rates and visual sightings. A total of 44 species (27.16%) were categorized as abundant, 32 species (19.75%) were considered common, 27 species (16.67%) were classified as fairly common and only 59 species (36.42%) were considered rare (Table 2). Species such as the Indian Peafowl (*Pavo cristatus*) (Galliformes), Greater Coucal (*Centropus sinensis*) (Cuculiformes), White-breasted Waterhen (*Amaurornis phoenicurus*) (Gruiformes), Red-wattled Lapwing (*Vanellus indicus*), Black-winged Stilt (*Himantopus himantopus*) (Charadriiformes), Little Cormorant (*Microcarbo niger*) (Suliformes), Cattle Egret (*Bubulcus ibis*) (Pelecaniformes), White-throated Kingfisher (*Halcyon smyrnensis*) (Coraciiformes), Common Myna (*Acridotheres tristis*), Jungle Babbler (*Turdoides striata*), Red-vented Bulbul (*Pycnonotus cafer*) (Passeriformes) were abundant, reflecting their adaptability to a wide range of habitats and anthropogenic landscapes (BirdLife International 2024). Conversely, species like the Glossy Ibis (*Plegadis falcinellus*) (Pelecaniformes), Small Minivet (*Pericrocotus cinnamomeus*), Indian White-eye (*Zosterops palpebrosus*) (Passeriformes) were rare, possibly due to specific habitat requirements and declining populations, echoing trends noted in other studies (Rahmani 2012). Asian Openbill (*Anastomus oscitans*), Yellow Crowned Woodpecker (*Leiopicus mahrattensis*), Hair-crested Drongo (*Dicrurus hottentottus*), Fire-capped Tit (*Cephalopyrus flammiceps*), White-capped Bunting (*Emberiza stewarti*) and Rock Bunting (*Emberiza cia*) were sighted only once during the whole study period.

A relationship between the residential status and local abundance of observed species revealed that among the 88 resident species, 38.63% were abundant, 20.45% were common, 14.77% were fairly common and 26.13% were rare. Of the 62 winter migrants, 9.67% were abundant, 16.13% were common, 19.35% were fairly common and 54.84% were rare. Among the 12 summer migrants, 33.33% species were abundant, 33.33% were common, 16.67% were fairly common and 16.67% were rare (Figure 3).

In terms of conservation status, two species (1.23%) were listed as Vulnerable (VU), two species (1.23%) as Near Threatened (NT) and other 158 species (97.54%) as Least Concern (LC) according to the International Union for Conservation of Nature & Natural Resources (IUCN 2024) Red List. The Vulnerable species were the Common Pochard (*Aythya ferina*) and the River Tern (*Sterna aurantia*), whereas Near Threatened species were the Asian Woolly-necked Stork (*Ciconia episcopus*) and Alexandrine Parakeet (*Psittacula eupatria*). No species categorized as Endangered (EN) or Critically Endangered (CR) were recorded during the study period. Population trends of bird species within the sanctuary were analyzed based on long-term global monitoring by IUCN and data

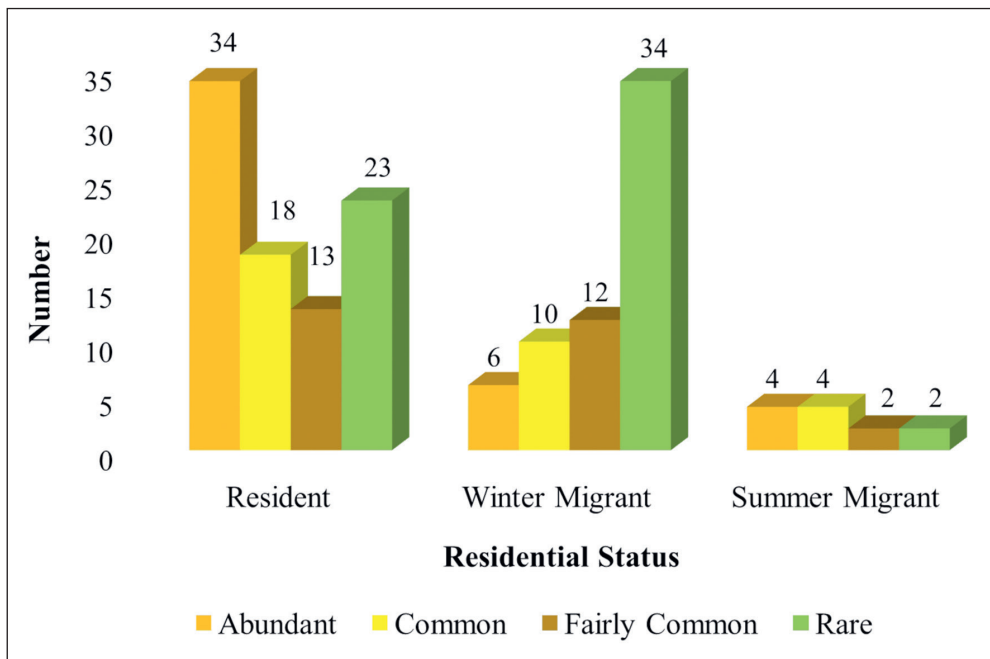


Figure 3. Relationship between residential status and local abundance status of recorded avian species

3. ábra A megfigyelt madárfajok helyi abundanciája és előfordulási státusza közti összefüggés

collected during the study period. Out of the 162 species, 34 species (20.98%) showed increasing population trends, 46 species (28.40%) displayed declining population trends, 57 species (35.18%) showed stable population trends and population trends of 25 species (15.44%) were unknown.

An analysis of global IUCN population trends based on the local abundance status of birds revealed that, among 44 abundant species, 27.27% exhibited an increasing trend (↑), 18.18% decreasing trends (↓), 34.10% remained stable (→), and 20.45% had an unknown trend (?). For 32 common species, 18.75% showed an increasing trend (↑), 37.50% decreasing trends (↓), 37.50% were stable (→) and 6.25% had an unknown trend (?). Similarly, among 27 fairly common species, 25.92% displayed an increasing trend (↑), 22.22% decreasing trends (↓), 37.03% were stable (→) and 14.81% had an unknown trend (?), while among 59 rare species, 15.25% displayed an increasing trend (↑), 33.90% decreasing trend (↓), 33.90% were stable (→), and 16.95% had an unknown trend (?) (Figure 4). A comparison of local abundance and population trends revealed that eight species – Indian Spot-billed Duck (*Anas poecilorhyncha*), Lesser Whistling-duck (*Dendrocygna javanica*), Northern Pintail (*Anas acuta*), Northern Shoveler (*Spatula clypeata*) (Anseriformes), Rock Dove (*Columba livia*) (Columbiformes), Intermediate Egret (*Ardea intermedia*), Purple Heron (*Ardea purpurea*) (Pelecaniformes), Rufous Treepie (*Dendrocitta vagabunda*) (Passeriformes) – were abundant in the sanctuary, despite their globally declining population trends as reported by the IUCN.

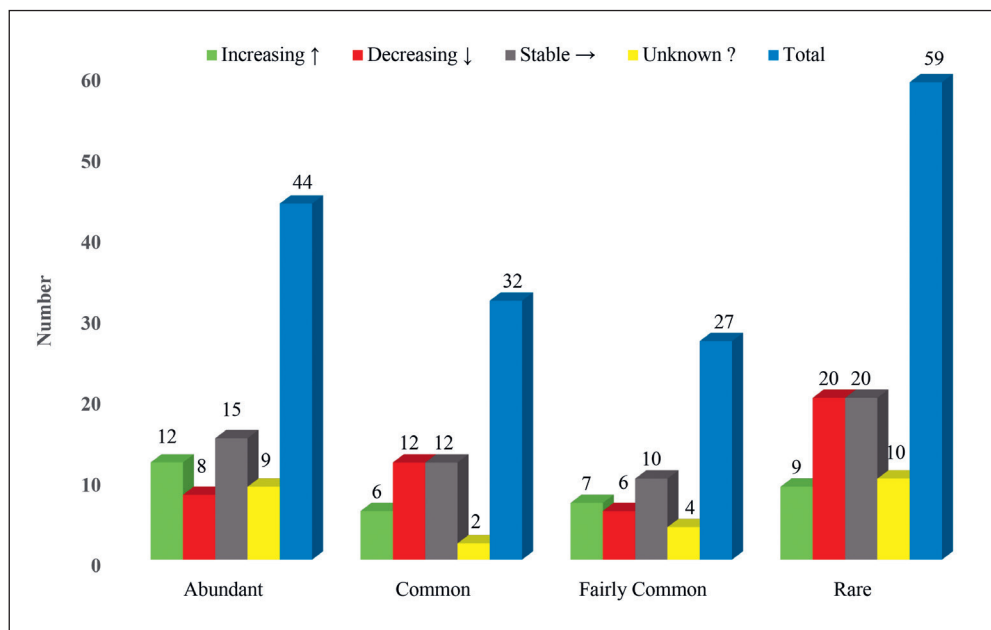


Figure 4. Local abundance status and its relationship with IUCN global population trends of recorded avian species

4. ábra A megfigyelt fajok helyi abundanciája és az IUCN által meghatározott világgállomány-trend közötti összefüggés

Discussion

The avifaunal diversity of Chhilchhila Wildlife Sanctuary reflects a mosaic of ecological niches supporting a wide array of bird species. This study shows that the Chhilchhila Wildlife Sanctuary, a protected area, harbours 11.87% of the total avian species found across India (Praveen & Jayapal 2024) and 30.56% of the bird species recorded in Haryana (Kalsi *et al.* 2019). The findings indicate that the bird species diversity observed in this protected area aligns with previous studies conducted in other protected areas of Haryana, where species richness ranges from 104 to 164 species, i.e. Khaparwas Bird Sanctuary, district Jhajjar (Gupta *et al.* 2012), Sultanpur National Park, district Gurugram (Kaushik & Gupta 2016), Bhindawas Bird Sanctuary, district Jhajjar (Chopra *et al.* 2017), Kalesar National Park, district Yamunanagar (Rai *et al.* 2017), Bhindawas Bird Sanctuary, district Jhajjar (Singh & Malik 2019), Sultanpur National Park, district Gurugram (Rani *et al.* 2023). Among the recorded 18 orders, Passeriformes was the most species-rich, followed by Charadriiformes and Anseriformes. This finding is consistent with the general trend observed in other protected and non-protected areas of Haryana (Chopra *et al.* 2012, Rai *et al.* 2017, 2019, Rai & Vanita 2021, Parul & Kumar 2023, Rani *et al.* 2023), where passerines dominate the avian diversity due to their adaptability to a wide range of habitats and feeding behaviours (Beresford *et al.* 2005, Rai & Vanita 2023, Rai & Yadav 2023). The high number of species in Passeriformes also reflects the availability of diverse microhabitats and ecological niches

within the sanctuary, such as grasslands, wetlands, and forests, which support different foraging strategies and nesting requirements.

An analysis of the residential and migratory status revealed that the sanctuary serves as a year-round haven for resident species while also being a pivotal stopover and wintering site for migratory species. The presence of long-distance migrants, such as Anseriformes and Charadriiformes, highlights the sanctuary's role in sustaining migratory bird populations, consistent with observations in other Indian wetland habitats (Kumar *et al.* 2005, Sundar & Kittur 2013). Such dual functionality underscores the importance of conserving habitats that cater to both resident and migratory birds, particularly in the face of habitat loss and climate change. The migratory species from orders Anseriformes and Charadriiformes, significantly contribute to the seasonal variation in bird community composition, with some species such as the Northern Pintail (*Anas acuta*), Garganey (*Spatula querquedula*), Greylag Goose (*Anser anser*), White-tailed Lapwing (*Vanellus leucurus*), Common Snipe (*Gallinago gallinago*) and Common Redshank (*Tringa totanus*) using the sanctuary as a crucial stopover or wintering site. These migratory species highlight the importance of the sanctuary as a part of regional migratory flyways, and underscore the need for continuous monitoring to understand the long-term impacts of climate change on migratory patterns.

The conservation status of species, as assessed by the IUCN Red List, revealed a spectrum from Least Concern to Vulnerable. Notably, the presence of Vulnerable species such as the Common Pochard and River Tern highlights the sanctuary's role as a refuge for threatened taxa. The population trends of these species, marked by gradual declines due to habitat destruction and human disturbance, align with global trends reported by Wetlands International (2020) and BirdLife International (2024). It is also worth mentioning that the conservation status of three Near Threatened bird species recorded in the sanctuary were upgraded to the Least Concern as per the IUCN (2024), i.e. Painted Stork, Black-headed Ibis (*Threskiornis melanocephalus*) and Oriental Darter.

However, the study also identified challenges that threaten the sanctuary's ecological integrity, including habitat fragmentation, anthropogenic pressures and potential impacts of climate change. While the sanctuary is protected under the Indian Wildlife Protection Act, 1972 (IWPA 1972), illegal fishing, grazing and deforestation in certain parts of the sanctuary continue to affect bird populations. The construction of nearby infrastructure and agricultural activities are contributing to habitat fragmentation, which could negatively impact migratory and resident species in the long term. Addressing these challenges requires effective conservation strategies, including stricter enforcement of protection laws, community engagement, and sustainable resource management practices. Further monitoring is recommended to track the impact of climate change on migratory patterns and to assess the sanctuary's ability to sustain its avifauna in the long term.

Conclusion

The Chhilchhila Wildlife Sanctuary, located in Haryana, India, represents a crucial habitat for avifaunal diversity, harbouring a wide array of bird species, including both resident and

migratory populations. This study provides a comprehensive assessment of the avifaunal diversity within the sanctuary, documenting 162 bird species spanning 118 genera, 56 families and 18 orders. The findings highlight the sanctuary's role as a critical refuge for species of ecological, conservation, and aesthetic importance. Seasonal variations in species composition underscore the sanctuary's significance for migratory birds, further emphasizing its role as part of the larger regional and global flyways. The ecological significance of this protected area is heightened by the presence of two bird species classified as Vulnerable and two as Near Threatened on the IUCN Red List, along with 46 species exhibiting declining global population trends. In conclusion, the Chhilchhila Wildlife Sanctuary serves as an indispensable avian habitat and a vital component of regional biodiversity. Continued research, coupled with effective management strategies, is essential to monitor and preserve the sanctuary's avifaunal diversity, ensuring its contribution to ecological balance and biodiversity conservation remains intact.

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