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# Assessment of Avian Diversity and Conservation Status in Bhindawas Wildlife Sanctuary: A Special Reference to Migratory Bird Species

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## ABSTRACT

67 bird families from 23 different bird orders were recorded during this observation. This highlights a rich and diverse avian community, encompassing birds with varied ecological roles and life histories. Certain families stand out with higher RDi values, indicating they were encountered more frequently during the study. These include Anseriformes (Ducks, Geese, and Swans) with an RDi of (9.52), Pelecaniformes (Pelicans, Herons, and Egrets) with an RDi of 10.48, Accipitriformes (Hawks, Eagles, and Kites) with an RDi of 4.76, Ciconiiformes (Storks and Jabirus) with an RDi of 3.81 and Galliformes (Chickens, Pheasants, and Grouse) also at 2.86. Combining RDi with other methods like point counts or transect surveys could provide a more comprehensive understanding of bird distribution. Several orders and families were represented by only one species, resulting in RDi values of 0.95. This report aims to analyze the issue of water scarcity in Bhindawas Wildlife Sanctuary, with a special focus on bird species. It provides an overview of the sanctuary, its importance for avian biodiversity, and the impact of water scarcity on bird populations. The report also explores the causes of water scarcity, the current measures taken to mitigate the problem, and suggests potential solutions to ensure the long-term conservation of bird species in the sanctuary.

## INTRODUCTION

Bhindawas Wildlife Sanctuary is a protected area located in the Jhajjar district of the state of Haryana, India. It was established in 1986 and covers an area of approximately 1,350 hectares. The sanctuary is situated around the Bhindawas Lake, which is a man-made reservoir created by constructing a barrage on the Dohan River.The Bhindawas Wildlife Sanctuary is known for its rich biodiversity and is home to a wide variety of flora and fauna. The sanctuary is particularly famous for its avian population, with over 250 species of birds recorded here. It is a haven for birdwatchers and nature enthusiasts, attracting visitors from all over the country. The sanctuary provides a diverse range of habitats for birds, including wetlands, grasslands, and woodlands. The Bhindawas Lake, with its marshy edges and shallow waters, attracts a large number of water birds. It serves as an important breeding ground and wintering site for many migratory bird species. One of the most notable bird species found in the Bhindawas Wildlife Sanctuary is the Sarus Crane (Grus antigone). It is the tallest flying bird in the world and is considered a symbol of good fortune in Indian culture. The sanctuary is home to a significant population of Sarus Cranes, and their breeding success here is crucial for their conservation. Another important bird species found in the sanctuary is the Black-necked Stork (Ephippiorhynchus asiaticus). It is a large wading bird with a distinctive black and white plumage and a long, thick bill. The Bhindawas Wildlife Sanctuary is one of the few places in India where this species can be regularly sighted. The storks breed here during the monsoon season and can be seen foraging in the shallow waters of the lake.The sanctuary also supports a variety of waterfowl species, including ducks, geese, and teals. Commonly sighted waterfowl species include the Northern Pintail (Anas acuta), Gadwall (Mareca strepera), and Eurasian Wigeon (Mareca penelope). These birds migrate to the sanctuary during the winter months, escaping the harsh weather conditions in their breeding grounds. In addition to water birds, the Bhindawas Wildlife Sanctuary is home to several species of raptors. The region's grasslands provide an ideal hunting ground for these birds of prey. The most commonly observed raptor species include the Black Kite (Milvus migrans), Marsh Harrier (Circus aeruginosus), and Oriental Honey Buzzard (Pernis ptilorhynchus). Apart from these charismatic bird species, the sanctuary also supports a diverse range of resident and migratory passerine birds. These include warblers, flycatchers, thrushes, and buntings. The woodlands surrounding the lake provide nesting sites and foraging opportunities for these small bird species. The Bhindawas Wildlife Sanctuary has been recognized as an Important Bird Area (IBA) by BirdLife International due to its significance for bird conservation. Efforts have been made by the forest department and local conservation organizations to protect and manage the sanctuary's avian population. However, the sanctuary faces several challenges that threaten its bird species. Encroachment, illegal fishing, and pollution are some of the major issues affecting the Bhindawas Wildlife Sanctuary. The destruction of wetlands and habitat degradation pose a significant threat to the survival of the bird species in the sanctuary. Thus the present study is an at- tempt to document the composition, status, distribution and habitat use of avifauna of Bhindawas Wildlife Sanctuary, Haryana for developing long term government conservation schemes and changes

indication of local and migratory species. The residential status (resident, summer migrant, or winter migrant) was determined with the presence-absence method (Kumar & Sharma 2018). Conservation status aligned with IWPA (1972) and CITES (2012), while the Red List of the IUCN (2022) guided assessment for conservation status and global population trend.

## MATERIALS AND METHODS

### STUDY AREA

Bhindawas bird sanctuary is located 25 kms south-east of Jhajjar (280 37'N and 760 40'E) and about 80 kms north-west of Delhi (Fig 3.2; Plates 1, 2). It was notified as wildlife sanctuary on 7th May, 1986 and the sanctuary derived its name from Bhindawasvillage which is 4-5 kms away from the sanctuary. This Sanctuary spreads over an area of 1016.94 acres. The sanctuary premises are surrounded by seven villages, namely, Kanwah, Bilochpura, Nawada, Redhuwas, Shanjabanpur, Kunjah and Chadwana. Sanctuary Park isserved with an extensive network of generally roughly maintained roads. Several small-to-medium sized village ponds and lakes are scattered in the vicinity ofthe sanctuary. The area also has a lake with a periphery of about 12 kms. Inflow to the Bhindawas Lake is from the JLN (Jawahar Lal Nehru) escape canal which acts as a feeder to the fresh-water swamp. Outflow is from gate numbers 1 and 2 into drain number 8. Thecapacity of the lake is 13750 acre-feet. The lake is about 4 feet deep. Submerged aquatic vegetation is Hydrilla, Typhaangustifolia, Trapa, Ceratophyllum, Isoetes, etc. Floating vegetation like Eichhornia (hyacinth) and Salvinia macrophytes tends to cover the surface and poses a hazard to the ecosystem. Bhindawas sanctuary is surrounded by agricultural cropland with wheat, mustard, rice and maize as the main crops. The chief vegetation in andaround the sanctuary comprises of Parthenium hysterophorus,Saccharum munja, Acrachneracemosa, Catharanthes roseus, Bougainvillea glabra, Cassia occidentalis, Calotropisprocera, Zizyphus mauritiana, Datura alba, Jatropha curcas, Morus alba, Prosopis juliflora,Eucalyptus camaldulensis, Ficus religiosa, Ficus bangalensis, Azadirachta indica, Meliaazedarach and Acacia Arabica. Cormorants, egrets, storks etc. use them forroosting and nesting (Plate 5). From the core wetland to the surrounding marshes, scrubland, and parkland, the park pulsates with life. Between August 2021 and March 2023, a study delved into this vibrant web, investigating bird migration patterns, species diversity, and feeding guilds across these habitats. Observations employed the line transect method, with variable widths but consistent length, as described by Shekhawat & Bhatnagar (2014).

### METHODS

Sharp Nikon 22x10 binoculars aided bird observations during mornings (7 AM to noon) and evenings (4 PM to 7 PM). Opportunistic sightings throughout the study were also documented. To ensure accurate identification, photographs were captured with a Canon 500D camera and cross-referenced with Grimmett et al.'s 2016 field

guide. Feeding habits and preferred habitats were recorded based on direct field observations. For seasonal migration patterns, we identified species within specific time spans and categorized them as summer migratory (March to August), winter migratory (October to March), passage migratory (August to October), or resident (present year-round). Species richness, threat status, and nomenclature followed the 2019.3 IUCN Red Data List, while bird identification relied on resources like Ali and Ripley (1987), Ali (1996), and Grimmet et al. (1998). The relative diversity (RDi) of bird families present was deduced by the follow formula (Torre- cuadros et al., 2007):

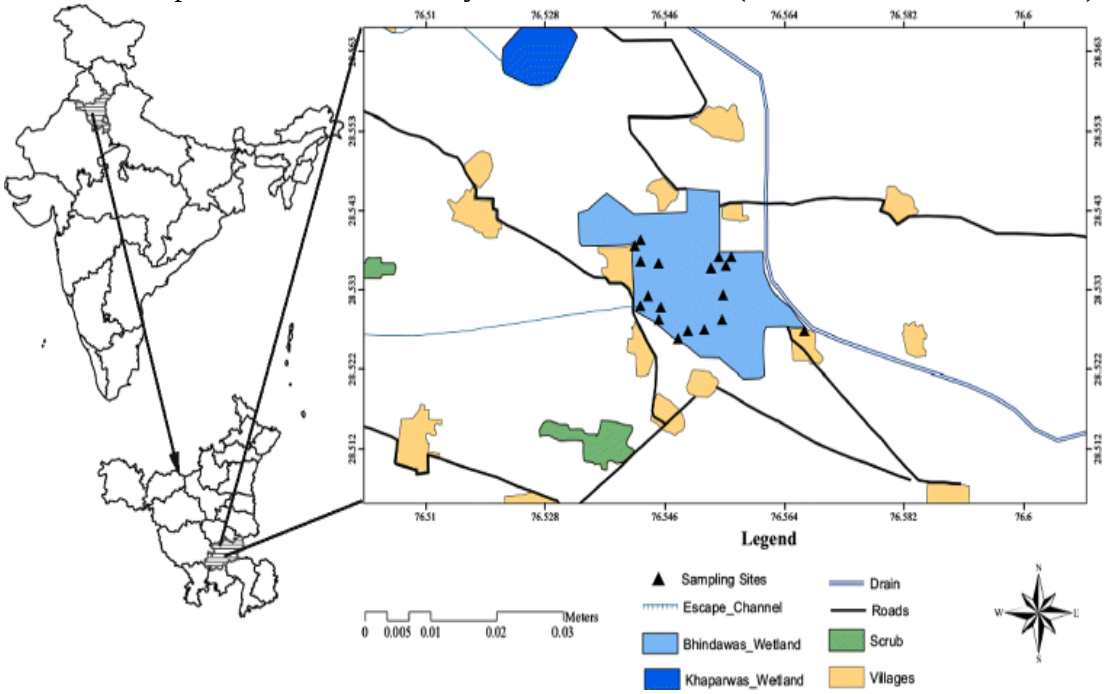


**Figure.1**. Bhindawas Wildlife Sanctuary, Haryana, India

## RESULTS AND DISCUSSION

This research work provides a breakdown of avian diversity in Bhindawas Wildlife Sanctuary, Haryana, India based on taxonomic classification. The table presented categorizes bird species according to their Order, Family, and Genus, with additional columns for the number of species recorded within each Genus (RDi) and the total RDi for each Order.

**Table: 1. Family Distribution pattern during study (RDi)**

| Order | Family | Genus | RDi | Total Order RDi |
|---|---|---|---|---|
| Accipitriformes (Birds of Prey) | Accipitridae (Hawks, Eagles) | 5 | 5 | 5 |
| Anseriformes (Waterfowl) | Anatidae (Ducks, Geese, Swans) | 10 | 10 | 10 |
| Bucerotiformes (Hornbills) | Bucerotidae (Hornbills) | 1 | 0.95 | |
| | Upupidae (Hoopoes) | 1 | 0.95 | 3.8 |
| | Jacanidae (Jacanas) | 1 | 0.95 | |

| | | | | |
|---|---|---|---|---|
| | Recurvirostridae (Avocets and Stilts) | 1 | 0.95 | |
| | Scolopacidae (Sandpipers, Snipes, Phalaropes) | 4 | 3.81 | |
| Ciconiiformes (Storks, Herons) | Ciconiidae (Storks) | 4 | 3.81 | 3.81 |
| Columbiformes (Pigeons and Doves) | Columbidae (Pigeons and Doves) | 4 | 3.81 | 3.81 |
| Coraciiformes (Rollers, Kingfishers, Bee-eaters) | Alcedinidae (Kingfishers) | 2 | 1.9 | |
| | Coraciidae (Rollers) | 1 | 0.95 | 5.6 |
| | Meropidae (Bee-eaters) | 1 | 0.95 | |
| Cuculiformes (Cuckoos) | Cuculidae (Cuckoos) | 4 | 3.81 | 3.81 |
| Galliformes (Chickens, Grouse, Turkeys) | Phasianidae (Pheasants, Partridges) | 3 | 2.86 | 2.86 |
| Gruiformes (Cranes, Rails) | Rallidae (Rails, Crakes, Coots) | 4 | 3.81 | 3.81 |
| Passeriformes (Perching Birds) | Alaudidae (Larks) | 1 | 0.95 | |
| | Cisticolidae (Cisticolas, Grass-warblers) | 3 | 2.86 | |
| | Corvidae (Crows, Ravens, Magpies) | 3 | 2.86 | |
| | Dicruridae (Drongos) | 1 | 0.95 | 33.12 |
| | Estrildidae (Waxbills and Weavers) | 2 | 1.9 | |
| | Hirundinidae (Swallows) | 2 | 1.9 | |
| | Laniidae (Shrikes) | 1 | 0.95 | |
| | Leiotrichidae (Scrub-robins) | 1 | 0.95 | |
| | Motacillidae (Wagtails and Pipits) | 4 | 3.81 | |
| | Muscicapidae (Old World Flycatchers) | 6 | 5.71 | |
| | Nectariniidae (Sunbirds) | 1 | 0.95 | |
| | Oriolidae (Old World Orioles) | 1 | 0.95 | |
| | Passeridae (Sparrows) | 2 | 1.9 | |
| | Phylloscopidae (Old World Leaf Warblers) | 1 | 0.95 | |
| | Ploceidae (Weaverbirds) | 2 | 1.9 | |
| | Pycnonotidae (Bulbuls) | 2 | 1.9 | |
| | Stenostridae | | | |

In Bhindawas Wildlife Sanctuary encompassing birds from 21 different orders, the most prominent order is Passeriformes, commonly known as songbirds, with a staggering 23 genera recorded. This highlights the abundance and variety of small, perching birds in the region. Other well-represented orders include Pelecaniformes (waterfowl and related species), Anseriformes (ducks, geese, and swans), and Ciconiiformes (storks and herons).Within each order, further diversity is evident at the family level. The Anatidae (duck family) boasts the highest number of genera (10) within Bhindawas Wildlife Sanctuary. This could be due to the presence of suitable aquatic habitats like lakes, ponds, or wetlands that support a variety of duck species. Similarly, the Ardeidae (heron family) with eight genera reflects the abundance of wading birds in the region. Table 1 provides a glimpse into the avian diversity of Bhindawas Wildlife Sanctuary, categorizing bird species based on their taxonomic order, family, genus, and a relative abundance measure (RDi). These orders represent major evolutionary groupings within the class Aves (birds). The presence of 20 orders signifies a high level of avian diversity in the sanctuary.

**DOMINANT ORDERS:**

**Anseriformes (Ducks, Geese, and Swans):** With 10 genera and the highest RDi (9.52), this order suggests ducks, geese, and swans are a prominent group in Bhindawas. The high RDi indicates their relative abundance compared to other bird groups.

**Pelecaniformes (Pelicans, Herons, and Egrets):** Represented by two families (Ardeidae and Threskiornithidae) with a combined RDi of 10.48, pelicans, herons, and egrets are another abundant group. The presence of eight genera within Ardeidae suggests a good variety of herons and egrets in the sanctuary.

**Passeriformes (Perching Birds):** This incredibly diverse order encompasses many familiar bird families like swallows (Hirundinidae), crows (Corvidae), and bulbuls (Pycnonotidae). While the

**Accipitriformes (Hawks, Eagles, and Kites):** Five genera with an RDi of 4.76 suggest a healthy population of raptors crucial for maintaining the ecosystem's balance.

**Ciconiiformes (Storks and Jabirus):** The presence of four genera with an RDi of 3.81 indicates a good representation of storks, potentially including resident and migratory species.

**Galliformes (Chickens, Pheasants, and Grouse):** Three genera with an RDi of 2.86 suggest the presence of some ground birds like pheasants, which can be important prey species for raptors. Several orders are represented by a single genus and a lower RDi. This could indicate resident species with smaller populations or migratory birds that visit seasonally. Examples include hornbills (Bucerotiformes), owls (Strigiformes), and swifts (Apodiformes - not shown in the table 1).

**Table: 2. Avian species distribution pattern in Bhindawas Wildlife Sanctuary, Haryana.**

| S. No | Bird (Common Name) | Scientific Name | Family | IUCN Status | Migratory Status | Population Trend | Feeding Guild |
|---|---|---|---|---|---|---|---|
| 1 | Crested Serpent-Eagle | Spilornis cheela | Accipitridae | LC | R | S | C |
| 2 | Indian Spotted Eagle | Aquila hastata | | LC | R | S | C |
| 3 | Western Marsh Harrier | Circus aeruginosus | | LC | R | S | C |
| 4 | Black-winged Kite (Black-shouldered Kite) | Elanus caeruleus | | LC | R | S | I |
| 5 | Oriental Honey-buzzard (Crested Honey Buzzard) | Pernis ptilorhynchus | | LC | R | S | I |
| 6 | Greater Spotted Eagle | Aquila clanga | | VU | R | D | C |
| 7 | Steppe Eagle | Aquila nipalensis | | VU | PM | S | C |
| 8 | Imperial Eagle | Aquila heliacal | | NT | R | S | C |
| 9 | Bonelli's Eagle | Aquila fasciata | | NT | R | S | C |
| 10 | Shikra | Accipiter badius | | LC | R | S | C |
| 11 | Black Kite | MilVUs migrans | | LC | R | S | Sc |
| 12 | Egyptian VUlture | Neophron percnopterus | | EN | R | D | Sc |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | White-eyed Buzzard | Butastur teesa | | LC | R | S | I |
| 14 | Long-legged Buzzard | Buteo rufinus | | LC | PM | S | I |
| 15 | Booted Eagle | Hieraaetus pennatus | | LC | R | S | C |
| 16 | Short-toed Snake-Eagle | Circaetus gallicus | | LC | PM | S | C |
| 17 | Grey-headed Fish-Eagle | Haliaeetus ichthyaetus | | LC | R | S | Pi |
| 18 | White-tailed Eagle | Haliaeetus albicilla | | LC | WM | S | Pi |
| 19 | Ashy-crowned Sparrow-Lark (Ashy-crowned Sparrow Lark) | Eremopterix griseus | Alaudidae | LC | R | S | Gr |
| 20 | Indian Bushlark (Red-winged Bushlark) | Mirafra erythroptera | | LC | R | S | I |
| 21 | Greater Short-toed Lark | Calandrella brachydactyla | | LC | PM | S | Gr |
| 22 | Oriental Skylark | Alauda gulgula | | LC | R | S | Gr |
| 23 | Crested Lark | Galerida cristata | | LC | R | S | I |
| 24 | Bengal Bushlark | Mirafra assamica | | LC | R | S | I |
| 25 | Sand Lark | Ammomanes phoenicurus | | LC | R | S | I |
| 26 | White-throated Kingfisher | Halcyon smyrnensis | Alcedinidae | LC | R | S | Pi |
| 27 | Pied Kingfisher | Ceryle rudis | | LC | R | S | Pi |
| 28 | Common Kingfisher (Small Blue Kingfisher) | Alcedo atthis | | LC | R | S | Pi |
| 29 | Asian Openbill | Anastomus oscitans | Anastomidae | LC | R | S | Pi |
| 30 | Greylag Goose | Anser anser | Anatidae | LC | PM | S | Gr |
| 31 | Northern Shoveler | Spatula clypeata | | LC | PM | S | Om |
| 32 | Gadwall | Mareca gadwall | | LC | PM | S | Om |
| 33 | Indian Spot-billed Duck | Anas poecilorhyncha | | LC | R | S | Om |
| 34 | Mallard | Anas platyrhynchos | | LC | PM | S | Om |
| 35 | Northern Pintail | Anas acuta | | LC | PM | D | Om |
| 36 | Common Pochard | Aythya ferina | | LC | PM | S | Om |
| 37 | Bar-headed Goose | Anser indicus | | LC | PM | S | Gr |
| 38 | Ruddy Shelduck (Brahminy Duck) | Tadorna ferruginea | | LC | R | S | Om |
| 39 | Cotton Pygmy-Goose (Cotton Teal) | Nettapus coromandelianus | | LC | R | S | Om |
| 40 | Garganey | Anas querquedula | | LC | PM | S | Om |
| 41 | Eurasian Wigeon | Anas penelope | | LC | PM | S | Om |
| 42 | Green-winged Teal (Common Teal) | Anas crecca | | LC | PM | S | Om |
| 43 | Ferruginous Duck (Ferruginous Pochard) | Aythya nyroca | | NT | PM | S | Om |
| 44 | Tufted Duck | Aythya fuligula | | LC | PM | S | Om |
| 45 | Knob-billed Duck (Comb Duck) | Sarkidiornis melanotos | | NT | PM | S | Om |
| 46 | Lesser Whistling-Duck | Dendrocygna javanica | | LC | R | S | Om |
| 47 | Red-crested Pochard | Netta rufina | | NT | PM | S | Om |
| 48 | Smew | Mergus albellus | | LC | WM | S | Pi |
| 49 | Oriental Darter | Anhinga melanogaster | Anhingidae | LC | R | S | Pi |
| 50 | Little Swift (Indian House Swift) | Apus affinis | Apodidae | LC | R | S | I |
| 51 | Black-crowned Night Heron | Nycticorax nycticorax | | LC | R | S | Pi |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 52 | Little Egret | Egretta garzetta | | LC | R | S | Pi |
| 53 | Grey Heron | Ardea cinerea | | LC | R | S | Pi |
| 54 | Purple Heron | Ardea purpurea | | LC | R | S | Pi |
| 55 | Great Bittern | Botaurus stellaris | | LC | PM | S | Pi |
| 56 | Black Bittern | Ixobrychus flavicollis | | LC | R | S | Pi |
| 57 | Cinnamon Bittern | Ixobrychus cinnamomeus | | LC | R | S | Pi |
| 58 | Indian Pond-Heron | Ardeola grayii | | LC | R | S | Pi |
| 59 | Eastern Cattle Egret | Bubulcus coromandus | | LC | R | S | I |
| 60 | Yellow Bittern | Ixobrychus flavicollis | | LC | R | S | Pi |
| 61 | Indian Grey Hornbill | Ocyceros griseus | Bucerotidae | LC | R | S | I |
| 62 | Indian Thick-knee | Burhinus indicus | Burhinidae | NT | R | S | I |
| 63 | Small Minivet | Pericrocotus cinnamomeus | Campephagidae | LC | R | S | I |
| 64 | Long-tailed Minivet | Pericrocotus ethologus | | LC | R | S | I |
| 65 | Little Ringed Plover | Charadrius dubius | Charadriidae | LC | PM | S | I |
| 66 | Yellow-wattled Lapwing | Vanellus malabaricus | | NT | R | D | I |
| 67 | Red-wattled Lapwing | Vanellus indicus | | LC | R | S | I |
| 68 | White-tailed Lapwing | Vanellus leucurus | | LC | R | S | I |
| 69 | Northern Lapwing | Vanellus vanellus | | LC | PM | S | I |
| 70 | Kentish Plover | Charadrius alexandrinus | | LC | PM | S | I |
| 71 | River Lapwing | Vanellus vanellus | | LC | PM | S | I |
| 72 | Tibetan Sand-Plover (Lesser Sand-Plover) | Charadrius mongolus | | LC | PM | S | I |
| 73 | Black-necked Stork | Ephippiorhynchus asiaticus | Ciconiidae | VU | R | D | Pi |
| 74 | Painted Stork | Mycteria leucocephala | | VU | R | D | Pi |
| 75 | Asian Woolly-necked Stork | Ciconia episcopus | | LC | R | S | Pi |
| 76 | Black Stork | Ciconia nigra | | LC | PM | S | I |
| 77 | Zitting Cisticola | Cisticola juncidis | Cisticolidae | LC | R | S | I |
| 78 | Eurasian Collared-Dove | Streptopelia decaocto | Columbidae | LC | R | S | Gr |
| 79 | Red Collared-Dove (Red Turtle-Dove) | Streptopelia tranquebarica | | LC | R | S | Gr |
| 80 | Laughing Dove (Little Brown Dove) | Streptopelia Senegalensis | | LC | R | S | Gr |
| 81 | Rock Pigeon (Blue Rock Pigeon) | Columba livia | | LC | R | S | Gr |
| 82 | Oriental Turtle-Dove | Streptopelia orientalis | | LC | R | S | Gr |
| 83 | Yellow-footed Green-Pigeon | Treron phoenicopterus | | LC | R | S | Fr |
| 84 | Spotted Dove | Streptopelia chinensis | | LC | R | S | Gr |
| 85 | Indian Roller | Coracias benghalensis | Coraciidae | LC | R | S | I |
| 86 | European Roller | Coracias garrulus | | LC | PM | S | I |
| 87 | Large-billed Crow | CorVUs macrorhynchos | Corvidae | LC | R | S | Om |
| 88 | Rufous Treepie | Dendrocitta vagabunda | | LC | R | S | Om |
| 89 | House Crow | CorVUs splendens | Cuculidae | LC | R | S | Om |
| 90 | Greater Coucal | Centropus sinensis | | LC | R | S | I |
| 91 | Common Hawk-Cuckoo | Hierococcyx varius | | LC | R | S | I |
| 92 | Pied Cuckoo (Jacobin Cuckoo) | Clamator jacobinus | | LC | PM | S | I |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 93 | Asian Koel | Eudynamys scolopaceus | | LC | PM | S | I |
| 94 | Grey-bellied Cuckoo | Cacomantis passerinus | | LC | PM | S | I |
| 95 | Common Cuckoo | Cuculus canorus | | LC | PM | S | I |
| 96 | Black Drongo | Dicrurus macrocercus | Dicruridae | LC | R | S | I |
| 97 | Ashy Drongo | Dicrurus leucophaeus | | LC | R | S | I |
| 98 | Red-headed Bunting | Emberiza brunniceps | Emberizidae | LC | PM | S | Gr |
| 99 | Indian Silverbill (White-throated Munia) | Lonchura malabarica | Estrildidae | LC | R | S | Gr |
| 100 | Red Avadavat | Amandava amandava | | LC | R | S | Gr |
| 101 | Scaly-breasted Munia (Spotted Munia) | Lonchura punctulata | | LC | R | S | Gr |
| 102 | Tricolored Munia (Black-headed Munia) | Lonchura malacca | | LC | R | S | Gr |
| 103 | Eurasian Kestrel (Common Kestrel) | Falco tinnunculus | Falconidae | LC | PM | S | C |
| 104 | Eurasian Hobby | Falco subbuteo | | LC | PM | S | C |
| 105 | Red-necked Falcon | Falco chicquera | | LC | R | S | C |
| 106 | Common Rosefinch | Carpodacus erythrinus | Fringillidae | LC | PM | S | Gr |
| 107 | Oriental Pratincole | Glareola lactea | Glareolidae | LC | PM | S | I |
| 108 | Small Pratincole | Glareola lactea | | LC | PM | S | I |
| 109 | Indian Courser | Cursorius coromandelicus | | LC | R | S | I |
| 110 | Sarus Crane | Grus antigone | Gruidae | VU | R | D | Om |
| 111 | Common Crane | Grus grus | | LC | PM | S | Om |
| 112 | Barn Swallow | Hirundo rustica | Hirundinidae | LC | PM | S | I |
| 113 | Wire-tailed Swallow | Hirundo smithii | | LC | PM | S | I |
| 114 | Streak-throated Swallow | Hirundo abyssinica | | LC | PM | S | I |
| 115 | Grey-throated Martin (Plain Martin) | Riparia chinensis | | LC | PM | S | I |
| 116 | Dusky Crag-Martin | Ptyonoprogne concolor | | LC | R | S | I |
| 117 | Red-rumped Swallow | Hirundo daurica | | LC | PM | S | I |
| 118 | Pheasant-tailed Jacana | Hydrophasianus chirurgus | Jacanidae | LC | R | S | I |
| 119 | Bronze-winged Jacana | Metopidius indicus | | LC | R | S | I |
| 120 | Common Woodshrike | Lanius sanus | Laniidae | LC | R | S | I |
| 121 | Isabelline Shrike | Lanius isabellinus | | LC | WM | S | I |
| 122 | Bay-backed Shrike | Lanius vittatus | | LC | R | S | I |
| 123 | Long-tailed Shrike | Lanius schach | | LC | R | S | I |
| 124 | Great Grey Shrike | Lanius excubitor | | LC | WM | S | I |
| 125 | Brown Shrike | Lanius cristatus | | LC | R | S | I |
| 126 | Pallas's Gull | Larus ichthyaetus | | LC | WM | S | Pi |
| 127 | Large Grey Babbler | Turdoides malcolmi | Leiothrichidae | LC | R | S | I |
| 128 | Jungle Babbler | Turdoides striatus | | LC | R | S | I |
| 129 | Common Babbler | Turdoides affinis | | LC | R | S | I |
| 130 | Striated Babbler | Turdoides grammaticus | | LC | R | S | I |
| 131 | Coppersmith Barbet | Megalaima haemacephala | Megalaimidae | LC | R | S | Fr |
| 132 | Brown-headed Barbet (Large Green Barbet) | Megalaima zeylanica | | LC | R | S | Fr |
| 133 | Asian Green Bee-eater | Merops orientalis | Meropidae | LC | R | S | I |
| 134 | Blue-tailed Bee-eater | Merops philippinus | | LC | R | S | I |
| 135 | Blue-cheeked Bee-eater | Merops leschenaulti | | LC | R | S | I |
| 136 | Grey-headed Canary- | Culicicapa ceylonensis | Monarc | LC | R | S | I |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Flycatcher | | hidae | | | | |
| 137 | Indian Paradise-Flycatcher | Terpsiphone paradisi | | LC | PM | S | I |
| 138 | Grey Wagtail | Motacilla cinerea | Motacillidae | LC | PM | S | I |
| 139 | Western Yellow Wagtail | Motacilla flava | | LC | PM | S | I |
| 140 | Citrine Wagtail | Motacilla citreola | | LC | PM | S | I |
| 141 | White-browed Wagtail (Large Pied Wagtail) | Motacilla maderaspatensis | | LC | R | S | I |
| 142 | White Wagtail | Motacilla alba | | LC | PM | S | I |
| 143 | Rosy Pipit | Anthus roseus | | LC | PM | S | I |
| 144 | Tree Pipit | Anthus trivialis | | LC | PM | S | I |
| 145 | Olive-backed Pipit | Anthus hodgsoni | | LC | PM | S | I |
| 146 | Long-billed Pipit | Anthus schwartzii | | LC | PM | S | I |
| 147 | Tawny Pipit | Anthus campestris | | LC | PM | S | I |
| 148 | Red-breasted Flycatcher | Ficedula parva | Muscicapidae | LC | PM | S | I |
| 149 | Taiga Flycatcher (Red-throated Flycatcher) | Ficedula parva | | LC | PM | S | I |
| 150 | Purple Sunbird | Cinnyris asiaticus | Nectariniidae | LC | R | S | Nectarivorous |
| 151 | Indian Golden Oriole | Oriolus kundoo | Oriolidae | LC | PM | S | I |
| 152 | Osprey | Pandion haliaetus | Pandionidae | LC | PM | S | Pi |
| 153 | Cinereous Tit (Great Tit) | Parus cinereus | Paridae | LC | R | S | I |
| 154 | House Sparrow | Passer domesticus | Passeridae | LC | R | S | Gr |
| 155 | Sind Sparrow | Passer pyrrhonotus | | LC | R | S | Gr |
| 156 | Spanish Sparrow | Passer hispaniolensis | | LC | R | S | Gr |
| 157 | Great White Pelican (Rosy Pelican) | Pelecanus roseus | Pelecanidae | VU | PM | S | Pi |
| 158 | Great Cormorant | Phalacrocorax carbo | Phalacrocoracidae | LC | R | S | Pi |
| 159 | Indian Cormorant (Indian Shag) | Phalacrocorax fuscicollis | | LC | R | S | Pi |
| 160 | Little Cormorant | Phalacrocorax niger | Phalacrocoracidae | LC | R | S | Pi |
| 161 | Indian Peafowl | Pavo cristatus | Phasianidae | LC | R | S | Om |
| 162 | Grey Francolin | Francolinus pondicerianus | | LC | R | S | I |
| 163 | Black Francolin | Francolinus francolinus | | LC | R | S | I |
| 164 | Greater Flamingo | Phoenicopterus roseus | Phoenicopteridae | NT | PM | S | FF |
| 165 | Common Chiffchaff | Phylloscopus collybita | Phylloscopidae | LC | PM | S | I |
| 166 | Greenish Warbler | Phylloscopus trochiloides | | LC | PM | S | I |
| 167 | Booted Warbler | Hippolais caligata | | LC | PM | S | I |
| 168 | Yellow-crowned Woodpecker | Micropus zeylonus | Picidae | LC | R | S | I |
| 169 | Black-rumped Flameback (Lesser Goldenback) | Dinopium benghalense | | LC | R | S | I |
| 170 | Baya Weaver | Ploceus philippinus | Ploceidae | LC | R | S | Gr |
| 171 | Streaked Weaver (Black-headed Munia) | Ploceus melanocephalus | | LC | R | S | Gr |
| 172 | Little Grebe | Tachybaptus ruficollis | Podicipedidae | LC | R | S | Pi |
| 173 | Eared Grebe (Black-necked | Podiceps nigricollis | | LC | PM | S | Pi |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Grebe) | | | | | | |
| 174 | Great Crested Grebe | Podiceps cristatus | | LC | PM | S | Pi |
| 175 | Alexandrine Parakeet | Psittacula eupatria | Psittaculidae | LC | R | S | Gr |
| 176 | Rose-ringed Parakeet | Psittacula krameri | | LC | R | S | Gr |
| 177 | Plum-headed Parakeet | Psittacula cyanocephala | | LC | R | S | Gr |
| 178 | Chestnut-bellied Sandgrouse | Pterocles exustus | Pteroclidae | LC | R | S | Gr |
| 179 | Red-vented Bulbul | Pycnonotus cafer | Pycnonotidae | LC | R | S | Fr |
| 180 | Red-whiskered Bulbul | Pycnonotus jocosus | | LC | R | S | Fr |
| 181 | White-eared Bulbul | Pycnonotus leucotis | | LC | R | S | Fr |
| 182 | Water Rail | Rallus aquaticus | Rallidae | LC | PM | S | I |
| 183 | Eurasian Moorhen | Gallinula chloropus | | LC | R | S | Om |
| 184 | Eurasian Coot | Fulica atra | | LC | R | S | Om |
| 185 | Grey-headed Swamphen (Purple Swamphen) | Porphyrio porphyrio | | LC | R | S | Om |
| 186 | White-breasted Waterhen | Amaurornis phoenicurus | | LC | R | S | Om |
| 187 | Ruddy-breasted Crake | Porzana fusca | | LC | PM | S | I |
| 188 | Baillon's Crake | Zapornia pusilla | | LC | PM | S | I |
| 189 | Brown Crake | Amaurornis phoenicurus | | LC | R | S | Om |
| 190 | Watercock | Gallicrex cristatus | | LC | R | S | Om |
| 191 | Black-winged Stilt | Himantopus himantopus | Recurvirostridae | LC | R | S | I |
| 192 | Pied Avocet | Recurvirostra avosetta | | LC | PM | S | I |
| 193 | White-browed Fantail | Rhipidura leucophrys | Rhipiduridae | LC | R | S | I |
| 194 | Greater Painted-Snipe | Rostratula benghalensis | Rostratulidae | LC | R | S | I |
| 195 | Eurasian Curlew | Numenius arquata | Scolopacidae | NT | PM | D | I |
| 196 | Black-tailed Godwit | Limosa limosa | | NT | PM | S | I |
| 197 | Common Snipe | Gallinago gallinago | | LC | PM | S | I |
| 198 | Common Redshank | Tringa totanus | | LC | PM | S | I |
| 199 | Spotted Redshank | Tringa erythropus | | LC | PM | S | I |
| 200 | Common Greenshank | Tringa nebularia | | LC | PM | S | I |
| 201 | Ruff | Philomachus pugnax | | LC | PM | S | I |
| 202 | Temminck's Stint | Calidris temminckii | | LC | PM | S | I |
| 203 | Little Stint | Calidris minuta | | LC | PM | S | I |
| 204 | Curlew Sandpiper | Calidris ferruginea | | NT | PM | D | I |
| 205 | Wood Sandpiper | Tringa glareola | | LC | PM | S | I |
| 206 | Common Sandpiper | Tringa stagnatilis | | LC | PM | S | I |
| 207 | Green Sandpiper | Tringa ochropus | | LC | PM | S | I |
| 208 | Marsh Sandpiper | Tringa palustris | | LC | PM | S | I |
| 209 | Whiskered Tern | Chlidonias hybrida | Sternidae | LC | PM | S | I |
| 210 | River Tern | Sterna hirundo | | LC | PM | S | I |
| 211 | Spotted Owlet | Athene brama | Strigidae | LC | R | S | I |
| 212 | Indian Scops-Owl (Collared Scops-Owl) | Otus bakkamoena | | LC | R | S | I |
| 213 | Short-eared Owl | Asio flammeus | | LC | PM | S | I |
| 214 | Dusky Eagle-Owl | Bubo coromandus | | NT | R | S | C |
| 215 | European Starling (Common Starling) | Sturnus VUlgaris | Sturnidae | LC | PM | S | Om |
| 216 | Indian Pied Starling (Pied Myna) | Gracupica contra | | LC | R | S | Om |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 217 | Bank Myna | Sturnus pagodarum | | LC | R | S | Om |
| 218 | Brahminy Starling | Sturnus pagodarum | | LC | R | S | Om |
| 219 | Rosy Starling | Pastor roseus | | LC | PM | S | Om |
| 220 | Common Tailorbird | Orthotomus sutorius | Sylviidae | LC | R | S | I |
| 221 | Delicate Prinia (Indian Graceful Prinia) | Prinia gracilis | | LC | R | S | I |
| 222 | Ashy Prinia | Prinia hodgsonii | | LC | R | S | I |
| 223 | Plain Prinia | Prinia inornata | | LC | R | S | I |
| 224 | Grey-breasted Prinia | Prinia hodgsonii | | LC | R | S | I |
| 225 | Moustached Warbler | Acrocephalus melanopogon | | LC | PM | S | I |
| 226 | Blyth's Reed Warbler | Acrocephalus dumetorum | | LC | PM | S | I |
| 227 | Clamorous Reed Warbler (Indian Great Reed Warbler) | Acrocephalus stentoreus | | LC | PM | S | I |
| 228 | Lesser Whitethroat | Sylvia curruca | | LC | PM | S | I |
| 229 | Yellow-bellied Prinia | Prinia flaviventris | | LC | R | S | I |
| 230 | Rufous-fronted Prinia | Prinia rufula | | LC | R | S | I |
| 231 | Western Crowned Warbler | Prinia cinereocapitata | | LC | R | S | I |
| 232 | Glossy Ibis | Plegadis falcinellus | Threskiornithidae | LC | PM | S | Om |
| 233 | Black-headed Ibis | Threskiornis melanocephalus | | LC | PM | S | Om |
| 234 | Red-naped Ibis (Indian Black Ibis) | Pseudibis papillosa | | VU | R | D | Om |
| 235 | Eurasian Spoonbill | Platalea leucorodia | | LC | PM | S | Pi |
| 236 | Yellow-eyed Babbler | Chrysomma sinense | Timaliidae | LC | R | S | I |
| 237 | Yellow-throated Sparrow (Chestnut-shouldered Sparrow) | Spizixos canicapillus | | LC | R | S | I |
| 238 | Isabelline Wheatear | Oenanthe isabelline | Turd | LC | WM | S | Pi |
| 239 | Oriental Magpie-Robin | Copsychus saularis | Turdidae | LC | R | S | I |
| 240 | Bluethroat | Luscinia svecica | | LC | PM | S | I |
| 241 | Black Redstart | Phoenicurus ochruros | | LC | WM | S | I |
| 242 | Siberian Stonechat (Common Stonechat) | Saxicola rubetra | | LC | PM | S | I |
| 243 | Pied Bushchat | Saxicola caprata | | LC | R | S | I |
| 244 | Brown Rock Chat (Indian Chat) | Saxicoloides fulicatus | | LC | R | S | I |
| 245 | Grey Bushchat | Saxicola ferreus | | LC | PM | S | I |
| 246 | Blue Rock-Thrush | Monticola solitarius | | LC | WM | S | I |
| 247 | Black-throated Thrush | Turdus atrogularis | | LC | PM | S | I |
| 248 | Desert Wheatear | Oenanthe deserti | | LC | PM | S | I |
| 249 | Barred Buttonquail | Turnix suscitator | Turnicidae | LC | R | S | I |
| 250 | Barn Owl | Tyto alba | Tytonidae | LC | R | S | C |
| 251 | Eurasian Hoopoe | Upupa epops | Upupidae | LC | PM | S | I |
| 252 | Indian White-eye (Oriental White-eye) | Zosterops palpebrosus | Zosteropidae | LC | R | S | I |

***IUCN category** (Least concern (LC), Near threatened (NT), Vulnerable (VU), Endangered (EN)), **Population Status** (Decreasing (D) and Stable (S)), **Migrant Status (**Passage Migrant (PM), Resident (R), Winter Migrant (WM)), **Feeding types** (Carnivorous (C), Filter Feeder (Ff), Frugivorous (Fr), Granivorous (Gr), Insectivorous (I), Nectarivorous (Ne), Omnivorous (O), Piscivorous (Pi), Scavenger (S))

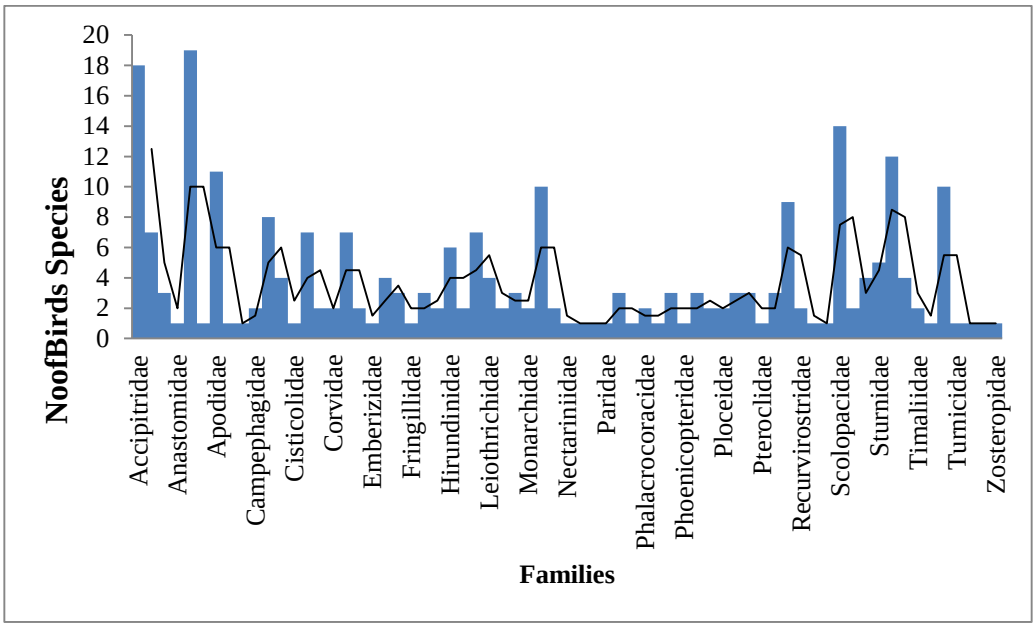


**Figure: 2. Distribution of Birds**

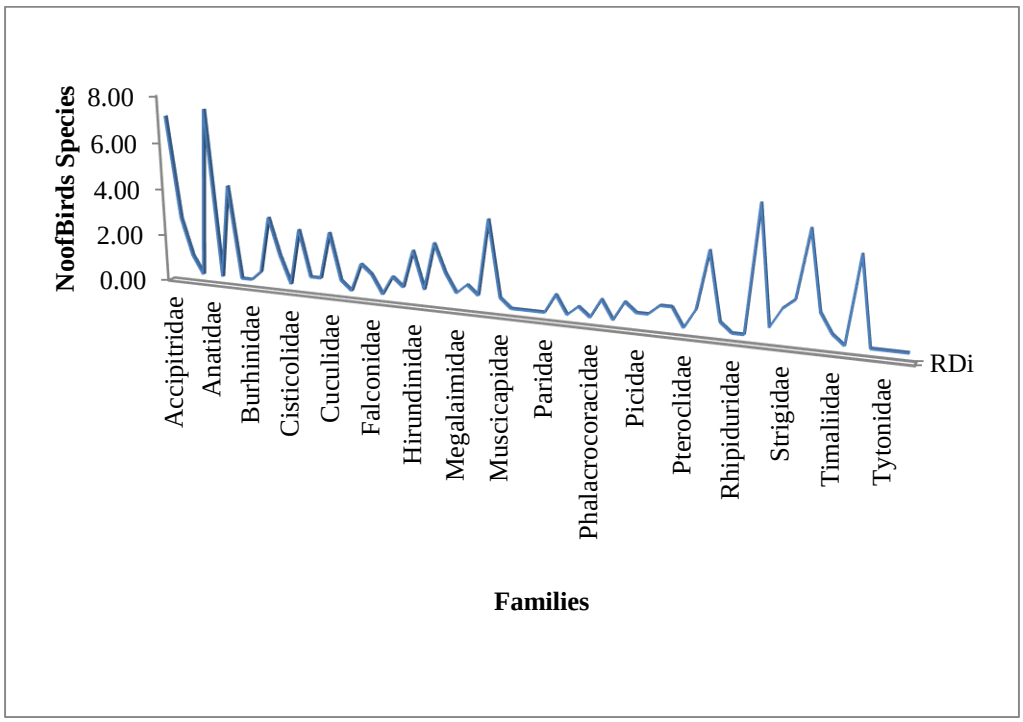


**Figure: 3. RDi Index**

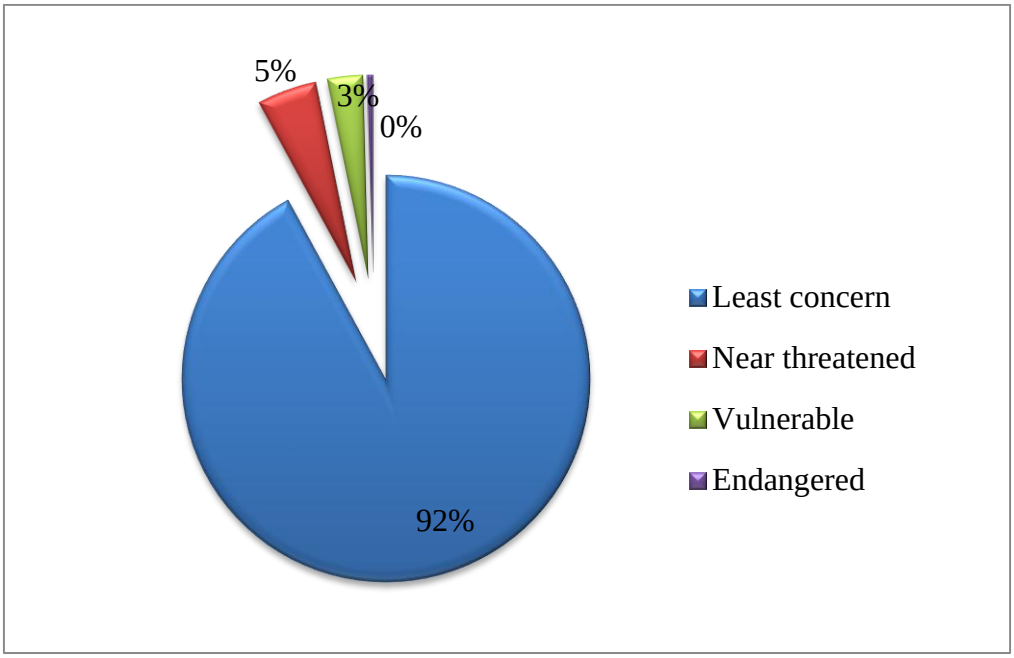


**Fig 4: Birds IUCN category**

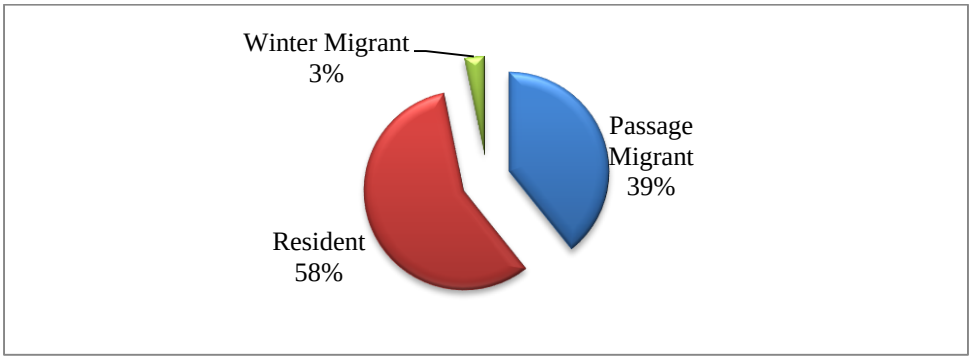


**Fig: 5. Migrant Status of Birds**

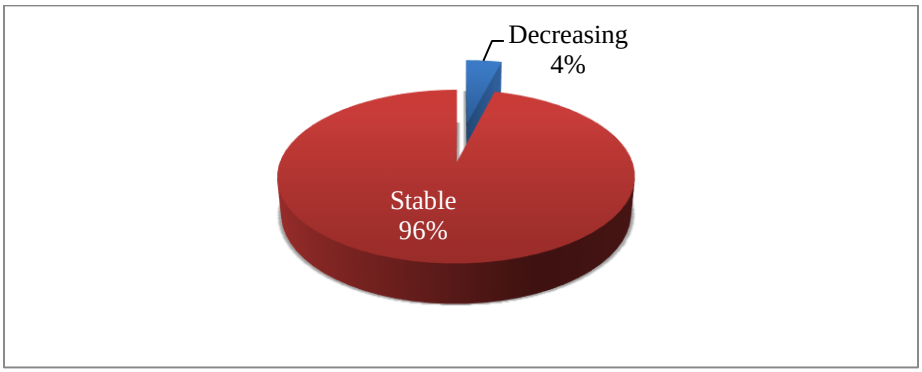


**Fig: 6. Population Status**

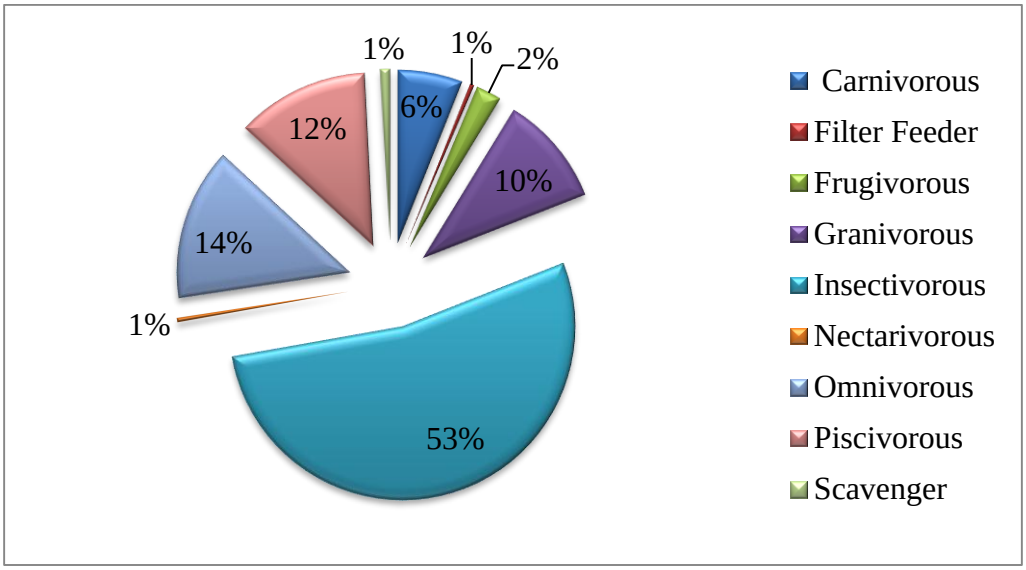


**Fig: 7. Feeding types**

The family distribution pattern of different bird genera is as follows: Accipitridae (18), Alaudidae (7), Alcedinidae (3), Anastomidae (1), Anatidae (19), Anhingidae (1), Apodidae (11), Bucerotidae (1), Burhinidae (1), Campephagidae (2), Charadriidae (8), Ciconiidae (4), Cisticolidae (1), Columbidae (7), Coraciidae (2), Corvidae (2), Cuculidae (7), Dicruridae (2), Emberizidae (1), Estrildidae (4), Falconidae (3), Fringillidae (1), Glareolidae (3), Gruidae (2), Hirundinidae (6), Jacanidae (2), Laniidae (7), Leiothrichidae (4), Megalaimidae (2), Meropidae (3), Monarchidae (2), Motacillidae (10), Muscicapidae (2), Nectariniidae (1), Oriolidae (1), Pandionidae (1), Paridae (1), Passeridae (3), Pelecanidae (1), Phalacrocoracidae (2), Phasianidae (3), Phoenicopteridae (1), Phylloscopidae (3), Picidae (2), Ploceidae (2), Podicipedidae (3), Psittaculidae (3), Pteroclidae (1), Pycnonotidae (3), Rallidae (9), Recurvirostridae (2), Rhipiduridae (1), Rostratulidae (1), Scolopacidae (14), Sternidae (2), Strigidae (4), Sturnidae (5), Sylviidae (12), Threskiornithidae (4), Timaliidae (2), Turd (1), Turdidae (10), Turnicidae (1), Tytonidae (1), Upupidae (1), and Zosteropidae (1). In order to assess the seasonal variation of avian species, data was analyzed season wise, on the basis of their presence or absence in different seasons of the year. The result revealed that the maximum number of species (145) was recorded as residence category, followed by Passage Migrant (99) and winter (8) (Fig). Scavengers make up 53% of the bird population and are important for cleaning up dead animals and preventing the spread of diseases. Vultures, crows, and marabou storks are examples of scavengers. Different habitats, with their unique offerings, cater to the specific needs of diverse species, ensuring their continued existence and evolution (Young et al., 2019; Boyce et al., 2016; Bailey & King, 2019). Carnivores, which make up 12%, hunt and kill their prey. Falcons, eagles, and hawks are examples of carnivores. Insectivores, accounting for 10%, primarily feed on insects and help control insect populations. Swallows, flycatchers, and bee-eaters are examples of insectivores. Granivores, making up 14%, consume seeds and play a significant role in seed

dispersal and plant regeneration. Sparrows, finches, and buntings are examples of granivores. Frugivores, accounting for 6%, eat fruits and help disperse seeds through their droppings, promoting plant reproduction. Toucans, parrots, and pigeons are examples of frugivores. The remaining portions of the bird population are represented by smaller slices in the pie chart. Piscivores, which make up 2%, primarily eat fish. Herons, kingfishers, and ospreys are examples of piscivores. Nectarivores, accounting for 1%, consume nectar from flowers. Hummingbirds and some sunbirds are examples of nectarivores. Omnivores, also making up 1%, eat a variety of foods including plants and animals. Crows, chickens, and gulls are examples of omnivores. Filter feeders, accounting for 1%, strain tiny food particles from water. Flamingos and some ducks are examples of filter feeders (Figure 2 to Figure 7) (Table: 1 and 2). This biodiversity underscores the crucial role environmental resources play in shaping the lives of countless organisms that call this place home (Shekhawat & Bhatnagar, 2014). The majority of bird species, accounting for 92%, are currently not in immediate danger of extinction. This is an encouraging indication of the progress made in global bird conservation endeavors. The reasons for this are likely linked to the park's diverse wetland habitats, providing abundant food and nesting opportunities for wintering birds (Kumar & Gupta, 2013) loser examination of population trends among migratory birds revealed further nuances. However, there is a smaller percentage, approximately 5%, of bird species that are categorized as "Near Threatened." Although they are not currently considered at risk, continuous monitoring of these populations is crucial to prevent their situation from deteriorating. Additionally, there is a more concerning group comprising 3% of bird species that are classified as "Vulnerable." These species face a significant risk of extinction in the wild due to various threats such as habitat loss, hunting, or climate change. To ensure their survival, urgent and effective conservation actions are imperative.

## CONCLUSION

Bhindawas Wildlife Sanctuary has the potential to be amongst good bird conservation areas but would need some good planning and management inputs. In addition bushes, herbs, scrubs, Beri and Mango trees are planted in hundreds each. Thirdly appropriate emergent and sub-mergent vegetation be sustained in water sheet as floating, rooted and sub-merged aquatic plants. In addition, several land flats be reconstructed in the centre and other places for water birds to roost and use. Watch towers and avenues for excursion are constructed on peripheral margins. These steps would generate good biodiversity in general and avian biodiversity in particular. Good bird life inside Bhindawas Wildlife Sanctuary could also mean better livelihood to people especially youths living around the park by engaging them as guides. Kumar et al (2024)

67 bird families from 23 different bird orders were recorded during this observation. This highlights a rich and diverse avian community, encompassing birds with varied ecological roles and life histories. Certain families stand out with higher RDi values, indicating they were encountered more frequently during the study. These include

Anseriformes (Ducks, Geese, and Swans) with an RDi of (9.52), Pelecaniformes (Pelicans, Herons, and Egrets) with an RDi of 10.48, Accipitriformes (Hawks, Eagles, and Kites) with an RDi of 4.76, Ciconiiformes (Storks and Jabirus) with an RDi of 3.81 and Galliformes (Chickens, Pheasants, and Grouse) also at 2.86. Combining RDi with other methods like point counts or transect surveys could provide a more comprehensive understanding of bird distribution. Several orders and families were represented by only one species, resulting in RDi values of 0.95. This might be due to limitations in the study's scope or specific habitat focus, potentially overlooking families with broader distributions. Overall, this table offers valuable information about the relative abundance and diversity of bird families within the study area. Further analysis, considering species-level data and potential limitations of RDi, can illuminate deeper ecological patterns and contribute to avian conservation efforts.In conclusion, the Bhindawas Wildlife Sanctuary is a significant birding destination in India. Its diverse habitats and the presence of the Bhindawas Lake make it an ideal habitat for a wide range of bird species. Efforts to protect and conserve the sanctuary's avian population are crucial for the long-term survival of these birds. This report will provide a comprehensive analysis of the water scarcity issue in Bhindawas Wildlife Sanctuary, focusing on its impact on bird species. By understanding the causes and consequences of water scarcity, as well as exploring potential solutions, this report aims to contribute to the conservation efforts in the sanctuary. It is hoped that the findings and recommendations presented here will support the development of effective strategies to ensure the long-term survival of bird species in Bhindawas Wildlife Sanctuary.

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