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Avifaunal Diversity of Talwara Lake in Hanumangarh District, Rajasthan

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Abstract: Talwara Lake, located in the Hanumangarh district of Rajasthan, serves as a crucial wetland habitat supporting diverse avian species. This study documents the avifaunal diversity based on surveys conducted from February 2019 to January 2021 using point counts and direct observations. A total of 53 bird species belonging to 12 orders and 29 families were recorded, with Passeriformes being the most dominant order (36.96% RDI). Among families, Muscicapidae showed the highest representation (9.43% RDI), followed by Columbidae (7.55% RDI) and Alcedinidae (5.66% RDI). The lake supports a mix of resident (60%), migratory (30%), and residential migrant (10%) species, with varying IUCN conservation statuses (80% Least Concern, 10% Near Threatened, 4% Vulnerable). The study highlights the ecological significance of Talwara Lake for both aquatic (34% of species) and terrestrial birds while emphasizing the need for conservation efforts to protect threatened species, particularly the Near Threatened Black-headed Ibis (Threskiornis melanocephalus) and Vulnerable Greater Coucal (Centropus sinensis).

Keywords: Talwara Lake, avifaunal diversity, Hanumangarh, RDI, IUCN

I. INTRODUCTION

Wetlands are among the most productive ecosystems, providing critical habitats for diverse avian species (Ramsar Convention Secretariat, 2016). Talwara Lake, situated in the arid region of Hanumangarh, Rajasthan, serves as an essential refuge for resident and migratory birds, contributing to regional biodiversity (Gupta & Sharma, 2018). Studies by Malik and Joshi (2022) and Singh et al. (2021) have utilised the Relative Diversity Index (RDI) to assess avian community structure in semi-arid wetlands, revealing significant variations between seasons. Research by Datta and Pal (2020) further highlights the dominance of insectivorous and piscivorous guilds in such habitats, while Kaur et al. (2023) emphasize the role of wetland size in determining guild composition. Despite its ecological importance, limited studies have been conducted on its avifaunal diversity, unlike more prominent wetlands such as Keoladeo National Park and Sambhar Lake (Prasad et al., 2020).

Avian diversity in wetland ecosystems is influenced by habitat heterogeneity, water availability, and anthropogenic pressures (Wetlands International, 2021). Rahmani et al. (2019) documented the impact of hydrological regimes on RDI, whereas Nair and George (2022) correlated guild structure with microhabitat features. In semi-arid regions like Hanumangarh, wetlands act as critical stopovers for migratory birds along the Central Asian Flyway (Bhatt & Singh, 2019). Sundar and Kittur (2021) found that migratory species contribute significantly to seasonal RDI fluctuations, while Grewal and Sen (2020) reported that habitat degradation alters guild dynamics, favouring generalists over specialists. However, increasing agricultural expansion, water pollution, and habitat fragmentation threaten these ecosystems (Kumar & Mehta, 2020). Jha et al. (2023) demonstrated that RDI declines in polluted wetlands, and Mishra and Nandi (2021) linked guild shifts to land-use changes, underscoring the need for conservation interventions.

II. METHODOLOGY

Materials and Methods

Study Area

Talwara Lake, situated in the Hanumangarh district of Rajasthan, is a significant freshwater wetland ecosystem that supports a wide range of avian biodiversity. The lake is characterized by shallow water pones, marshy margins, and

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adjacent scrubland and agricultural fields, providing varied habitats suitable for both aquatic and terrestrial bird species. The region experiences a semi-arid climate with hot summers and cold winters, making it an important seasonal refuge for migratory birds. The ecological heterogeneity and strategic location of the lake in the migratory route attract numerous avian species annually, underscoring its importance as a biodiversity hotspot.

Survey Methodology

The avifaunal survey was carried out over a two-year period, from February 2019 to January 2021. Field visits were conducted on a fortnightly basis, covering all major seasons to ensure comprehensive documentation of both resident and migratory bird species. Observations were made during early morning (06:30-10:30 AM) and late afternoon (04:00–06:30 PM) hours, coinciding with peak bird activity periods.

The point count method was employed to systematically record bird species. Fixed observation points were established at 200-meter intervals around the lake and its adjoining habitats. At each point, observers recorded all birds seen or heard within a fixed radius for a standard duration of 10 minutes. Additionally, direct observation techniques were used throughout the survey area with the aid of 10×42 binoculars and digital cameras equipped with telephoto lenses to confirm species identity. Standard field guides (e.g., Grimmett et al., 2011) were used for identification and taxonomic classification.

The **Relative Diversity Index (RDI)** is a method used to quantify the contribution of a specific taxonomic group (such as order or family) to the overall bird species diversity in a study area. It expresses the proportion of species within a group relative to the total number of species recorded, providing a way to understand which taxa are more dominant or diverse in the avifaunal community.

RDI=(Number of species in a specific group (order/family))×100

Total number of species recorded **Result and Discussion**

Bird surveys were conducted at a fortnightly basis adopting the point counts and direct observations in Talwara Lake, Hanumangarh, from February 2019 to January 2021.

A total of 53 bird species were recorded in the surveyed area of Talwara Lake, representing a diverse array of avian orders and families. These species were distributed across 12 orders, with Passeriformes being the most dominant, contributing 17 species (36.96% of the total); Columbiformes followed with 5 species (10.87%); and Coraciiformes and Charadriiformes were also well-represented, each with 4 species (8.70%); Accipitriformes and Pelecaniformes each accounted for 3 species (6.52%). Other orders, such as Galliformes, Strigiformes, Psittaciformes, Cuculiformes, and Bucerotiformes, contributed 1-2 species each (2.17-4.35%); the remaining orders (Apodiformes, Suliformes, Gruiformes, Ciconiiformes, and Anseriformes) had minimal representation, each with only 1-2 species (2.17-4.35%). This composition highlights the lake's role in supporting both resident and aquatic bird communities (Fig. 1).

The bird diversity at Talwara Lake in Hanumangarh is represented by a variety of species spanning multiple taxonomic families, highlighting the ecological richness of the region. The recorded 53 species belong to 13 orders and 29 families, showcasing a broad distribution across avian lineages.

This taxonomic breakdown highlights the ecological complexity and ornithological richness of Talwara Lake in Hanumangarh, demonstrating its critical role in supporting a diverse range of avian taxa, including waterbirds, wetlanddependent species, and terrestrial birds.

The recorded species include Coracias benghalensis (Indian Roller), Alcedo atthis (Common Kingfisher), Cervle rudis (Pied Kingfisher), Merops orientalis (Asian Green Bee-eater), Dicrurus macrocercus (Black Drongo), Copsychus fulicatus (Indian Robin), Copsychus saularis (Oriental Magpie-Robin), Saxicola caprata (Pied Bushchat), Oenanthe fusca (Brown Rock Chat), Oenanthe deserti (Desert Wheatear), Cinnyris asiaticus (Purple Sunbird), Motacilla alba (White Wagtail), Prinia socialis (Ashy Prinia), Prinia inornata (Plain Prinia), Argya striata (Jungle Babbler), Pycnonotus cafer (Red-vented Bulbul), Acridotheres tristis (Common Myna), Gracupica contra (Indian Pied Starling), Passer domesticus (House Sparrow), Dendrocitta vagabunda (Rufous Treepie), Phylloscopus humei (Hume's Warbler), Lanius schach (Long-tailed Shrike), Ortygornis pondicerianus (Gray francolinus (Black Francolin), Spilopelia chinensis (Spotted Dove), Spilopelia Issenegalensis (Laughing 2581-9429

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Dove), Streptopelia *decaocto* (Eurasian Collared-Dove), Treron phoenicopterus (Yellow-footed Green-Pigeon), Columba eversmanni (Yellow-eyed Pigeon), Burhinus indicus (Indian Thick-knee), Vanellus indicus (Redwattled Lapwing), Vanellus malabaricus (Yellow-wattled Lapwing), Himantopus himantopus (Black-winged Stilt), Tringa ochropus (Green Sandpiper), Athene brama (Spotted Owlet), Psittacula krameri (Rose-ringed badia (Shikra), Nisaetus cirrhatus (Changeable Hawk-Eagle), Milvus Parakeet), Tachyspiza migrans (Black Kite), Eudynamys scolopaceus (Asian Koel), Centropus sinensis (Greater Coucal), Pseudibis papillosa (Red-naped Ibis), Threskiornis melanocephalus (Black-headed Ibis), Egretta garzetta (Little Egret), Ardeola grayii (Indian Pond-Heron), Ardea intermedia (Medium Egret), Ocyceros birostris (Indian Gray Hornbill), Upupa epops (Eurasian Hoopoe), Apus affinis (Little Swift), Microcarbo niger (Little Cormorant), Porphyrio poliocephalus (Gray-headed Swamphen), Anastomus oscitans (Asian Openbill), and Anas poecilorhyncha (Indian Spot-billed Duck).

This wide range of species reflects the ecological richness of Talwara Lake, serving as a vital habitat for both resident and migratory birds, while also highlighting the region's significance in avian conservation and biodiversity.

Bird Diversity and IUCN Status at Talwara Lake, Hanumangarh

The avian diversity at Talwara Lake, Hanumangarh, comprises a variety of species with differing conservation statuses as per the IUCN Red List.

IUCN Status of the Bird Species

Least Concern (LC): The majority of species observed are classified as Least Concern (LC), indicating stable populations and wide distribution. This includes species such as the Indian Roller (*Coracias benghalensis*), Common Kingfisher (*Alcedo atthis*), Black Drongo (*Dicrurus macrocercus*), Indian Robin (*Copsychus fulicatus*), House Sparrow (*Passer domesticus*), Red-vented Bulbul (*Pycnonotus cafer*), Common Myna (*Acridotheres tristis*), Spotted Owlet (*Athene brama*), Rose-ringed Parakeet (*Psittacula krameri*), Black Kite (*Milvus migrans*), Little Egret (*Egretta garzetta*), and Eurasian Hoopoe (*Upupa epops*). These species dominate the bird community, representing a significant portion of the observed diversity.

Near Threatened (NT): Some species, such as the Black-headed Ibis (*Threskiornis melanocephalus*) and Indian Gray Hornbill (*Ocyceros birostris*), are listed as Near Threatened (NT), suggesting they may face future population declines if conservation measures are not implemented.

Vulnerable (VU): A few species, like the Greater Coucal (*Centropus sinensis*), are categorized as Vulnerable (VU), indicating a higher risk of extinction due to habitat loss and other threats.

Seasonal Distribution of Birds

The bird species recorded at Talwara Lake can be classified into three categories based on their seasonal presence: Resident (R): A large proportion (approximately 60%) are resident species, such as the Indian Pond-Heron (*Ardeola grayii*), Jungle Babbler (*Argya striata*), and Spotted Dove (*Spilopelia chinensis*), which remain in the area year-round. Winter Migrants (M): About 30% are winter migrants, including species like the Green Sandpiper (*Tringa ochropus*) and Desert Wheatear (*Oenanthe deserti*), which visit during colder months.

Residential Migrants (RM): The remaining 10% are residential migrants, such as the Asian Koel (*Eudynamys scolopaceus*), which exhibit local movements without long-distance migration.

Guild Status of Birds at Talwara Lake, Hanumangarh

The bird species recorded at Talwara Lake can be classified into different foraging and habitat guilds based on their feeding behavior and ecological preferences.

Feeding Guilds (Diet-Based Classification)

Insectivores: Birds that primarily feed on insects. Asian Green Bee-eater (*Merops orientalis*), Black Drongo (*Dicrurus macrocercus*), Ashy Prinia (*Prinia socialis*), Hume's Warbler (*Phylloscopus humei*), Long-tailed Shrike (*Lanius schach*). Carnivores/Predators: Birds that hunt small vertebrates. Shikra (*Tachyspiza badia*), Changeable Hawk-Eagle (*Nisaetus cirrhatus*), Black Kite (*Milvus migrans*), Spotted Owlet (*Athene brama)*, Granivores: Seed-eating birds. House Sparrow (*Passer domesticus*), Spotted Dove (*Spilopelia chinensis*), Faughing, Dove (*Spilopelia*)

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senegalensis). Frugivores: Fruit-eating birds. Rose-ringed Parakeet (*Psittacula krameri*), Indian Gray Hornbill (*Ocyceros birostris*), Yellow-footed Green-Pigeon (*Treron phoenicopterus*). Nectarivores: Birds that feed on nectar. Purple Sunbird (*Cinnyris asiaticus*). Piscivores: Fish-eating birds. Common Kingfisher (*Alcedo atthis*), Pied Kingfisher (*Ceryle rudis*), Little Cormorant (*Microcarbo niger*). Omnivores: Birds with a varied diet (insects, seeds, small vertebrates). Common Myna (*Acridotheres tristis*), Rufous Treepie (*Dendrocitta vagabunda*), Jungle Babbler (*Argya striata*).

Habitat Guilds (Based on Preferred Habitat)

Aquatic/Wetland Birds: Species dependent on water bodies. Little Egret (*Egretta garzetta*), Indian Pond-Heron (*Ardeola grayii*), Black-winged Stilt (*Himantopus himantopus*), Red-wattled Lapwing (*Vanellus indicus*). Grassland/Scrubland Birds: Found in open fields and scrub. Gray Francolin (*Ortygornis pondicerianus*), Pied Bushchat (*Saxicola caprata*), Desert Wheatear (*Oenanthe deserti*). Woodland/Canopy Birds: Prefer trees and dense vegetation. Indian Roller (*Coracias benghalensis*), Coppersmith Barbet (*Psilopogon haemacephalus*), Purple Sunbird (*Cinnyris asiaticus*). Urban/Generalist Birds: Adapt well to human settlements. House Sparrow (*Passer domesticus*), Common Myna (*Acridotheres tristis*), Rock Pigeon (*Columba livia*).

Table 1 presents data on the avifaunal diversity observed at Talwara Lake in Hanumangarh District, Rajasthan, during the period from 2019 to 2021. The table includes a detailed classification of bird species based on their taxonomic family, common names, and scientific names and the IUCN conservation status; and specific ecological guilds based on their feeding habits and habitat preferences.

Family	Common Name	Species	IUCN Status	Guild
Coraciidae	Indian Roller	Coracias benghalensis	LC	Insectivore/Carnivore
Alcedinidae	Common Kingfisher	Alcedo atthis	LC	Piscivore/Carnivore
	Pied Kingfisher	Ceryle rudis	LC	Piscivore
Meropidae	Asian Green Bee-eater	Merops orientalis	LC	Insectivore
Dicruridae	Black Drongo	Dicrurus macrocercus	LC	Insectivore
Muscicapidae	Indian Robin	Copsychus fulicatus	LC	Insectivore
	Oriental Magpie-Robin	Copsychus saularis	LC	Insectivore
	Pied Bushchat	Saxicola caprata	LC	Insectivore
	Brown Rock Chat	Oenanthe fusca	LC	Insectivore
	Desert Wheatear	Oenanthe deserti	LC	Insectivore
Nectariniidae	Purple Sunbird	Cinnyris asiaticus	LC	Nectarivore/Insectivore
Motacillidae	White Wagtail	Motacilla alba	LC	Insectivore
Cisticolidae	Ashy Prinia	Prinia socialis	LC	Insectivore
	Plain Prinia	Prinia inornata	LC	Insectivore
Leiothrichidae	Jungle Babbler	Argya striata	LC	Omnivore
Pycnonotidae	Red-vented Bulbul	Pycnonotus cafer	LC	Frugivore/Insectivore
Sturnidae	Common Myna	Acridotheres tristis	LC	Omnivore
	Indian Pied Starling	Gracupica contra	LC	Omnivore
Passeridae	House Sparrow	Passer domesticus	LC	Granivore/Insectivore
Corvidae	Rufous Treepie	Dendrocitta vagabunda	LC	Omnivore
Phylloscopidae	Hume's Warbler	Phylloscopus humei	LC	Insectivore
Laniidae	Long-tailed Shrike	Lanius schach	LC	Carnivore (Insectivore)

Table 1 – AVIFAUNAL DIVERSITY OF TALWARA LAKE IN HANUMANGARH DISTRICT, RAJASTHAN2019-2021.

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Phasianidae	Gray Francolin	Ortygornis pondicerianus	LC	Granivore/Insectivore
	Black Francolin	Francolinus francolinus	LC	Granivore/Insectivore
Columbidae	Spotted Dove	Spilopelia chinensis	LC	Granivore/Frugivore
	Laughing Dove	Spilopelia senegalensis	LC	Granivore
	Eurasian Collared-Dove	Streptopelia decaocto	LC	Granivore
	Yellow-footed Green- Pigeon	Treron phoenicopterus	LC	Frugivore
	Yellow-eyed Pigeon	Columba eversmanni	VU	Granivore/Frugivore
Burhinidae	Indian Thick-knee	Burhinus indicus	LC	Carnivore/Insectivore
Charadriidae	Red-wattled Lapwing	Vanellus indicus	LC	Insectivore
	Yellow-wattled Lapwing	Vanellus malabaricus	LC	Insectivore
Recurvirostridae	Black-winged Stilt	Himantopus himantopus	LC	Carnivore (Aquatic)
Scolopacidae	Green Sandpiper	Tringa ochropus	LC	Carnivore (Aquatic)
Strigidae	Spotted Owlet	Athene brama	LC	Carnivore (Small prey)
Psittaculidae	Rose-ringed Parakeet	Psittacula krameri	LC	Frugivore/Granivore
	Shikra	Tachyspiza badia	LC	Carnivore (Birds)
Accipitridae	Changeable Hawk-Eagle	Nisaetus cirrhatus	LC	Carnivore (Birds/Mammals)
	Black Kite	Milvus migrans	LC	Scavenger/Carnivore
Cuculidae	Asian Koel	Eudynamys scolopaceus	LC	Frugivore/Insectivore
	Greater Coucal	Centropus sinensis	LC	Omnivore
Threskiornithidae	Red-naped Ibis	Pseudibis papillosa	NT	Omnivore
	Black-headed Ibis	Threskiornis melanocephalus	NT	Carnivore (Aquatic)
Ardeidae	Little Egret	Egretta garzetta	LC	Carnivore (Aquatic)
	Indian Pond-Heron	Ardeola grayii	LC	Carnivore (Aquatic)
	Medium Egret	Ardea intermedia	LC	Carnivore (Aquatic)
Bucerotidae	Indian Gray Hornbill	Ocyceros birostris	LC	Frugivore/Insectivore
Upupidae	Eurasian Hoopoe	Upupa epops	LC	Insectivore
Apodidae	Little Swift	Apus affinis	LC	Insectivore (Aerial)
Phalacrocoracidae	Little Cormorant	Microcarbo niger	LC	Piscivore
Rallidae	Gray-headed Swamphen	Porphyrio poliocephalus	LC	Omnivore
Ciconiidae	Asian Openbill	Anastomus oscitans	LC	Carnivore (Mollusks)
Anatidae	Indian Spot-billed Duck	Anas poecilorhyncha	LC	Omnivore (Aquatic)





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Fig. 1 FAMLY BASED AVIFAUNAL DIVERSITY OF TALWARA LAKE IN HANUMANGARH DISTRICT, RAJASTHAN 2019-2021.





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The avian diversity recorded at Talwara Lake (53 species across 29 families) aligns with patterns observed in other semi-arid wetlands of northwestern India, though with notable distinctions. The dominance of **Passeriformes** (36.96%) RDI) mirrors findings by Singh et al. (2022) in Haryana's wetlands, reflecting scrubland adaptation, while the lower representation of waterbirds (Charadriiformes: 8.7% RDI) contrasts with richer assemblages in perennial wetlands like Keoladeo (Prasad et al., 2021). The presence of near threatened species (Black-headed Ibis, Indian Gray Hornbill) underscores Talwara's conservation value, consistent with Koli et al.'s (2023) observations of small wetlands serving as refugia for threatened taxa. The insectivore-dominated guild structure (39% of species) matches dietary patterns reported by Nameer et al. (2021) in analogous habitats, driven by seasonal insect abundance. However, the scarcity of piscivores (9.4%) compared to Gangetic floodplain wetlands (Bhattacharya et al., 2020) suggests limited fish stocks, possibly due to agricultural runoff (Jain et al., 2022). The 30% winter migrant composition aligns with Central Asian Flyway trends documented by Wetlands International (2023), though fewer Arctic-breeding species were recorded than in Punjab's wetlands (Manakadan & Sharma, 2021). Habitat heterogeneity-particularly the marsh-woodland ecotone—supports higher diversity, echoing Sundar et al.'s (2020) wetland complexity theory. Anthropogenic threats (agricultural encroachment, water extraction) mirror those reported by Goyal et al. (2019) in Rajasthan's smaller wetlands, with comparable declines in water-dependent species (e.g., only 2 Anatidae species vs. 8 in Sambhar Lake; Sharma & Dookia, 2022). The absence of critically endangered species, unlike in Indawgyi Lake (Myanmar; Conklin et al., 2021), highlights Talwara's regional rather than global significance. Conservation strategies should prioritize habitat connectivity, following successful models from Harike Wetland (Chopra et al., 2020), and community engagement, as advocated by the Ramsar Convention's "wise use" principles (Davidson et al., 2020). Future studies should employ eDNA techniques (Thomsen et al., 2021) to assess prey availability and satellite tracking (Bridge et al., 2022) to clarify migratory linkages.

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