



# Avifaunal Composition of Municipal Areas of Ajmer District, Rajasthan, India

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## Abstract

The urbanization is the key phenomenon of the Information Age. The tremendous growth of the urban areas has developed a new interest of the conservationists to work in the direction of synchronizing the conservation of the habitats and associated species with the pace of development. These man-made ecosystems have the spaces with high biological diversity. In the series of the work of the authors in the central chain of the Aravalli Hills (Rajasthan, India), the present investigation has been carried out in the urban areas of the central district of Rajasthan, i.e., Ajmer. The investigation aimed to review and prepare comprehensive database through assessment of the avifaunal species of the municipal area of Ajmer. The seasonal surveys and periodic sampling observations were taken for twenty-four months from February 2017 to January 2019.

In the present study the urban area was classified into three regions namely, the Urban Green Patches (UGP), Urban Aquatic Area (UAA) and Human Settlement Area (HSA). The terrestrial habitats of UGA & HSA harbored 104 species and 41 species respectively whereas the aquatic habitats categorized as UAA harbored 95 species. The Relative Diversity Index of the various species was calculated to observe the species dominance in a particular area. Thus, the present investigation recorded 167 species from 58 families.

The earlier studies recorded around 235 species of 62 families from the Ajmer District which included the urban, rural and rural environs. There was addition of 13 new species in the checklist along with two families. Thus, the cumulative list presents an account of 243 bird species from 64 families from different habitats of Ajmer District.

**Keywords:** Avifauna; Urban Habitats; Ajmer; Rajasthan

## Introduction

The urbanization process has given rise to the human dominated landscapes with complex ecological systems as the urban ecosystems which need to be explored and converted to the opportunity [1-7]. Such man-made ecosystems have certain areas of high biological diversity. These sites are the point of interest for the conservationists for the study of the urban biodiversity especially avifauna. The patterns of biodiversity determine the features of the urban ecosystems.

Rajasthan (India) owes diversity of the habitats which area also evident in the human settlements. The western low rainfall desert region, central hilly terrains, eastern high rainfall terrains of plains and plateau provide habitats for diverse avifauna. Over 500 avifaunal species are being recorded from the state of Rajasthan. The Aravalli Hills harbor over 300 avifaunal species, near about eighty percent of which are recorded from the central parts [3,5,6,8].

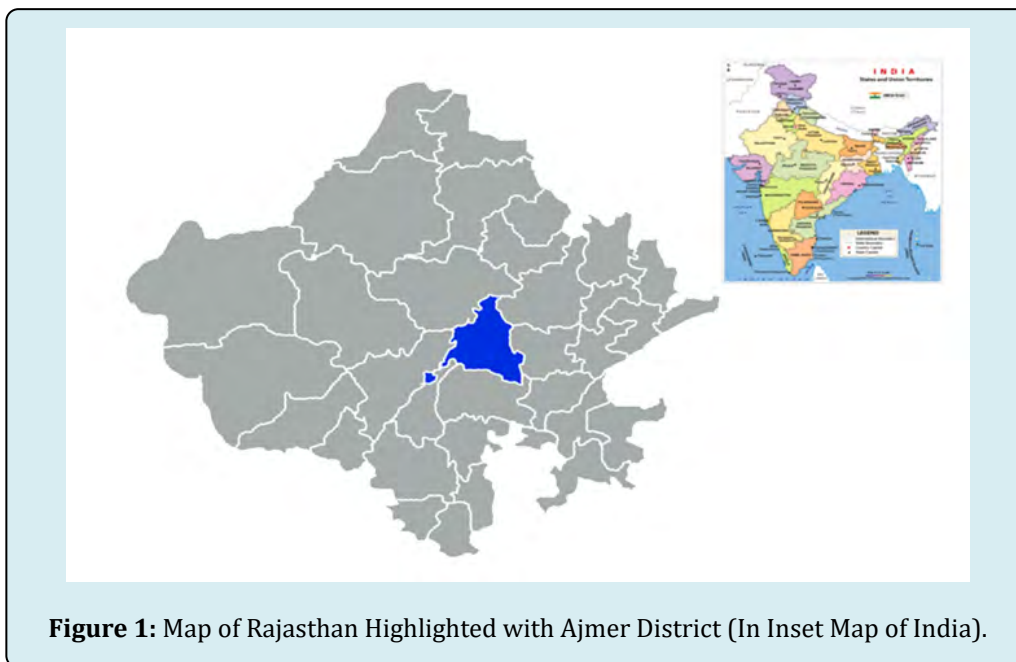
The study of the birds gives the better understanding of the past and present status of the biodiversity of the area. The environmental challenges could be better understood by the birds [9-11]. Further, monitoring the species abundance, habitat preference, and correlation between species abundance and habitat provides basic information for determining factors causing population fluctuation of bird species. Richness, abundance and community composition are often used by ecologists to understand the diversity of species in their natural occurrence [12]. The

change in vegetation composition could impact the quality and quantity of habitat for birds in terms of food, water and cover which can further affect the diversity, abundance and distribution of birds [13]. In order to prioritize the future conservation of species, understanding the effect of habitat on bird community structure is important [14]. In the long run, the relative value of different habitats and conservation importance of sites can be assessed by investigating the diversity of birds present at those sites [15].

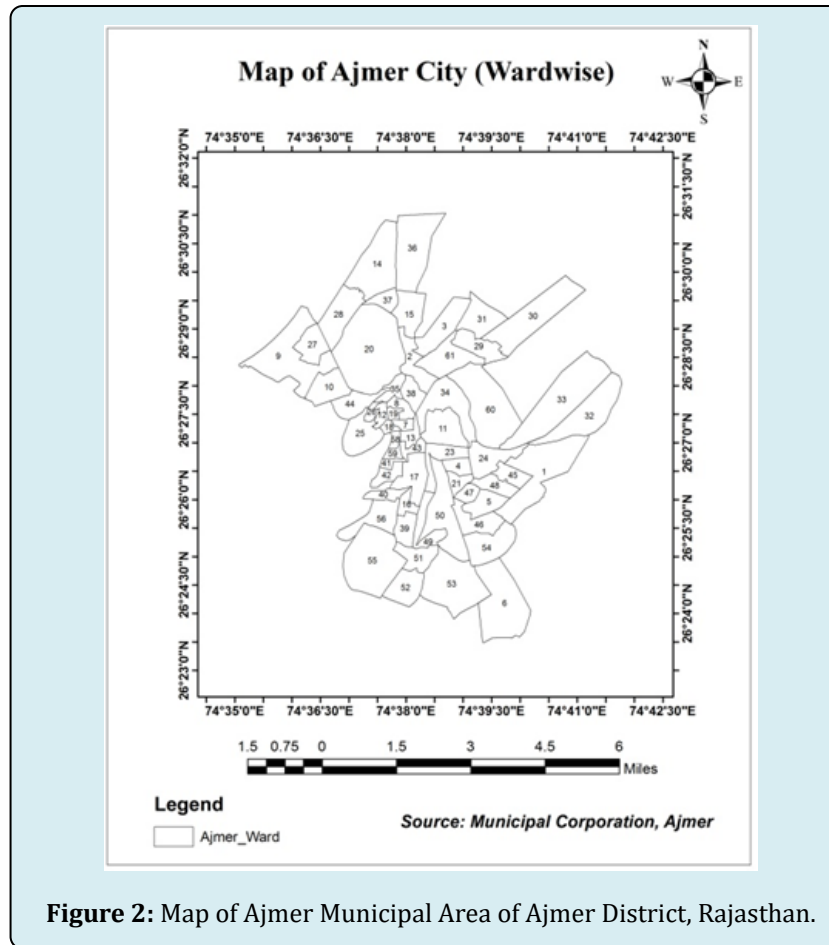
## Material and Methods

### Profile of Study Area

Rajasthan is situated in north – western part of India between the latitude 23° 03' to 30° 12' N and longitude 69° 30' to 78° 17'E. It is the largest state of the Republic of India by area. Geographical features include the Thar Desert, Aravalli Mountain Ranges, Southern Malwa Plateau and Eastern plains. The Ajmer District is located nearly in the center of the Rajasthan and bordered with one of the world oldest mountain ranges *i.e.* Aravalli Hills (Figure 1). The Ajmer Municipal area lies in the foothills of the Central Aravalli Hills with the highest peak Taragarh (870 feet) (Figure 2). It experiences a mean annual rainfall of 573mm but scanty and often uncertain. Temperature ranges from 2°C to 46°C. The summers are extremely hot in this part. However, there are many climate changes the Aravalli has witnessed in the recent past, particularly the rainfall, temperature fluctuation and shift of weathers.



**Figure 1:** Map of Rajasthan Highlighted with Ajmer District (In Inset Map of India).



**Figure 2:** Map of Ajmer Municipal Area of Ajmer District, Rajasthan.

For the ease of study, the habitats of the municipal area of Ajmer city in the present study was categorized under two broad groups.

- A. Urban Aquatic Areas (UAA):** All perennial and seasonal water bodies within the municipal limits of Ajmer city were categorized under Urban Aquatic Areas (Anasagar Lake, Foy Sagar Lake, Chaurasiyas Talab, Paal Bichla Talab and Khanpura Talab).
- B. Urban Terrestrial Areas:** The terrestrial area within the municipal limits of Ajmer city which was further classified as:

**Human Settlement Areas (HSA):** Areas with direct human involvement and high anthropogenic pressure were included in this category (Constructed areas, buildings, roads etc.).

**Urban Green Patches (UGP):** This includes areas with less human intervention and lesser anthropogenic pressure (Institutional and Urban gardens, Agricultural fields, green patches of hillock of Aravalli).

### Field Studies and Surveys

The field surveys and observations were taken for the

period of two years February 2017 to January 2019. Recording of the bird species were also made from the calls. Regular surveys carried out by systematically walking on the fixed routes through the study area. Systematic observations of the species in different habitats of the municipal limits (Figure 2) were recorded from 6:00 to 9:00 hrs and from 16:00 to 18:00 hrs. General observations were also made during other timings too. The nomenclature is after Manakadan & Pittie [16], and taxonomic arrangement is following Gill & Donsker [17]. The status of the species like resident, winter migrant, summer migrant and passage migrant were assigned were assigned as per the observations in each survey based on the presence/absence method along with analysis of the other parameters.

### Data Collection and Analysis

**Relative Diversity (RD<sub>i</sub>):** The relative diversity (RD<sub>i</sub>) of families was calculated using the following formula [18]

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

**Similarity Indices:** Similarity indices between the intensive study sites were calculated using Jaccard Index and Sorenson Index [12].

**Jaccard Index:**

$$c_j = \frac{j}{(a+b-j)}$$

Where

j = the number of species common to both sites

a = the number of species in site A and

b = the number of species in site b

**Sorenson Index:**

$$c_8 = \frac{2j}{(a+b-j)}$$

j = the number of species common to both sites

a = the number of species in site A and

b = the number of species in site b

## Observation and Results

S. No.	Common Name	Scientific Name	UAA	HSA	UGP
	<b>Grebes</b>	<b>Podicipedidae</b>			
1	Little Grebe	<i>Tachybaptus ruficollis</i>	+	-	-
	<b>Pelicans</b>	<b>Pelecanidae</b>			
2	Great White Pelican	<i>Pelecanus onocrotalus</i>	+	-	-
3	Dalmatian Pelican	<i>Pelecanus crispus</i>	+	-	-
	<b>Cormorants/Shags</b>	<b>Phalacrocoracidae</b>			
4	Little Cormorant	<i>Phalacrocorax niger</i>	+	-	-
5	Indian Shag	<i>Phalacrocorax fuscicollis</i>	+	-	-
6	Great Cormorant	<i>Phalacrocorax carbo</i>	+	-	-
	<b>Darters</b>	<b>Anhingidae</b>			
7	Darter	<i>Anhinga melanogaster</i>	+	-	-
	<b>Hérons, Egrets &amp; Bitterns</b>	<b>Ardeidae</b>			
8	Little Egret	<i>Egretta garzetta</i>	+	-	-
9	Grey Heron	<i>Ardea cinerea</i>	+	-	-
10	Purple Heron	<i>Ardea purpurea</i>	+	-	-
11	Large Egret	<i>Casmerodius albus</i>	+	-	-
12	Median Egret	<i>Mesophoyx intermedia</i>	+	+	-
13	Cattle Egret	<i>Bubulcus ibis</i>	+	+	+
14	Indian Pond-Heron	<i>Ardeola grayii</i>	+	+	+
15	Little Green Heron	<i>Butorides striatus</i>	+	-	-
16	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	+	-	-
	<b>Storks</b>	<b>Ciconiidae</b>			
17	Painted Stork	<i>Mycteria leucocephala</i>	+	-	+
18	Asian Openbill-Stork	<i>Anastomus oscitans</i>	+	-	-
	<b>Ibises &amp; Spoonbills</b>	<b>Threskiornithidae</b>			
19	Glossy Ibis	<i>Plegadis falcinellus</i>	+	-	-
20	Oriental White Ibis	<i>Threskiornis melanocephalus</i>	+	-	-
21	Black Ibis	<i>Pseudibis papillosa</i>	+	-	+

22	Eurasian Spoonbill	<i>Platalea leucorodia</i>	+	-	-
	<b>Flamingos</b>	<b>Phoenicopteridae</b>			
23	Greater Flamingo	<i>Phoenicopterus ruber</i>	+	-	-
	<b>Swans, Geese &amp; Ducks</b>	<b>Anatidae</b>			
24	Greylag Goose	<i>Anser anser</i>	+	-	-
25	Bar-headed Goose	<i>Anser indicus</i>	+	-	-
26	Brahminy Shelduck	<i>Tadorna ferruginea</i>	+	-	-
27	Comb Duck	<i>Sarkidiornis melanotos</i>	+	-	-
28	Gadwall	<i>Anas strepera</i>	+	-	-
29	Eurasian Wigeon	<i>Anas penelope</i>	+	-	-
30	Mallard	<i>Anas platyrhynchos</i>	+	-	-
31	Spot-billed Duck	<i>Anas poecilorhyncha</i>	+	-	-
32	Northern Shoveller	<i>Anas clypeata</i>	+	-	-
33	Northern Pintail	<i>Anas acuta</i>	+	-	-
34	Garganey	<i>Anas querquedula</i>	+	-	-
35	Common Teal	<i>Anas crecca</i>	+	-	-
36	Red-crested Pochard	<i>Rhodonessa rufina</i>	+	-	-
37	Common Pochard	<i>Aythya ferina</i>	+	-	-
38	Ferruginous Pochard	<i>Aythya nyroca</i>	+	-	-
	<b>Hawks, Eagles, Buzzards, Old World Vultures, Kites, Harriers</b>	<b>Accipitridae</b>			
39	Oriental Honey-Buzzard	<i>Pernis ptilorhynchus</i>	-	-	+
40	Black-shouldered Kite	<i>Elanus caeruleus</i>	-	-	+
41	Black Kite	<i>Milvus migrans</i>	+	+	+
42	Egyptian Vulture	<i>Neophron percnopterus</i>	-	-	+
43	Short-toed Snake-Eagle	<i>Circaetus gallicus</i>	-	-	+
44	Western Marsh-Harrier	<i>Circus aeruginosus</i>	+	-	+
45	Shikra	<i>Accipiter badius</i>	-	+	+
46	Tawny Eagle	<i>Aquila rapax</i>	-	-	+
47	Steppe Eagle	<i>Aquila nipalensis</i>	-	-	+
	<b>Osprey</b>	<b>Pandionidae</b>			
48	Osprey	<i>Pandion haliaetus</i>	+	-	-
	<b>Falcons</b>	<b>Falconidae</b>			
49	Common Kestrel	<i>Falco tinnunculus</i>	-	-	+
	Pheasants, Partridges, Quails	Phasianidae			
50	Grey Francolin	<i>Francolinus pondicerianus</i>	-	+	+
51	Rain Quail	<i>Coturnix coromandelica</i>	-	-	+
52	Jungle Bush-Quail	<i>Perdica asiatica</i>	-	-	+
53	Indian Peafowl	<i>Pavo cristatus</i>	-	+	+
	<b>Rails, Crakes, Moorhens, Coots</b>	<b>Rallidae</b>			

54	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	+	-	+
55	Purple Moorhen	<i>Porphyrio porphyrio</i>	+	-	-
56	Common Moorhen	<i>Gallinula chloropus</i>	+	-	-
57	Common Coot	<i>Fulica atra</i>	+	-	-
	<b>Jacanas</b>	<b>Jacanidae</b>			
58	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	+	-	-
59	Bronze-winged Jacana	<i>Metopidius indicus</i>	+	-	-
	<b>Painted-Snipes</b>	<b>Rostratulidae</b>			
60	Greater Painted-Snipe	<i>Rostratula benghalensis</i>	+	-	-
	<b>Plovers, Dotterels, Lapwings</b>	<b>Charadriidae</b>			
61	Little Ringed Plover	<i>Charadrius dubius</i>	+	-	-
62	Kentish Plover	<i>Charadrius alexandrinus</i>	+	-	-
63	Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>	+	-	+
64	Red-wattled Lapwing	<i>Vanellus indicus</i>	+	+	+
	Sandpipers, Stints, Snipes, Godwits & Curlews	Scolopacidae			
65	Common Snipe	<i>Gallinago gallinago</i>	+	-	-
66	Black-tailed Godwit	<i>Limosa limosa</i>	+	-	-
67	Spotted Redshank	<i>Tringa erythropus</i>	+	-	-
68	Common Redshank	<i>Tringa totanus</i>	+	-	-
69	Wood Sandpiper	<i>Tringa glareola</i>	+	-	-
70	Common Sandpiper	<i>Actitis hypoleucos</i>	+	-	+
71	Little Stint	<i>Calidris minuta</i>	+	-	+
72	Temminck's Stint	<i>Calidris temminckii</i>	+	-	-
73	Ruff	<i>Philomachus pugnax</i>	+	-	+
	<b>Ibisbill, Avocets &amp; Stilts</b>	<b>Recurvirostridae</b>			
74	Black-winged Stilt	<i>Himantopus himantopus</i>	+	+	+
75	Pied Avocet	<i>Recurvirostra avoetta</i>	+	-	-
	<b>Gulls, Terns &amp; Noddies</b>	<b>Laridae</b>			
76	Pallas's Gull	<i>Larus ichthyaetus</i>	+	-	-
77	Brown-headed Gull	<i>Larus brunnicephalus</i>	+	-	-
78	Black-headed Gull	<i>Larus ridibundus</i>	+	-	-
79	Gull-billed Tern	<i>Gelochelidon nilotica</i>	+	-	-
80	River Tern	<i>Sterna aurantia</i>	+	-	-
81	Whiskered Tern	<i>Chlidonias hybridus</i>	+	-	-
	<b>Sandgrouse</b>	<b>Pteroclididae</b>			
82	Chestnut-bellied Sandgrouse	<i>Pterocles exustus</i>	-	-	+
83	Painted Sandgrouse	<i>Pterocles indicus</i>	-	-	+
	<b>Pigeons &amp; Doves</b>	<b>Columbidae</b>			
84	Blue Rock Pigeon	<i>Columba livia</i>	+	+	+

85	Little Brown Dove	<i>Streptopelia senegalensis</i>	+	+	+
86	Red Collared-Dove	<i>Streptopelia tranquebarica</i>	-	-	+
87	Eurasian Collared-Dove	<i>Streptopelia decaocto</i>	+	+	+
88	Yellow-legged Green-Pigeon	<i>Treron phoenicoptera</i>	-	-	+
	<b>Parakeets &amp; Hanging-Parrots</b>	<b>Psittacidae</b>			
89	Alexandrine Parakeet	<i>Psittacula eupatria</i>	-	-	+
90	Rose-ringed Parakeet	<i>Psittacula krameri</i>	+	+	+
91	Plum-headed Parakeet	<i>Psittacula cyanocephala</i>	-	-	+
	<b>Cuckoos, Malkohas &amp; Coucals</b>	<b>Cuculidae</b>			
92	Asian Koel	<i>Eudynamys scolopacea</i>	-	+	+
93	Greater Coucal	<i>Centropus sinensis</i>	-	-	+
	<b>Owls</b>	<b>Strigidae</b>			
94	Spotted Owlet	<i>Athene brama</i>	-	+	+
	<b>Nightjars</b>	<b>Caprimulgidae</b>			
95	Common Indian Nightjar	<i>Caprimulgus asiaticus</i>	-	-	+
	<b>Swifts</b>	<b>Apodidae</b>			
96	House Swift	<i>Apus affinis</i>	-	-	+
	<b>Kingfishers</b>	<b>Alcedinidae</b>			
97	Small Blue Kingfisher	<i>Alcedo atthis</i>	+	-	-
98	White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	+	+	+
99	Lesser Pied Kingfisher	<i>Ceryle rudis</i>	+	-	-
	<b>Bee-eaters</b>	<b>Meropidae</b>			
100	Small Bee-eater	<i>Merops orientalis</i>	+	+	+
101	Blue-cheeked Bee-eater	<i>Merops persicus</i>	-	-	+
102	Blue-tailed Bee-eater	<i>Merops philippinus</i>	-	-	+
	<b>Rollers</b>	<b>Coraciidae</b>			
103	European Roller	<i>Coracias garrulus</i>	-	-	+
104	Indian Roller	<i>Coracias benghalensis</i>	+	-	+
	<b>Hoopoes</b>	<b>Upupidae</b>			
105	Common Hoopoe	<i>Upupa epops</i>	-	+	+
	<b>Hornbills</b>	<b>Bucerotidae</b>			
106	Indian Grey Hornbill	<i>Ocyrceros birostris</i>	-	+	+
	<b>Barbets</b>	<b>Capitonidae</b>			
107	Coppersmith Barbet	<i>Megalaima haemacephala</i>	-	+	+
	<b>Woodpeckers</b>	<b>Picidae</b>			
108	Eurasian Wryneck	<i>Jynx torquilla</i>	-	-	+
109	Lesser Golden-backed Woodpecker	<i>Dinopium benghalense</i>	-	+	+
	<b>Larks</b>	<b>Alaudidae</b>			
110	Singing Bush-Lark	<i>Mirafra cantillans</i>	-	-	+
111	Common Crested Lark	<i>Galerida cristata</i>	-	-	+

	<b>Swallows &amp; Martins</b>	<b>Hirundinidae</b>			
112	Dusky Crag-Martin	<i>Hirundo concolor</i>	-	+	+
113	Wire-tailed Swallow	<i>Hirundo smithii</i>	+	+	+
114	Red-rumped Swallow	<i>Hirundo daurica</i>	-	-	+
115	Streak-throated Swallow	<i>Hirundo fluvicola</i>	-	-	+
	<b>Wagtails &amp; Pipits</b>	<b>Motacillidae</b>			
116	Large Pied Wagtail	<i>Motacilla maderaspatensis</i>	+	-	-
117	Citrine Wagtail	<i>Motacilla citreola</i>	+	-	-
118	Yellow Wagtail	<i>Motacilla flava</i>	+	-	-
119	Paddyfield Pipit	<i>Anthus rufulus</i>	+	-	+
	<b>Cuckoo-Shrikes, Flycatcher-Shrikes, Trillers, Minivets, Woodshrikes</b>	<b>Campephagidae</b>			
120	Small Minivet	<i>Pericrocotus cinnamomeus</i>	-	-	+
121	Common Woodshrike	<i>Tephrodornis pondicerianus</i>	-	+	+
	<b>Bulbuls &amp; Finchbills</b>	<b>Pycnonotidae</b>			
122	White-eared Bulbul	<i>Pycnonotus leucotis</i>	-	-	+
123	Red-vented Bulbul	<i>Pycnonotus cafer</i>	+	+	+
	<b>Shrikes</b>	<b>Laniidae</b>			
124	Bay-backed Shrike	<i>Lanius vittatus</i>	-	-	+
125	Rufous-backed Shrike	<i>Lanius schach</i>	-	-	+
126	Southern Grey Shrike	<i>Lanius meridionalis</i>	-	+	+
	<b>Thrushes, Shortwings, Robins, Forktails, Wheaters</b>	<b>Turdinae</b>			
127	Bluethroat	<i>Luscinia svecica</i>	+	-	-
128	Oriental Magpie-Robin	<i>Copsychus saularis</i>	-	-	+
129	Indian Robin	<i>Saxicoloides fulicata</i>	-	+	+
130	Black Redstart	<i>Phoenicurus ochruros</i>	-	-	+
131	Common Stonechat	<i>Saxicola torquata</i>	-	-	+
132	Pied Bushchat	<i>Saxicola caprata</i>	-	-	+
133	Desert Wheatear	<i>Oenanthe deserti</i>	-	-	+
134	Isabelline Wheatear	<i>Oenanthe isabellina</i>	-	-	+
135	Indian Chat	<i>Cercomela fusca</i>	-	+	+
	<b>Babblers, Laughingthrushes, Babaxes, Barwings, Yuhinas</b>	<b>Timaliinae</b>			
136	Yellow-eyed Babbler	<i>Chrysomma sinense</i>	+	-	-
137	Common Babbler	<i>Turdoides caudatus</i>	-	-	+
138	Large Grey Babbler	<i>Turdoides malcolmi</i>	-	+	+
139	Jungle Babbler	<i>Turdoides striatus</i>	-	-	+
	<b>Goldcrest, Prinias, Tesias, Warblers</b>	<b>Sylviinae</b>			
140	Ashy Prinia	<i>Prinia socialis</i>	-	+	+
141	Rufous-fronted Prinia	<i>Prinia buchanani</i>	-	-	+



142	Plain Prinia	<i>Prinia inornata</i>	-	-	+
143	Common Chiffchaff	<i>Phylloscopus collybita</i>	-	+	+
144	Common Lesser Whitethroat	<i>Sylvia curruca</i>	-	+	+
	<b>Flycatchers</b>	<b>Muscicapinae</b>			
145	Red-throated Flycatcher	<i>Ficedula parva</i>	-	-	+
146	Grey-headed Flycatcher	<i>Culicicapa ceylonensis</i>	-	-	+
	<b>Monarch-Flycatchers &amp; Paradise-Flycatchers</b>	<b>Monarchinae</b>			
147	Asian Paradise-Flycatcher	<i>Terpsiphone paradisi</i>	-	-	+
	<b>Fantail-Flycatchers</b>	<b>Rhipidurinae</b>			
148	White-browed Fantail-Flycatcher	<i>Rhipidura aureola</i>	-	-	+
	<b>Tits</b>	<b>Paridae</b>			
149	Great Tit	<i>Parus major</i>	-	-	+
	<b>Sunbirds &amp; Spiderhunters</b>	<b>Nectariniidae</b>			
150	Purple Sunbird	<i>Nectarinia asiatica</i>	-	+	+
	<b>White-eyes</b>	<b>Zosteropidae</b>			
151	Oriental White-eye	<i>Zosterops palpebrosus</i>	-	-	+
	<b>Buntings</b>	<b>Emberizinae</b>			
152	Crested Bunting	<i>Melophus lathami</i>	-	-	+
	<b>Finches</b>	<b>Fringillidae</b>			
153	Common Rosefinch	<i>Carpodacus erythrinus</i>	+	-	+
	<b>Munias (Estrildid Finches)</b>	<b>Estrildidae</b>			
154	White-throated Munia	<i>Lonchura malabarica</i>	-	-	+
155	Spotted Munia	<i>Lonchura punctulata</i>	-	-	+
	<b>Sparrows &amp; Snowfinches</b>	<b>Passerinae</b>			
156	House Sparrow	<i>Passer domesticus</i>	+	+	+
157	Yellow-throated Sparrow	<i>Petronia xanthocollis</i>	-	-	+
	<b>Weavers</b>	<b>Ploceinae</b>			
158	Baya Weaver	<i>Ploceus philippinus</i>	+	-	+
	<b>Starlings &amp; Mynas</b>	<b>Sturnidae</b>			
159	Brahminy Starling	<i>Sturnus pagodarum</i>	-	+	+
160	Rosy Starling	<i>Sturnus roseus</i>	+	-	+
161	Asian Pied Starling	<i>Sturnus contra</i>	+	+	+
162	Common Myna	<i>Acridotheres tristis</i>	+	+	+
163	Bank Myna	<i>Acridotheres ginginianus</i>	+	+	+
	<b>Orioles</b>	<b>Oriolidae</b>			
164	Eurasian Golden Oriole	<i>Oriolus oriolus</i>	-	-	+
	<b>Drongos</b>	<b>Dicruridae</b>			
165	Black Drongo	<i>Dicrurus macrocercus</i>	+	+	+
	<b>Crows, Jays, Treepies, Magpies</b>	<b>Corvidae</b>			

166	Indian Treepie	<i>Dendrocitta</i>	-	+	+
167	House Crow	<i>Corvus splendens</i>	+	+	+

**Table 1:** The Avi-Faunal Composition of Municipal Area of Ajmer District, Rajasthan (Family wise species occurrence at classified microhabitats).

UAA: Urban Aquatic Areas; HSA: Human Settlement Areas; UGP: Urban Green Patches.

(+) represents presence of species and (-) represents absence of species.

S. No.	Family Commonly Known as	Family Name	Overall Rdi	No of Species in UAA	No of Species in HSA	No of Species in UGP
1	Grebes	Podicipedidae	0.6	1	0	0
2	Pelicans	Pelecanidae	1.19	2	0	0
3	Cormorants/Shags	Phalacrocoracidae	1.79	3	0	0
4	Darters	Anhingidae	0.6	1	0	0
5	Hérons, Egrets & Bitterns	Ardeidae	5.36	9	3	2
6	Storks	Ciconiidae	1.19	2	0	1
7	Ibises & Spoonbills	Threskiornithidae	2.38	4	0	0
8	Flamingos	Phoenicopteridae	0.6	1	0	0
9	Swans, Geese & Ducks	Anatidae	8.93	15	0	0
10	Hawks, Eagles, Buzzards, Old World Vultures, Kites, Harriers	Accipitridae	5.36	2	2	9
11	Osprey	Pandionidae	0.6	1	0	0
12	Falcons	Falconidae	0.6	0	0	1
13	Pheasants, Partridges, Quails	Phasianidae	2.38	0	2	4
14	Rails, Crakes, Moorhens, Coots	Rallidae	2.38	4	0	1
15	Jacanas	Jacanidae	1.19	2	0	0
16	Painted-Snipes	Rostratulidae	0.6	1	0	0
17	Sandpipers, Stints, Snipes, Godwits & Curlews	Scolopacidae	5.36	4	1	2
18	Plovers, Dotterels, Lapwings	Charadriidae	2.38	9	0	3
19	Ibisbill, Avocets & Stilts	Recurvirostridae	1.19	2	1	1
20	Gulls, Terns & Noddies	Laridae	3.57	6	0	0
21	Sandgrouse	Pteroclididae	1.19	0	0	2
22	Pigeons & Doves	Columbidae	2.98	3	3	5

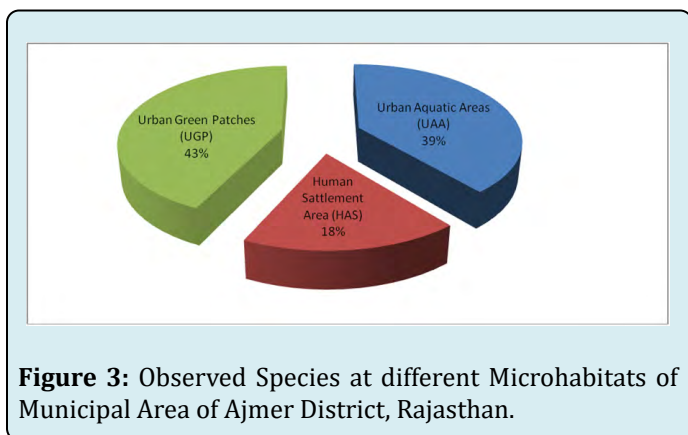
23	Parakeets & Hanging-Parrots	Psittacidae	1.79	1	1	3
24	Cuckoos, Malkohas & Coucals	Cuculidae	1.19	0	1	2
25	Owls	Strigidae	0.6	0	1	1
26	Nightjars	Caprimulgidae	0.6	0	0	1
27	Swifts	Apodidae	0.6	0	0	1
28	Kingfishers	Alcedinidae	1.79	3	1	1
29	Bee-eaters	Meropidae	1.79	1	1	3
30	Rollers	Coraciidae	1.19	1	0	2
31	Hoopoes	Upupidae	0.6	0	1	1
32	Hornbills	Bucerotidae	0.6	0	1	1
33	Barbets	Capitonidae	0.6	0	1	1
34	Woodpeckers	Picidae	1.19	0	1	2
35	Larks	Alaudidae	1.19	0	0	2
36	Swallows & Martins	Hirundinidae	2.38	1	2	4
37	Wagtails & Pipits	Motacillidae	2.38	4	0	1
38	Cuckoo-Shrikes, Flycatcher-Shrikes, Trillers, Minivets, Woodshrikes	Campephagidae	1.19	0	1	2
39	Bulbuls & Finchbills	Pycnonotidae	1.19	1	1	2
40	Shrikes	Laniidae	1.79	0	1	3
41	Thrushes, Shortwings, Robins, Forktails, Wheaters	Turdinae	5.36	1	2	8
42	Babblers, Laughingthrushes, Babaxes, Barwings, Yuhinas	Timaliinae	2.38	1	1	3
43	Goldcrest, Prinias, Tesias, Warblers	Sylviinae	2.98	0	3	5
44	Flycatchers	Muscicapinae	1.19	0	0	2
45	Monarch-Flycatchers & Paradise-Flycatchers	Monarchinae	0.6	0	0	1
46	Fantail-Flycatchers	Rhipidurinae	0.6	0	0	1
47	Tits	Paridae	0.6	0	0	1
48	Sunbirds & Spiderhunters	Nectariniidae	0.6	0	1	1

49	White-eyes	Zosteropidae	0.6	0	0	1
50	Buntings	Emberizinae	0.6	0	0	1
51	Finches	Fringillidae	0.6	1	0	1
52	Munias (Estrildid Finches)	Estrildidae	1.19	0	0	2
53	Sparrows & Snowfinches	Passerinae	1.19	1	1	2
54	Weavers	Ploceinae	0.6	1	0	1
55	Starlings & Mynas	Sturnidae	3.57	4	4	5
56	Orioles	Oriolidae	0.6	0	0	1
57	Drongos	Dicruridae	0.6	1	1	1
58	Crows, Jays, Treepies, Magpies	Corvidae	1.19	1	2	2
			100	95	41	104

**Table 2:** Relative diversity (RDi) of avian families at Municipal area of Ajmer District, Rajasthan and number of species at various sites.

Sorenson Index	Jaccard Index			
		UAA	HAS	UGP
	UAA		0.1709	0.1976
	HSA	0.2919		0.3809
UGP	0.33	0.5517		

**Table 3:** Similarity indices (Jaccard Index and Sorenson Index) between the various study sites.



**Figure 3:** Observed Species at different Microhabitats of Municipal Area of Ajmer District, Rajasthan.

### Observation and Results

In the investigation period of twenty-four months, a total of 167 species of birds belonging to 58 families were recorded in the study area (Table 1). The three different study sites i.e. Urban Aquatic Area (UAA) had 39% of the total species

observed; Human Settlement Area (HAS) had 18% and Urban Green Patches (UGP) had 43% of the total species observed (Figure 3). The Relative Diversity of different families was calculated to determine the dominance of species occurrence at a particular study site (Table 2). The highest relative diversity was recorded as of Anatidae family with 15 species and 8.93 RDi followed by Ardeidae, Accipitridae, Scolopacidae and Turdinae families with 9 species each and 5.36 RDi respectively representing the dominance of species occurrence belonging to these families at study area (Table 2). The calculation for the similarity indices among different study sites revealed that Urban Green Patches and Human Settlement Areas had more similar habitat structure as the Jaccard index and Sorenson Index values are higher i.e. 0.3809 and 0.5517 respectively. While on the other hand Urban Aquatic Areas and Human Settlement Areas had very less similarity in habitat characteristics hence the values of Jaccard index and Sorenson Index are lower as 0.1709 and 0.2919 respectively (Table 3).

Overall 95 species belonging to 34 families were present in the Urban Aquatic Area (UAA). The Anatidae family with 15 species dominated the Urban Aquatic Area followed by the Scolopacidae with 9 species. The urban terrestrial area which was further classified for simplification into Human Settlement Area (HAS) and Urban Green Patches (UGP). The Human Settlement Area was represented by 41 species belonging to 27 families. This Area had a lesser number of species and was dominated by Sturnidae family (4 species) followed by Ardeidae, Columbidae, and Sylviinae (3 species each). The Urban Green Patches had 47 families (104 species) and Accipitridae family dominated the area (9 species) followed by Turdinae family (8 species).

### Conclusion and Discussion

The present study concluded that the Municipal area of Ajmer district represents near about 68% of the avifaunal diversity observed in different habitats of the Ajmer District as a whole [2,3,5-8]. The study area includes the foothills of the oldest mountain range the Aravalli that provides an excellent habitat for various floral and faunal components hence the diversity is rich at the study area. The Urban Aquatic Areas (Anasagar Lake, Foy Sagar Lake, Chaurasiywas Talab, Paal Bichla Talab and Khanpura Talab) represented by the 96 species belonging to the 34 families. The Anasagar Lake, which is located in the central part of Ajmer Municipal area supports the 40 species [19], whereas another study conducted after two years by same authors documented 42 species from the same locality [20]. In the continuation another worker documented 48 species of birds from the Anasagar Lake and 42 species from the Foy Sagar Lake [21-23].

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