Avifaunal Distribution and Habitat Assessment in the Semi-Arid Region of Eastern Rajasthan

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ABSTRACT

The present study documents the avifaunal diversity of the Tonk district in Rajasthan, based on intensive surveys conducted during the 2023–24 session. A total of 127 bird species belonging to 55 families were recorded across 13 major water bodies and their surrounding areas. Among these, 94 species were identified as local/resident, 19 species as summer and winter migratory, and 14 species as resident migratory. Additionally, 28 families comprised only a single species, while species distribution varied among other families: 6 families had 2 species, 8 families had 3 species, 7 families had 4 species, 2 families had 5 species, and 3 families had 6 species. Notably, only one family had a maximum of 7 species. Like many other regions in India, the study area faces significant conservation challenges. Further research is essential to assess the impact of human-induced habitat modifications on local avifaunal diversity. The findings of this study contribute to a better understanding of bird diversity in the region and emphasize the need for conservation measures to protect avian habitats. Therefore, a conservation strategy is also proposed to mitigate these threats.

Keywords: Avifaunal diversity, Resident birds, Winter migratory, Relative diversity index, Habitat, Conservation.

INTRODUCTION

Birds have developed special adaptations to help them live long and prosper in their surroundings. They are renowned for their extraordinary ability to adapt to a variety of habitats, comprising cold areas, tropical islands, thick rainforests, and barren deserts. These adaptations include the size and form of the beak, colors of the feathers for show or camouflage, migratory patterns, and nesting techniques.

Over ten thousand bird species may be found in practically every region on the planet. A few examples of the variables that affect this diversity include location, temperature, and the

accessibility of food sources. Bird variety includes variations in behavior, size, shape, color, and ecological roles.

As seed dispersers, predators, prey, and pollinators, birds are essential to ecosystems. Throughout human history, birds have also affected art, literature, and scientific research. As sources of recreation and as markers of environmental health, they are economically significant [1-3].

Numerous bird species face threats of death as a result of pollution, climate change, habitat loss, and other human activities. To maintain ecological balance and conserve avian diversity, conservation activities are crucial [4].

Understanding avian diversity is crucial for appreciating the ecological importance and natural beauty and conservation efforts of birds worldwide. Each species represents a unique evolutionary history and contributes to the intricate web of life on our planet. Studying the avian diversity of the Tonk District in Rajasthan, India, offers a glimpse into the rich birdlife that inhabits this region, influenced by its diverse habitats and environmental characteristics. The main motive of this study is to make a checklist of bird species in the Tonk district that are under varying degrees of strain from human activities.

STUDY AREA

Tonk District (present study area) is situated in the eastern part of Rajasthan, India, bordering Ajmer District to the north, Jaipur District to the west, Bundi District to the southeast, and Sawai Madhopur District to the east. (Figure 1a). From a geographical point of view, it is present at 25°41’ to 26°34' latitude and 75°07’ to 76°19' longitude covering an area of 7,190.5 sq km. The Tonk district has generally dry climatic conditions. In winter, the minimum temperature is 8 oC, and the maximum temperature remains 22 ^{o}C, while in summer the minimum and maximum temperatures are 30 ^{o}C and 45 ^{o}C, correspondingly. 613.6 mm is the average annual rainfall in the whole district, but it usually decreases from the southeast to the northwest. The district has two types of forests i.e. tropical thorn forests and tropical dry deciduous forests.

According to the convenience of the study, 13 major wetlands and their surrounding terrestrial areas within a radius of 100 km of Tonk City were included under the study area. All those areas that are potential shelters for birds like rivers, ponds, dams, and fields were studied. (Table 1; Figure 1b).

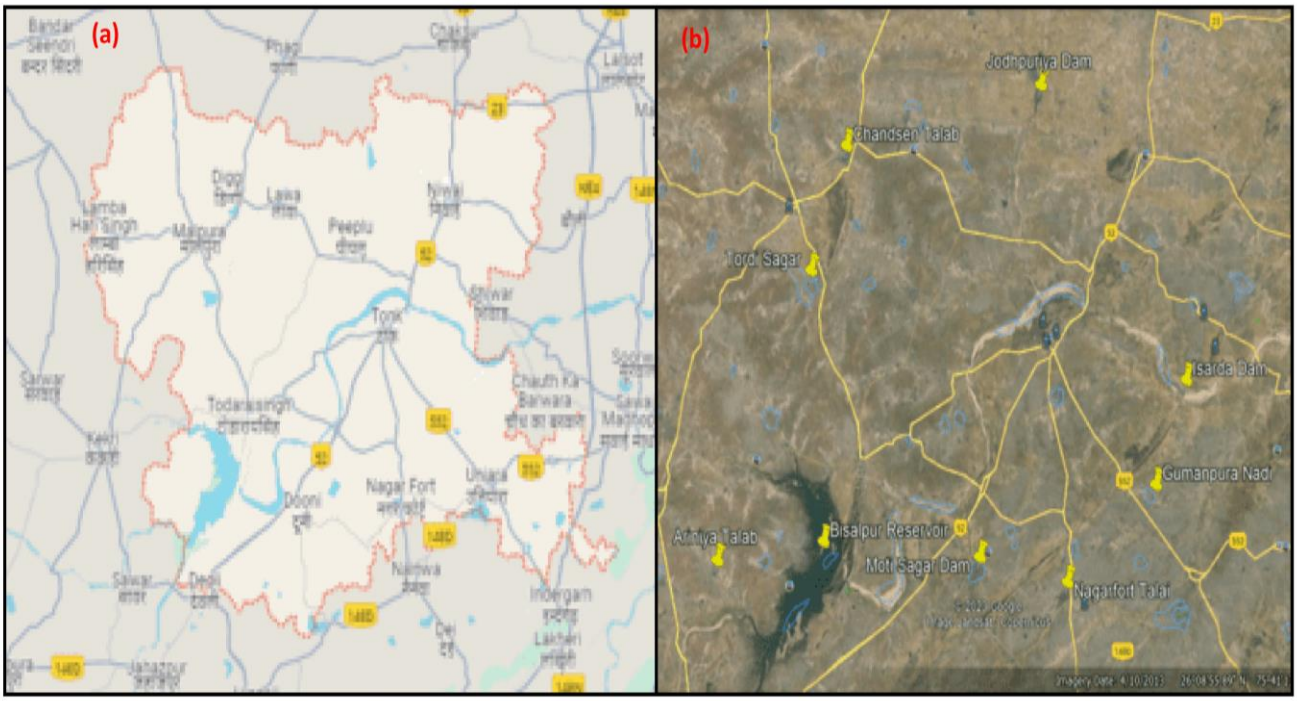

Figure 1. (a) Administrative border map of Tonk district (b) Google Map showing selected wetlands in the study area

Table 1. Major wetlands under Study Area

S.NO.	WETLAND NAME	S.NO.	WETLAND NAME	S.NO.	WETLAND NAME
1.	Gumanpura Nadi	**5.**	Bisalpur Reservoir	**9.**	Choru Pond
2.	Patoki Pond	**6.**	Moti Sagar Dam	**10.**	Ranipura Pond
3.	Jodhpuriya Dam	**7.**	Nagarfort Pond	**11.**	Saroli Pond
4.	Isarda Dam	**8.**	Ariniya Pond	**12.**	Tordi Sagar
				13.	Chandsen Pond

MATERIAL AND METHODS

The following standard scientific methods and techniques have been used to assess avian diversity in the study area. They demonstrate their presence and are also used to study the abundance, distribution, behavior, and ecological roles of bird species within a particular area or ecosystem. These types of common methods used for assessing avian diversity are as follows:

1. **Bird Surveys**: A survey was carried out around the Tonk district to document all major wetlands of importance, specifically for Palearctic residents, terrestrial birds, and migratory aquatic birds.

2. **Point Counts:** Point counts involve stationary observations where birds are counted and identified at predetermined points within a study area. This method is effective for assessing bird abundance and species composition in a specific habitat. For assessing avian density, point count is the outmost method according to Sutherland (2006) [5].

3. **Transect Surveys:** Transect surveys comprise walking along an encoded path (transect) and recording all bird species heard or observed within a specified distance on either side of the path. Transects allow for the assessment of bird diversity across different habitats or gradients within an ecosystem.

4. **Bioacoustic Monitoring:** Bioacoustic monitoring involves recording bird vocalizations using specialized equipment such as microphones or automated recording units. By analyzing bird calls and songs, species richness, activity patterns, and even detecting rare or elusive species can be assessed.

5. **Habitat Assessment:** Assessing habitat characteristics such as vegetation structure, food availability, water sources, and nesting sites is crucial for understanding bird diversity and distribution within the study area.

At each study area, data was collected on the water-holding period, size of the water body, bird species abundance, and composition. Roads and paths offered easy access to the study area, and a survey was conducted in clear weather approximately after an hour of sunrise using a moving vehicle at a 20 km/hr speed that stopped at designated spots to view flying and perched birds. This enabled the effective search for various bird species across broad expanses of the study locations. A set of good binoculars and a spotting scope were employed to help identify distant birds [6,7]. Other threats or information to bird's conversion were also observed throughout the study. By the use of following formula, the relative diversity (RDi) of families was calculated [8].

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

OBSERVATION

Under the study conducted during the session 2023-24, a total of 127 bird species of 55 families in the study area were recorded and summarised in Table 2. These species, seen in

different seasons of the session, were classified under three categories, which are Resident, Resident Migratory & Migratory respectively. The 94 species were resident; 19 species were found to be migratory, and 14 species were found to be resident migratory, out of a total of 127 species (Figure 2). The migratory group includes both types, i.e. winter migratory and monsoon migratory species. In the study area, the most diverse avian family was Accipitridae reported by the analysis of relative diversity data (7 species, RDi = 5.51), followed by Muscicapidae, Anatidae, and Scolopacidae (6 species, RDi = 4.72), whereas, with single species from each (RDi = 0.78), 28 families were poorly represented in the study area (Table 4).

Table 2. Checklist of Bird Species Reported in Study Area

S. No.	English Name	Zoological Name	Family	Residential Status
1	Black-Shouldered Kite	*Elanus axillaris* (Latham, 1801)	*Accipitridae*	RM
2	Black Kite	*Milvus migrans* (Boddaert, 1783)		M
3	Shikra	*Accipiter badius* (Gmelin, 1788)		R
4	White-Eyed Buzzard	*Butastur teesa* (Franklin, 1831)		R
5	Tawny Eagle	*Aquila rapax* (Temminck, 1828)		R
6	Egyptian Vulture	*Neophron percnopterus* (Linnaeus, 1758)		R
7	Indian Vulture	*Gyps indicus* (Scopoli, 1786)		R
8	Common Iora	*Aegithina tiphia* (Linnaeus, 1758)	*Aegithinidae*	R
9	Indian Bush Lark	*Mirafra erythroptera* (Blyth, 1845)	*Alaudidae*	R
10	Ashy-crowned Sparrow-lark	*Eremopterix griseus* (Scopoli, 1786)		R

11	Rufous-tailed Lark	*Ammomanes phoenicura* (Franklin, 1831)		R
12	Crested Lark	*Galerida cristata* (Linnaeus, 1758)		R
13	Pied Kingfisher	*Ceryle rudis* (Linnaeus, 1758)	*Alcedinidae*	R
14	Common Kingfisher	*Alcedo atthis* (Linnaeus, 1758)		R
15	White-throated Kingfisher	*Halcyon smyrnensis* (Linnaeus, 1758)		R
16	Stork-billed Kingfisher	*Pelargopsis capensis* (Linnaeus, 1766)		R
17	Lesser Whistling Duck	*Dendrocygna javanica* (Horsfield, 1821)	*Anatidae*	R
18	Ruddy Shelduck	*Tadorna ferruginea* (Pallas, 1764)		M
19	Northern Pintail	*Anas acuta* (Linnaeus, 1758)		M
20	Indian Spot-Billed Duck	*Anas poecilorhyncha* (Forster, 1781)		M
21	Cotton Pygmy Goose	*Nettapus coromandelianus* (Gmelin, JF, 1789)		M
22	Comb Duck	*Sarkidiornis sylvicola* (Ihering, HFA. & Ihering, R, 1907)		M
23	Oriental Darter	*Anhinga melanogaster* (Pennant, 1769)	*Anhingidae*	R
24	House Swift	*Apus nipalensis* (Hodgson, 1837)	*Apodidae*	R
25	Grey Heron	*Ardea cinerea* (Linnaeus, 1758)	*Ardeidae*	R
26	Indian Pond Heron	*Ardeola grayii*		R

		*(*Sykes, 1832)		
27	Cattle Egret	*Bubulcus ibis* *(*Linnaeus, 1758)		R
28	Little Egret	*Egretta garzetta* *(*Linnaeus, 1766)		R
29	Indian Grey Hornbill	*Ocyceros birostris* *(*Scopoli, 1786)	*Bucerotidae*	R
30	Small Minivet	*Pericrocotus cinnamomeus* (Linnaeus, 1766)	*Campephagidae*	R
31	Black-headed Cuckooshrike	*Lalage melanoptera* (Rüppell, 1839)		RM
32	Large Cuckooshrike	*Coracina macei* *(*Lesson, 1830)		RM
33	Indian Nightjar	*Caprimulgus asiaticus* (Latham, 1790)		R
34	Red-Wattled Lapwing	*Vanellus indicus* *(*Boddaert, 1783)	*Charadriidae*	R
35	Yellow-Wattled Lapwing	*Vanellus malabaricus* (Boddaert, 1783)		RM
36	Common Tailorbird	*Orthotomus sutorius* (Pennant, 1769)	*Cisticolidae*	R
37	Yellow-footed Green Pigeon	*Treron phoenicopterus* (Latham, 1790)	*Columbidae*	R
38	Rock Pigeon	*Columba livia* *(*Gmelin, 1789)		R
39	Red Collared Dove	*Streptopelia tranquebarica* (Hermann, 1804)		R
40	Spotted Dove	*Spilopelia chinensis* (Scopoli, 1768)		R
41	Laughing Dove	*Spilopelia senegalensis* (Linnaeus, 1766)		R
42	Indian Roller	*Coracias benghalensis*	*Coraciidae*	R

		(Linnaeus, 1758)		
43	European Roller	*Coracias garrulous* (Linnaeus, 1758)		M
44	Rufous Treepie	*Dendrocitta vagabunda* (Latham, 1790)	*Corvidae*	R
45	House Crow	*Corvus splendens* (Vieillot, 1817)		R
46	Indian Jungle Crow	*Corvus culminates* (Sykes, 1832)		R
47	Jacobin Cuckoo	*Clamator jacobinus* (Boddaert, 1783)	*Cuculidae*	RM
48	Asian Koel	*Eudynamys scolopaceus* (Linnaeus, 1758)		R
49	Greater Coucal	*Centropus sinensis* (Stephens, 1815)		R
50	Black Drongo	*Dicrurus macrocercus* (Vieillot, 1817)	*Dicruridae*	R
51	White-bellied Drongo	*Dicrurus caerulescens* (Linnaeus, 1758)		R
52	Crested Bunting	*Emberiza lathami* (Gray, 1831)	*Emberizidae*	R
53	Indian Silverbill	*Euodice malabarica* (Linnaeus, 1758)	*Estrildidae*	R
54	Common Kestrel	*Falco tinnunculus* (Linnaeus, 1758)	*Falconidae*	R
55	Dusky Crag Martin	*Ptyonoprogne concolor* (Sykes, 1832)	*Hirundinidae*	R
56	Wire-tailed Swallow	*Hirundo smithii* (Leach, 1818)		R
57	Red-rumped Swallow	*Cecropis daurica* (Laxmann, 1769)		R
58	Pheasant-Tailed	*Hydrophasianus chirurgus*	*Jacanidae*	R

	Jacana	(Scopoli, 1786)		
59	Great Grey Shrike	*Lanius excubitor* (Linnaeus, 1758)	*Laniidae*	R
60	Bay-backed Shrike	*Lanius vittatus* (Valenciennes, 1826)		R
61	Long-tailed shrike	*Lanius schach* (Linnaeus, 1758)		R
62	Indian River Tern	*Sterna aurantia* (J.E. Gray, 1831)	*Laridae*	R
63	Common Tern	*Sterna hirundo* (Linnaeus, 1758)		RM
64	Common Babbler	*Argya caudate* (Dumont, 1823)	*Leiothrichidae*	R
65	Large Grey Babbler	*Argya malcolmi* (Sykes, 1832)		R
66	Coppersmith Barbet	*Psilopogon haemacephalus* (Statius Müller, 1776)	*Megalaimidae*	R
67	Blue-tailed Bee-Eater	*Merops philippinus* (Linnaeus, 1766)	*Meropidae*	R
68	Chestnut-Headed Bee-eater	*Merops leschenaulti* (Vieillot, 1817)		R
69	Little Green Bee-eater	*Merops orientalis* (Latham, 1801)		R
70	Indian Paradise Flycatcher	*Terpsiphone paradise* (Linnaeus, 1758)	*Monarchidae*	R
71	Citrine Wagtail	*Motacilla citreola* (Pallas, 1776)	*Motacillidae*	RM
72	Grey Wagtail	*Motacilla cinerea* (Tunstall, 1771)		RM
73	White Wagtail	*Motacilla alba* (Linnaeus, 1758)		RM

74	White-browed Wagtail	*Motacilla maderaspatensis* (Gmelin, 1789)		RM
75	Red-breasted Flycatcher	*Ficedula parva* (Bechstein, 1792)	*Muscicapidae*	R
76	Oriental Magpie-Robin	*Copsychus saularis* (Linnaeus, 1758)		R
77	Indian Robin	*Copsychus fulicatus* (Linnaeus, 1766)		R
78	Black Redstart	*Phoenicurus ochruros* (Gmelin, S.G., 1774)		M
79	Asian Stonechat	*Saxicola maurus* (Pallas, 1773)		M
80	Pied Bush Chat	*Saxicola caprata* (Linnaeus, 1766)		M
81	Purple Sunbird	*Cinnyris asiaticus* (Latham, 1790)	*Nectariniidae*	R
82	Indian golden oriole	*Oriolus kundoo* (Sykes, 1832)	*Oriolidae*	RM
83	Yellow-eyed Babbler	*Chrysomma sinense* (Gmelin, 1789)	*Paradoxornithidae*	R
84	Cinereous Tit	*Parus cinereus* (Vieillot, 1818)	*Paridae*	R
85	House Sparrow	*Passer domesticus* (Linnaeus, 1758)	*Passeridae*	R
86	Little Cormorant	*Microcarbo niger* (Vieillot, 1817)	*Phalacrocoracidae*	R
87	Black Francolin	*Francolinus francolinus* (Linnaeus, 1766)	*Phasianidae*	R
88	Grey Francolin	*Ortygornis pondicerianus* (Gmelin, JF, 1789)		R
89	Rain Quail	*Coturnix coromandelica* (Gmelin, JF, 1789)		R

90	Indian Peafowl	*Pavo cristatus* (Linnaeus, 1758)		R
91	Jungle Bush Quail	*Perdicula asiatica* (Latham, 1790)		R
92	Eurasian Wryneck	*Jynx torquilla* (Linnaeus, 1758)	*Picidae*	M
93	Black-rumped Flameback	*Dinopium benghalense* (Linnaeus, 1758)		R
94	Yellow-crowned Woodpecker	*Leiopicus mahrattensis* (Latham, 1801)		R
95	Indian Pitta	*Pitta brachyuran* (Linnaeus, 1766)	*Pittidae*	RM
96	Baya Weaver	*Ploceus philippinus* (Linnaeus, 1766)	*Ploceidae*	R
97	Little Grebe	*Tachybaptus ruficollis* (Pallas, 1764)	*Podicipedidae*	R
98	Alexandrine Parakeet	*Psittacula eupatria* (Linnaeus, 1766)	*Psittaculidae*	R
99	Rose-ringed Parakeet	*Psittacula krameri* (Scopoli, 1769)		R
100	Blossom-headed Parakeet	*Psittacula roseate* (Biswas, 1951)		R
101	Chestnut-bellied Sandgrouse	*Pterocles exustus* (Temminck, 1825)	*Pteroclidae*	R
102	White-eared Bulbul	*Pycnonotus leucotis* (Gould, 1836)	*Pycnonotidae*	R
103	White-Breasted Waterhen	*Amaurornis phoenicurus* (Pennant, 1769)	*Rallidae*	R
104	Common Moorhen	*Gallinula chloropus* (Linnaeus, 1758)		R
105	Western Swamphen	*Porphyrio porphyrio* (Linnaeus, 1758)		R

106	Common Coot	*Fulica atra* (Linnaeus, 1758)		M
107	Black-winged Stilt	*Himantopus himantopus* (Linnaeus, 1758)	*Recurvirostridae*	RM
108	White-browed Fantail	*Rhipidura aureola* (Lesson, 1830)	*Rhipiduridae*	R
109	Common Redshank	*Tringa tetanus* (Linnaeus, 1758)	*Scolopacidae*	M
110	Wood Sandpiper	*Tringa glareola* (Linnaeus, 1758)		M
111	Common Sandpiper	*Actitis hypoleucos* (Linnaeus, 1758)		M
112	Little Stint	*Calidris minuta* (Leisler, 1812)		M
113	Eurasian Curlew	*Numenius arquata* (Linnaeus, 1758)		M
114	Green Sandpiper	*Tringa ochropus* (Linnaeus, 1758)		M
115	Grey-headed Canary-Flycatcher	*Culicicapa ceylonensis* (Swainson, 1820)	*Stenostiridae*	R
116	Spotted Owlet	*Athene brama* (Temminck, 1821)		R
117	Collared Scops Owl	*Otus lettia* (Hodgson, 1836)	*Strigidae*	R
118	Brahminy Starling	*Sturnia pagodarum* (Gmelin, 1789)	*Sturnidae*	R
119	Rosy Starling	*Pastor roseus* (Linnaeus, 1758)		RM
120	Common Starling	*Sturnus vulgaris* (Linnaeus, 1758)		M
121	Bank Myna	*Acridotheres ginginianus* (Latham, 1790)		R

122	Lesser Whitethroat	*Curruca curruca* (Linnaeus, 1758)	*Sylviidae*	R
123	Oriental White Ibis	*Threskiornis melanocephalus* (Latham, 1790)	*Threskiornithidae*	R
124	Red-Naped Ibis	*Pseudibis papillosa* (Temminck, 1824)		R
125	Eurasian Spoonbill	*Platalea leucorodia* (Linnaeus, 1758)		R
126	Common Hoopoe	*Upupa epops* (Linnaeus, 1758)	*Upupidae*	R
127	Indian White-eye	*Zosterops palpebrosus* (Temminck, 1824)	*Zosteropidae*	R

Here: **R-** Resident**; RM-** Resident Migratory**; M-** Migratory

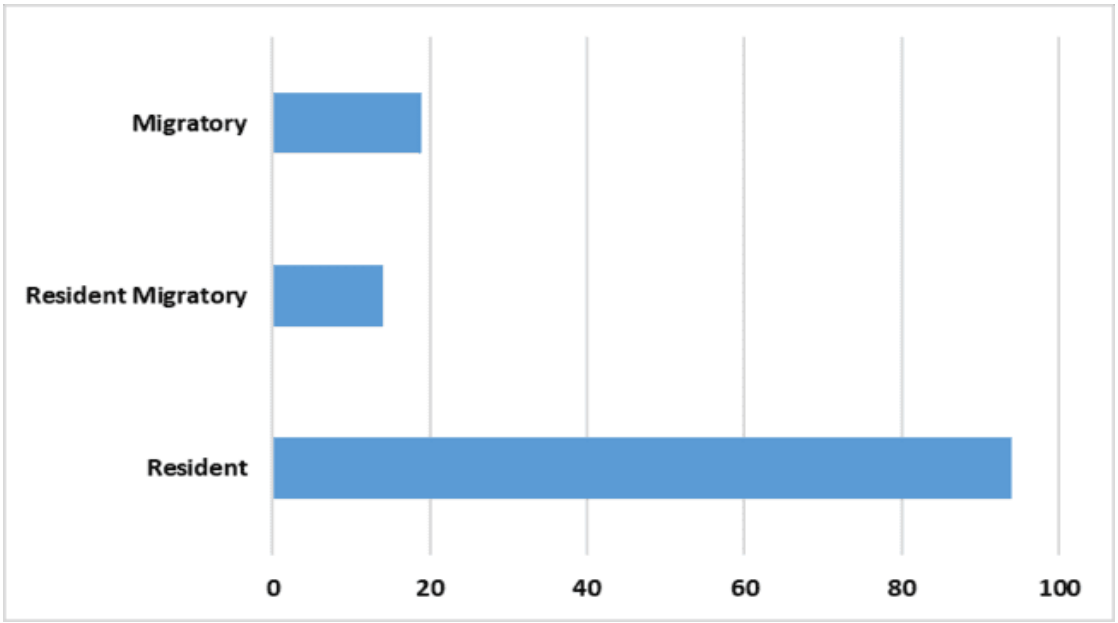

Figure 2. Residential status of different bird species in the study area

From Table 2, it is known that there are 55 families of birds of different species at the selected study sites, which shows the moderate diversity of the said area. Among these, there are 28 families in which only 1 species is present. Similarly, there are 2 species in 6 families; 3 species in 8 families; 4 species in 7 families; 5 species in 2 families; There are 6 species in

3 families. Whereas there is only 1 family in which a maximum of 7 species are found. (Table 3; Figure 3). Figure 4 shows the relative density index of bird families and species. From the Figure, we can observe that the maximum RDi value found in the *Accipitridae* Family with the value of 5.51 each for a maximum number of species i.e., 7. *Anatidae* and *Muscicapidae* have a value of 4.72 each with 6 species (Figure 4). The RDi values for all the reported 55 Families and 28 species are comprised in Table 4.

Table 3. Position of Families Corresponding to Number of Bird Species

Recorded Families				Total No. of Family(s)	No. of species reported
Aegithinidae	*Falconidae*	*Paridae*	*Pycnonotidae*	28 Families	1 species
Anhingidae	*Jacanidae*	*Passeridae*	*Recurvirostridae*		
Apodidae	*Megalaimidae*	*Phalacrocoracidae*	*Rhipiduridae*		
Bucerotidae	*Monarchidae*	*Pittidae*	*Strigidae*		
Cisticolidae	*Nectariniidae*	*Ploceidae*	*Sylviidae*		
Emberizidae	*Oriolidae*	*Podicipedidae*	*Upupidae*		
Estrildidae	*Paradoxornithidae*	*Pteroclidae*	*Zosteropidae*		
Charadriidae	*Dicruridae*	*Leiothrichidae*		6 Families	2 species
Coraciidae	*Laridae*	*Stenostiridae*			
Corvidae	*Hirundinidae*	*Meropidae*	*Psittaculidae*	8 Families	3 species
Cuculidae	*Laniidae*	*Picidae*	*Threskiornithidae*		
Alaudidae	*Ardeidae*	*Motacillidae*	*Sturnidae*	7 Families	4 species
Alcedinidae	*Campephagidae*	*Rallidae*			
Columbidae	*Phasianidae*			2 Families	5 species
Anatidae	*Muscicapidae*	*Scolopacidae*		3 Families	6 species
Accipitridae				1 Family	7 species

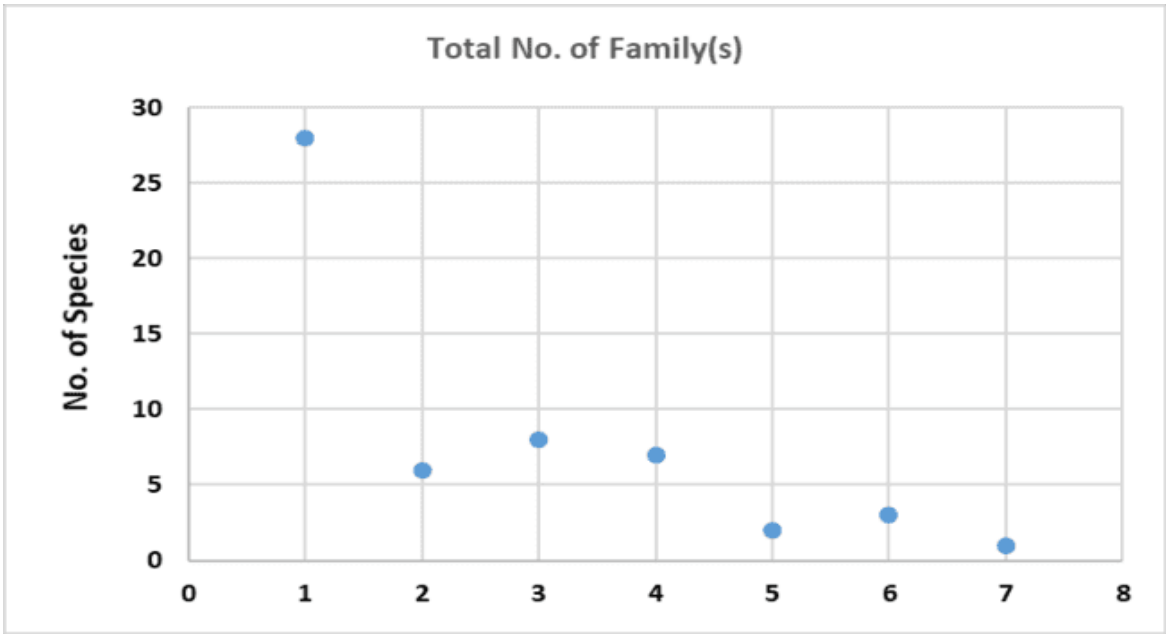

Figure 3. Position of number of family(s) relative to number of species

Table 4. Relative diversity (RDi) of various avian families in study area

Avian Families	Number of species	RDi value
Accipitridae	7	5.51
Anatidae, Muscicapida, Scolopacidae	*6*	4.72
Columbidae, Phasianidae	*5*	3.93
Alaudidae, Alcedinidae, Ardeidae, Campephagidae, Motacillidae, Rallidae, Sturnidae	4	3.14
Corvidae, Cuculidae, Hirundinidae, Laniidae, Meropidae, Picidae, Psittaculidae, Threskiornithidae	3	2.36
Charadriidae, Coraciidae, Dicruridae, Laridae, Leiothrichidae, Stenostiridae	2	1.57
Aegithinidae, Anhingidae, Apodidae, Bucerotidae, Cisticolidae, Emberizidae, Estrildidae, Falconidae, Jacanidae, Megalaimidae, Monarchidae, Nectariniidae, Oriolidae, Paradoxornithidae, Paridae,	1	0.78

Passeridae, Phalacrocoracidae, Pittidae, Ploceidae, Podicipedidae, Pteroclidae, Pycnonotidae, Recurvirostridae, Rhipiduridae, *Strigidae, Sylviidae, Upupidae, Zosteropidae*		

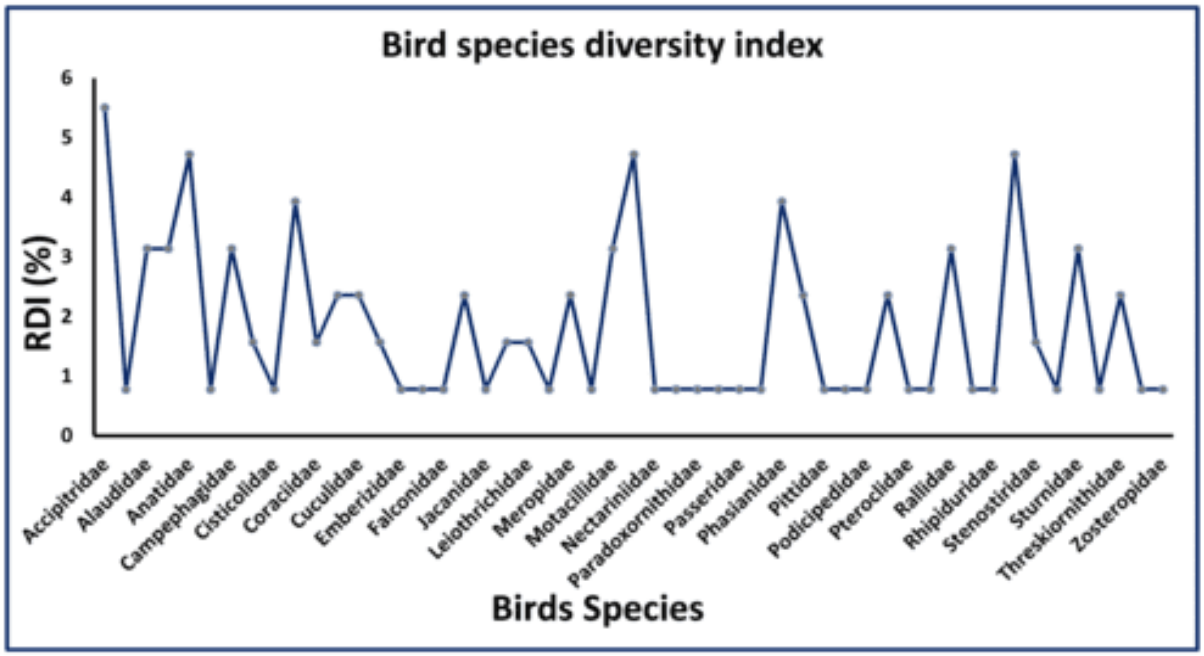

Figure 4. Line graph showing Relative diversity (RDi) of various avian families

Figure 5. Avian Fauna at wetlands

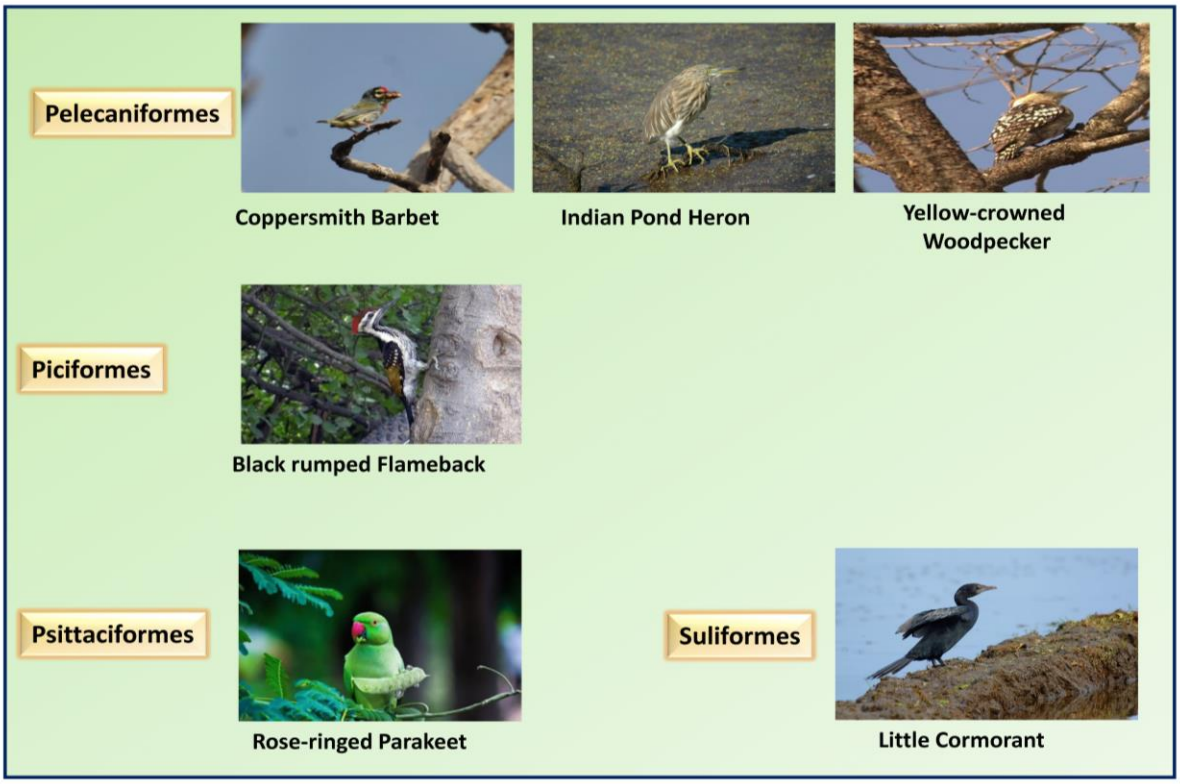

Figure 6. Avian fauna in agricultural areas

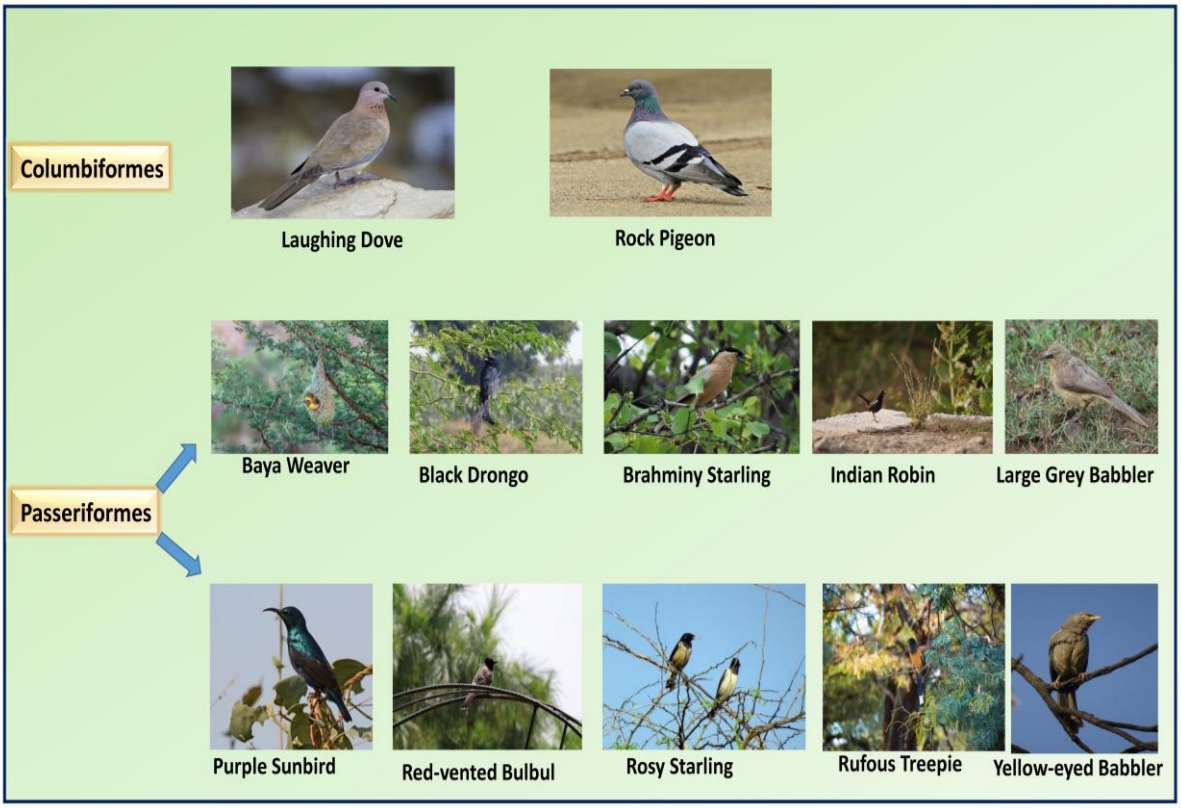

Figure 7. Avian fauna in forest and grassland areas

RESULTS AND DISCUSSION

A maximum number of bird species was recorded in the *Accipitridae* family having 7 species. *Anatidae***,** *Muscicapidae, and Scolopacidae* each have 6 species, and *Columbidae,* and *Phasianidae* each with 5 species. These were followed by 7 families *Alaudidae, Ardeidae, Motacillidae, Sturnidae, Alcedinidae, Campephagidae, Rallidae* each had 4 species. Eight families, comprising *Corvidae, Hirundinidae, Meropidae, Psittaculidae, Cuculidae, Laniidae, Picidae,* and *Threskiornithidae,* each recorded with 3 species of birds. Six families, including *Charadriidae, Dicruridae, Leiothrichidae, Coraciidae, Laridae,* and *Stenostiridae,* were each observed with 2 species. While the remaining 28 avian families comprising *Aegithinidae, Falconidae, Paridae, Pycnonotidae, Anhingidae, Jacanidae, Passeridae, Recurvirostridae, Apodidae, Megalaimidae, Phalacrocoracidae, Rhipiduridae, Bucerotidae, Monarchidae, Pittidae, Strigidae, Cisticolidae, Nectariniidae, Ploceidae, Sylviidae, Emberizidae, Oriolidae, Podicipedidae, Upupidae, Estrildidae, Paradoxornithidae, Pteroclidae,* and, *Zosteropidae* each was with 1 species (Table 3).

The abundance and status of bird species in and around Tonk District are given in Table 2. Figure 5-7 comprises the residential birds found in Tonk District in different study areas i.e., in wetlands, agricultural fields, and forest and grassland areas. The residential birds like Black-winged Stilt, Common Sandpiper, Pheasant-Tailed Jacana, Red-Wattled Lapwing from the family Charadriiformes, Common Coot, and White-Breasted Waterhen from the family Gruiformes, Common Hoopoe, Common Kingfisher, and Little Green Bee-eater from Coraciiformes, and Asian Koel, and Greater Coucal from Cuculiformes are found in wetland areas (Figure 5). Figure 6 comprises Laughing Dove, and Rock Pigeon from the family Columbiformes. Baya Weaver, Black Drongo, Brahminy Starling, Indian Robin, Large Grey Babbler, Purple Sunbird, Red-vented Bulbul, Rosy Starling, Rufous Treepie, Yellow-eyed Babbler from family Passeriformes are found in forest and grassland areas (Figure 6). The residential birds in agricultural fields are Coppersmith Barbet, Indian Pond Heron, Yellow-crowned Woodpecker from family Pelecaniformes, Black-rumped Flameback from Piciformes, Rose-ringed Parakeet from Psittaciformes family and Little Cormorant from Suliformes family (Figure 7).

COMMUNITY AND CONSERVATION

A. Local Engagement: Involving local communities in bird monitoring and conservation initiatives can be crucial for protecting bird habitats and promoting sustainable practices.

B. Educational Programs: Conducting educational programs and workshops on bird identification, conservation, and the importance of biodiversity can foster a sense of stewardship among residents.

CONCLUSION

In recent years, protecting the world's biodiversity has emerged as a critical concern [9]. Because human disruptions to biodiversity pose an ever-growing threat, conservationists worldwide are fighting to conserve biodiversity. Since birds inhabit nearly every kind of habitat, the variety of bird populations may sometimes be used as a proxy for the total diversity of a specific region [10]. Since birds are known to react to environmental changes of any type, they can serve as bioindicators [11,12]. Because a comprehensive inventory of variety requires impractical amounts of time and effort [13], scientists have recently placed a strong emphasis on conducting quick inventories [14-20]. The creation of wider-scale bird checklists has been given significant relevance as the use of short-span studies for biodiversity estimates gains popularity [19,20].

Tonk District encompasses various terrestrial habitats such as scrublands, agricultural fields, grasslands, and urban areas. The district is dotted with rivers, ponds, reservoirs, and wetlands, providing crucial habitats for terrestrial birds, waterfowl, waders, and aquatic birds. It is home to a variety of resident bird species adapted to the local climate and habitats. During the winter months, various migratory birds visit the Tonk District, seeking refuge in its wetlands and agricultural fields. The current study, which identified 127 bird species, shows that overall biodiversity in the studied regions is relatively healthy. However, it should be noted that the research areas under the current examination are subject to human disturbances such as urbanization, pressure from tourists, reliance on livelihoods (primarily fuel wood collection and cow grazing), and pollution [21-24].

The current work demonstrates the profusion of avian fauna in and around Tonk district which is a virtuous needle from an environmental viewpoint. Compared to the wetlands and River basin, many bird species are observed in Forest and Grassland areas and Agricultural fields. Many migratory birds like European Roller, Common Coot, Black Redstart, Wood

Sandpiper, Ruddy Shelduck, Common Starling etc. arrive at Wetlands in the Tonk district during the winter season. However, there are also certain rare and uncommon species of birds related to the secrets of the food web and ecosystem. In future research in this study of the Tonk district, researchers have a great scope to discover the avian fauna which is not covered over here. There is a prerequisite for time to reserve wetlands and forest areas from a conservation point of view, through proper administration and legislation. Besides, the species richness can be increased in the district, through the plantation of bird-attracting plants and the development of new habitats for birds.

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