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# AVIFAUNAL COMPOSITION OF VARIOUS MICROHABITATS OF SOUTHERN NAGAUR (PARBATSAR, KUCHAMAN, NAWA AND MAKRANA), RAJASTHAN

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## ABSTRACT

Present study comprises a comprehensive dataset about the Avifaunal diversity of one of the climatic transition zone i.e., Southern Nagur, Rajasthan. The Study was conducted under the classified six different microhabitats i.e., Agricultural Field Plains, Sambhar Lake and Other Waterbodies, Aravalli Hill Patches, Urban Settlements, Scrub Thorn Forest and Open Grasslands & Wastelands. The key aspect of present study is to provide well structured and extensive information on the avian diversity, their distribution and their habitat association at the study area. A total of 191 Avifaunal species belonging to 21 Orders and 61 Families were recorded from study area. A total of 7 Feeding Guilds were observed in the study area viz., Carnivores, Frugivores, Granivores, Herbivores, Insectivores, Nectivores and Omnivored. The Migratory status and IUCN status of the observed species was also assessed. Jaccard and Sorenson index's was highest for the Agricultural and Grassland Microhabitats.

## 1. INTRODUCTION

The state of Rajasthan can be divided into two major climatic zones i.e. Arid and Semiarid, by the Aravalli Mountain ranges. The districts lying near Aravalli mountain ranges act as a transition zone between such two climatic zones. With variety of microhabitats in the state of Rajasthan along with two Ramsar Sites i.e., are Keoladeo National Park and Sambhar Lake (Islam and Rahmani, 2004). Rajasthan is rich in various floral and faunal components including the avifaunal diversity with estimation of about 500 species of birds (BNHS, 2011b).

Birds are one of the best indicators of environmental quality, health and they easily depicted significant variations against changes in the microhabitat quality in both the terms spatial as well as temporal. Birds also exhibit the relationship with the structure and characteristics of the microhabitat (Cody, 1978). The population and

community structure of bird is directly affected by the food availability, nest site availability, human exposure and presence of other threat (Wiens, 1989). Studying the bird population is useful to monitor the long term changes in habitat quality and responses of birds to both natural and anthropogenic induced environmental changes (Wiens, 1989).

As, this is well known fact, that the transition zones exhibited greater amount of diversity as they shared nearly all characteristics of both the nearby microhabitats. Inspite of such importance still many transition zones including the Nagaur district are not evaluated properly for their faunal diversity including the avifaunal compositions. The present study is an approach to fulfill such gap as it comprises the avifaunal diversity of southern region of Naguar district in classified six different microhabitats i.e., Agricultural Field Plains, Sambhar Lake and Other Waterbodies, Aravalli Hill Patches, Urban Settlements, Scrub Thorn Forest and Open Grasslands & Wastelands. The main purpose of this study is to provide well structured and extensive information on the avian diversity, distribution and habitat association of avifauna of southern region of Nagaur, administratively comes under the Parbatsar, Nawa, Makrana and Kuchaman towns of Nagaur District.

### 1.1. OBJECTIVES OF THE STUDY

The objective of present study is to prepare an avifaunal inventory of the study area by observing all six microhabitats and to identify the feeding guild (Simberloff and Dayan 1991), IUCN Status (IUCN, 2020) and Migration Pattern (Able, 1995) of the documented bird species of the study area.

## 2. MATERIALS AND METHODS

### 2.1. PROFILE OF STUDY AREA

The study was carried out in six microhabitats at southern region of Nagaur district, Rajasthan. The study area located between 26°54'20.1"N 74°46'31.5"E at transition zone between arid and semiarid climatic zones of Rajasthan.

Four seasons are recognized at the study area based on rainfall i.e., Summer (April-June), Pre-monsoon (July-September), Monsoon (October-December) and Post-monsoon (January-March). The December to January is the coolest time period and May to June is the warmest period at the study area. The study area is well dominated by Agricultural Lands followed by Scrub Thorn Forest and Wasteland. The western parts of the study area are covered by Aravalli Mountain Ranges. Soils are relatively fertile and support all agricultural activity in the study area. Four types of soils have been reported from the study area viz., Clay, Clay Loam, Sandy Loam and Sandy Soil. The area lies under the transition zone of arid and semiarid climate and is represented by chiefly Dry mixed deciduous thorn forest along with some bushy plants Anogeissus pendula and Capparis decidua. The plainer parts of the study area is dominated by Acacia nilotica, Acacia senegal, Salvadora persica etc. The nearby of seasonal rivers and streams the soil is of sandy with good amount of moisture and mainly populated by the Dalbergia sissoo as the common tree, while other important species are Azadirachta indica, Prosopis cineraria and Prosopis juliflora. The degraded areas at the catchment are dominated by an invasive plant Prosopis juliflora. Due to high saline condition the other species does not survive easily at the study area but the growth of Prosopis juliflora is in abundance.

Agro-Ecosystems or Agricultural area covers the largest portion of study area. The area is mostly cultivated during the monsoon season. Some of the important crops like Pearl millet, Cluster bean, Sesame, Green gram, Moth bean are the main seasonal crops. However, in more fertile soil groundnut, wheat, cumin, cotton, mustard and gram are also grown on fairly large scale.

**Figure 1:** (A) Satellite map of Study Area, (B) With highlighted microhabitats

## 2.2. DATA COLLECTION

Regular field surveys were carried out from August 2019 to August 2020 resulting in a total 52 surveys in six microhabitats: 20 in summer, 20 in winter and 12 in monsoon. The length of transect remained constant in all the surveys that is 1000 m (1KM). The time remained constant in all microhabitat, morning surveys was carried out from 6:00 Am to 9:00 Am and evening surveys was carried out from 4:00 Pm to 7:00 Pm. Olympus Binocular 10*50X was used for on field observations and Canon- Eos 1300D camera was used for photography. For identification of birds "Book of Indian Birds" by Salim ali (Ali, 1992) and "A field guide on the birds of the Indian subcontinent" Grimmett (Grimmett et al., 1998) was referred. Checklist was prepared using various methods like Adhoc, Area Search Method, Point Count Method, Rolling Bird Survey Method and Call Based Identification Method (Urfi et al., 2005).

## 2.3. DATA ANALYSIS

**Relative Diversity Index (RDi)**

The relative diversity (RDi) of families was calculated (Torre-Cuadros et al., 2007).

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

**Sorenson Index**

To assess the association of species between two study sites, Sorensen's index of similarity (Sorenson, 1948) was calculated.

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

Where j = number of species common to both sites; a = number of species at site A; b = number of species at site B

**Jaccard Index**

To assess the association of species between two study sites, Jaccard index of similarity was calculated.

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

Where j = number of species common to both sites; a = number of species at site A; b = number of species at site B.

## 3. RESULTS AND DISCUSSION

A total of 191 Avifaunal species were recorded from study area (Table 1). Total 21 Orders were recorded from the study area (Table 2). Order Passeriformes dominated the study area with 71 Bird species followed by order Charadriiformes (28), Anseriformes (14), Pelecaniformes (13) and Accipitriformes (12). A total of 61 Families were recorded from study area (Table 3). Family Anatidae dominated the study area with 14 species followed by Muscicapidae (12), Accipitridae (11) and Scolopacide (11) with relative diversity value of 7.33%, 6.28%, 5.76% and 5.76% respectively. A total of 7 Feeding Guilds were observed in the study area viz., Carnivores, Frugivores, Granivores, Herbivores, Insectivores, Nectivores and Omnivored based on the food preferences of the Avifauna (Table 4 & Fig. 2).

Most Birds in study area preferred Insectivore feeding guild as of 77 species of total 191 are insectivore followed by Carnivores (45), Granivores (24), Omnivores (23), Herbivores (11), Frugivores (10) and only one species of Nectivores. 119 out of total 191 species recorded in study area were identified as residential species of the area, 72 species were identified as Migratory species out of which 5 as Summer Migratory and 67 as Winter Migratory (Table 5 & Fig. 3).

In recorded 191 species, a total of 4 IUCN Red List Categories out of 7 was observed in the study area. 178 Species out of 191 were identified as Least Concerned Species. 8 Species were identified as Near Threatened species which are Ferruginous pochard, Great thick knee, River tern, Black tailed godwit, Painted Stork, Oriental White Ibis, Lesser Flamingo, Alexendrine Parakeet. 3 Species i.e. Common Pochard, Woolly Necked Stork, Southern Grey Shrike were identified as Vulnerable, And 2 Species viz., Egyptian Vulture and Steppe Eagle as Endangered (Table 6 & Fig. 4).

During the entire period of study the maximum species was observed from the Water bodies microhabitat (95 species) followed by Scrub forest microhabitats (89). In contrast the minimum species represented by Urban settlements microhabitat (38 species). The higher amount of species diversity indicated the better quality and resource availability at that particular microhabitat.

Jaccard and Sorenson index's increasing values indicates the similarity between two microhabitats. The Agricultural and Grassland Microhabitats have highest values (Jaccard= 0.559, Sorenson= 0.717) are much similar to each other.

**Table 1:** Order, Family, Common Name, Scientific Name, Feeding Guild, Migratory Status and IUCN Status of Observed Species

| S. NO | Order | Family | Common name | Scientific name | Feeding Guild | Migratory Status | IUCN Status |
|---|---|---|---|---|---|---|---|
| 1 | Accipitriformes | Accipitridae | Black winged kite | *Elanus axillaris* | Carnivorous | R | Least concern |
| 2 | Accipitriformes | Accipitridae | Black kite | *Milvus migrans* | Carnivorous | R | Least concern |
| 3 | Accipitriformes | Accipitridae | Shikra | *Accipiter badius* | Carnivorous | R | Least concern |
| 4 | Accipitriformes | Accipitridae | Oriental honey buzzard | *Pernis ptilorhynchus* | Carnivorous | R | Least concern |
| 5 | Accipitriformes | Accipitridae | White eyed buzzard | *Butastur teesa* | Carnivorous | R | Least concern |
| 6 | Accipitriformes | Accipitridae | Eurasian Marsh harrier | *Ciircus aeruginosus* | Carnivorous | W | Least concern |
| 7 | Accipitriformes | Accipitridae | Egyptian vulture | *Neophron percnopterus* | Carnivorous | R | Endagered |

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|---|---|---|---|---|---|---|---|
| 8 | Accipitriformes | Accipitridae | Montagu's harrier | *Circus pygargus* | Carnivorous | W | Least concern |
| 9 | Accipitriformes | Accipitridae | Long leg buzzard | *Buteo rufinus* | Carnivorous | W | Least concern |
| 10 | Accipitriformes | Accipitridae | Steppe eagle | *Aquila nipalensis* | Carnivorous | W | Endagered |
| 11 | Accipitriformes | Accipitridae | Common buzzard | *Buteo buteo* | Carnivorous | W | Least concern |
| 12 | Accipitriformes | Pandionidae | Osprey | *Pandion haliaetus* | Carnivorous | R | Least concern |
| 13 | Anseriformes | Anatidae | Bar headed goose | *Anser indicus* | Omnivorous | R | Least concern |
| 14 | Anseriformes | Anatidae | Ruddy Shelduck | *Tadorana ferruginea* | Omnivorous | W | Least concern |
| 15 | Anseriformes | Anatidae | Common pochard | *Aythya ferina* | Omnivorous | W | Vulnerable |
| 16 | Anseriformes | Anatidae | Ferrogenous pochard | *Aythya nyroca* | Omnivorous | W | Near Threatened |
| 17 | Anseriformes | Anatidae | Graylag goose | *Anser anser* | Herbivorous | W | Least concern |
| 18 | Anseriformes | Anatidae | Knob billed duck | *Sarkidiornis melanotos* | Herbivorous | R | Least concern |
| 19 | Anseriformes | Anatidae | Lesser whistling duck | *Dendrocygna javanica* | Herbivorous | R | Least concern |
| 20 | Anseriformes | Anatidae | Northern Pintail | *Anas acuta* | Herbivorous | W | Least concern |
| 21 | Anseriformes | Anatidae | Common teal | *Anas crecca* | Herbivorous | W | Least concern |
| 22 | Anseriformes | Anatidae | Spot billed duck | *Anas poecilorhyncha* | Herbivorous | R | Least concern |
| 23 | Anseriformes | Anatidae | Mallard | *Anas platyrhynchos* | Herbivorous | W | Least concern |
| 24 | Anseriformes | Anatidae | Gadwall | *Anas strepera* | Herbivorous | W | Least concern |
| 25 | Anseriformes | Anatidae | Garganey | *Anas querquedula* | Herbivorous | W | Least concern |
| 26 | Anseriformes | Anatidae | Northern shoveler | *Anas clypeata* | Carnivorous | W | Least concern |
| 27 | Apodiformes | Apodidae | House swift | *Apus affinis* | Insectivorous | R | Least concern |
| 28 | Bucerotiformes | Upupidae | Common hoopoe | *Upupa epops* | Insectivorous | R | Least concern |
| 29 | Bucerotiformes | Bucerotidae | Indian grey hornbill | *Ocyceros birostris* | Frugivorous | R | Least concern |
| 30 | Charadriiformes | Burhinidae | Great thick knee | *Esacus recurvirostris* | Carnivorous | W | Near threatened |
| 31 | Charadriiformes | Burhinidae | Indian thick knee | *Burhinus oedicnemus* | Insectivorous | R | Least concern |
| 32 | Charadriiformes | Charadriidae | Kentish Plover | *Charadrius alexandrinus* | Insectivorous | W | Least concern |

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|---|---|---|---|---|---|---|---|
| 33 | Charadriiformes | Charadriidae | Little Ringed Plover | *Charadrius dubius* | Insectivorous | R | Least concern |
| 34 | Charadriiformes | Charadriidae | Red wattled lapwing | *Vanellus indicus* | Insectivorous | R | Least concern |
| 35 | Charadriiformes | Charadriidae | Yellow wattled lapwing | *Vanellus malabaricus* | Insectivorous | R | Least concern |
| 36 | Charadriiformes | Glareolidae | Small pratincole | *Glareola lactea* | Insectivorous | W | Least concern |
| 37 | Charadriiformes | Laridae | Black headed gull | *Chroicocephalus ridibundus* | Omnivorous | W | Least concern |
| 38 | Charadriiformes | Laridae | Brown Headed Gull | *Chroicocephalus brunnicephalus* | Omnivorous | W | Least concern |
| 39 | Charadriiformes | Laridae | Gull billed tern | *Gelochelidon nilotica* | Carnivorous | W | Least concern |
| 40 | Charadriiformes | Laridae | Pallas gull | *Ichthyaetus ichthyaetus* | Carnivorous | W | Least concern |
| 41 | Charadriiformes | Laridae | River tern | *Sterna aurantia* | Carnivorous | W | Near Threatened |
| 42 | Charadriiformes | Laridae | Whiskered tern | *Chlidonias hybrida* | Carnivorous | W | Least concern |
| 43 | Charadriiformes | Recurvirostridae | Black winged stilt | *Himantopus himantopus* | Carnivorous | R | Least concern |
| 44 | Charadriiformes | Recurvirostridae | Pied avocet | *Recurvirostra avosetta* | Insectivorous | W | Least concern |
| 45 | Charadriiformes | Rostratulidae | Greater painted snipe | *Rostratula benghalensis* | Omnivorous | R | Least concern |
| 46 | Charadriiformes | Scolopacidae | Black tailed godwit | *Limosa limosa* | Insectivorous | W | Near Threatened |
| 47 | Charadriiformes | Scolopacidae | Common Sandpiper | *Actitis hypoleucosa* | Insectivorous | W | Least concern |
| 48 | Charadriiformes | Scolopacidae | Little stint | *Calidris minuta* | Insectivorous | W | Least concern |
| 49 | Charadriiformes | Scolopacidae | Ruff | *Calidris pugnax* | Herbivorous | W | Least concern |
| 50 | Charadriiformes | Scolopacidae | Common snipe | *Gallinago gallinaggo* | Insectivorous | W | Least concern |
| 51 | Charadriiformes | Scolopacidae | Spotted redshank | *Tringa erythropus* | Insectivorous | W | Least concern |
| 52 | Charadriiformes | Scolopacidae | Common redshank | *Tringa totanus* | Insectivorous | W | Least concern |
| 53 | Charadriiformes | Scolopacidae | Green sandpiper | *Tringa ochropus* | Insectivorous | W | Least concern |
| 54 | Charadriiformes | Scolopacidae | Wood sandpiper | *Tringa glareola* | Insectivorous | W | Least concern |
| 55 | Charadriiformes | Scolopacidae | Temminck's stint | *Calidris temminckii* | Insectivorous | W | Least concern |
| 56 | Charadriiformes | Scolopacidae | Curlew sandpiper | *Calidris ferruginea* | Insectivorous | W | Least concern |

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|---|---|---|---|---|---|---|---|
| 57 | Charadriiformes | Turnicidae | Barred button quail | *Turnix suscitator* | Granivorous | R | Least concern |
| 58 | Ciconiiformes | Ciconiidae | Asian openbill | *Anastomus oscitans* | Carnivorous | R | Least concern |
| 59 | Ciconiiformes | Ciconiidae | Painted stork | *Mycteria leucocephala* | Carnivorous | R | Near Threatened |
| 60 | Ciconiiformes | Ciconiidae | Woolly necked stork | *Ciconia episcopus* | Carnivorous | R | Vulnerable |
| 61 | Columbiformes | Columbidae | Blue rock dove | *Columba livia* | Granivorous | R | Least concern |
| 62 | Columbiformes | Columbidae | Laughing Dove | *Spilopelia senegalensis* | Granivorous | R | Least concern |
| 63 | Columbiformes | Columbidae | Spotted dove | *Spilopelia chinensis* | Granivorous | R | Least concern |
| 64 | Columbiformes | Columbidae | Red-collared dove | *Streptopelia tranquebarica* | Granivorous | R | Least concern |
| 65 | Columbiformes | Columbidae | Eurasian collared dove | *Streptopelia decaocto* | Granivorous | R | Least concern |
| 66 | Columbiformes | Columbidae | Yellow footed green pigeon | *Treron phoenicoptera* | Frugivorous | R | Least concern |
| 67 | Coraciiformes | Alcedinidae | Common kingfisher | *Alcedo atthis* | Carnivorous | R | Least concern |
| 68 | Coraciiformes | Alcedinidae | Pied kingfisher | *Ceryle rudis* | Carnivorous | R | Least concern |
| 69 | Coraciiformes | Alcedinidae | White throated kingfisher | *Halcyon smyrnensis* | Insectivorous | R | Least concern |
| 70 | Coraciiformes | Coraciidae | European roller | *Coracias garrulus* | Insectivorous | S | Least concern |
| 71 | Coraciiformes | Coraciidae | Indian roller | *Coracias benghalensis* | Insectivorous | R | Least concern |
| 72 | Coraciiformes | Meropidae | Green bee-eater | *Merops orientalis* | Insectivorous | R | Least concern |
| 73 | Coraciiformes | Meropidae | Blue tailed bee-eater | *Merops philippinus* | Insectivorous | W | Least concern |
| 74 | Coraciiformes | Meropidae | Blue cheeked bee-eater | *Merops persicus* | Insectivorous | W | Least concern |
| 75 | Cuculiformes | Cuculidae | Jacobin cuckoo | *Clamator jacobinus* | Insectivorous | S | Least concern |
| 76 | Cuculiformes | Cuculidae | Common hawk cuckoo | *Hierococcyx varius* | Insectivorous | R | Least concern |
| 77 | Cuculiformes | Cuculidae | Asian koel | *Eudynamys scolopaceus* | Frugivorous | R | Least concern |
| 78 | Cuculiformes | Cuculidae | Greater coucal | *Centropus sinensis* | Carnivorous | R | Least concern |
| 79 | Falconiformes | Falconidae | Common kestrel | *Falco tinnunculus* | Carnivorous | R | Least concern |
| 80 | Galliformes | Phasianidae | Grey Francolin | *Francolinus pondicerianus* | Granivorous | R | Least concern |
| 81 | Galliformes | Phasianidae | Common quail | *Coturnix coturnix* | Granivorous | S | Least concern |

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|---|---|---|---|---|---|---|---|
| 82 | Galliformes | Phasianidae | Rain quail | *Coturnix coromandelica* | Granivorous | R | Least concern |
| 83 | Galliformes | Phasianidae | Indian peafowl | *Pavo cristatus* | Omnivorous | R | Least concern |
| 84 | Galliformes | Phasianidae | Rock bush quail | *Perdicula argoondha* | Herbivorous | R | Least concern |
| 85 | Gruiformes | Gruidae | Common crane | *Grus grus* | Omnivorous | W | Least concern |
| 86 | Gruiformes | Gruidae | Demoiselle crane | *Grus virgo* | Omnivorous | W | Least concern |
| 87 | Gruiformes | Rallidae | White breasted water hen | *Amaurornis phoenicurus* | Insectivorous | W | Least concern |
| 88 | Gruiformes | Rallidae | Grey headed swamp hen | *Porphyrio poliocephalus* | Omnivorous | R | Least concern |
| 89 | Gruiformes | Rallidae | Common moorhen | *Gallinula chloropus* | Omnivorous | R | Least concern |
| 90 | Gruiformes | Rallidae | Common coot | *Fulica atra* | Omnivorous | R | Least concern |
| 91 | Passeriformes | Alaudidae | Indian bushlark | *Mirafra erythroptera* | Granivorous | R | Least concern |
| 92 | Passeriformes | Alaudidae | Crested lark | *Galerida cristata* | Granivorous | R | Least concern |
| 93 | Passeriformes | Alaudidae | Rufous tailed lark | *Ammomanes phoenicura* | Granivorous | R | Least concern |
| 94 | Passeriformes | Alaudidae | Singing bushlark | *Mirafra cantillans* | Granivorous | R | Least concern |
| 95 | Passeriformes | Alaudidae | Greater short toed lark | *Calandrella brachydactyla* | Granivorous | W | Least concern |
| 96 | Passeriformes | Alaudidae | Ashy crowned sparrow lark | *Eremopterix griseus* | Granivorous | R | Least concern |
| 97 | Passeriformes | Campephagidae | Small minivete | *Pericrocotus cinnamomeus* | Insectivorous | R | Least concern |
| 98 | Passeriformes | Campephagidae | Large cuckoo shrike | *Coracina macei* | Insectivorous | W | Least concern |
| 99 | Passeriformes | Certhiidae | Indian spotted creeper | *Salpornis spilonotus* | Insectivorous | R | Least concern |
| 100 | Passeriformes | Cisticolidae | Rufous fronted prinia | *Prinia buchanani* | Insectivorous | R | Least concern |
| 101 | Passeriformes | Cisticolidae | Plain prinia | *Prinia inornata* | Insectivorous | R | Least concern |
| 102 | Passeriformes | Cisticolidae | Ashy prinia | *Prinia socialis* | Insectivorous | R | Least concern |
| 103 | Passeriformes | Cisticolidae | Grey breasted prinia | *Prinia hodgsonii* | Insectivorous | R | Least concern |
| 104 | Passeriformes | Cisticolidae | Jungle prina | *Prinia sylvatica* | Insectivorous | R | Least concern |
| 105 | Passeriformes | Cisticolidae | Common tailorbird | *Orthotomus sutorius* | Insectivorous | R | Least concern |
| 106 | Passeriformes | Corvidae | Rufous treepie | *Dendrocitta vagabunda* | Omnivorous | R | Least concern |

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|---|---|---|---|---|---|---|---|
| 107 | Passeriformes | Corvidae | House crow | *Corvus splendens* | Omnivorous | R | Least concern |
| 108 | Passeriformes | Dicruridae | Black drongo | *Dicrurus macrocercus* | Insectivorous | R | Least concern |
| 109 | Passeriformes | Dicruridae | White bellied drongo | *Dicrurus caerulescens* | Insectivorous | R | Least concern |
| 110 | Passeriformes | Emberizidae | Crested bunting | *Emberiza lathami* | Granivorous | R | Least concern |
| 111 | Passeriformes | Emberizidae | Red headed bunting | *Emberiza bruniceps* | Granivorous | W | Least concern |
| 112 | Passeriformes | Estrildidae | Indian silverbill | *Euodice malabarica* | Granivorous | R | Least concern |
| 113 | Passeriformes | Hirundinidae | Dusky crag martin | *Hirundo concolor* | Insectivorous | R | Least concern |
| 114 | Passeriformes | Hirundinidae | Streak throated swallow | *Hirundo fluvicola* | Insectivorous | R | Least concern |
| 115 | Passeriformes | Hirundinidae | Wire tailed swallow | *Hirundo smithii* | Insectivorous | R | Least concern |
| 116 | Passeriformes | Hirundinidae | Red Rumped Swallow | *Hirundo daurica* | Insectivorous | R | Least concern |
| 117 | Passeriformes | Laniidae | Bay backed shrike | *Lanius vittatus* | Insectivorous | R | Least concern |
| 118 | Passeriformes | Laniidae | Long tailed shrike | *Lanius schach* | Insectivorous | R | Least concern |
| 119 | Passeriformes | Laniidae | Southern grey shrike | *Lanius excubitor* | Insectivorous | R | Vulnerable |
| 120 | Passeriformes | Leiothrichidae | Common babbler | *Argya caudata* | Granivorous | R | Least concern |
| 121 | Passeriformes | Leiothrichidae | Large grey babbler | *Turdoides malcolmi* | Granivorous | R | Least concern |
| 122 | Passeriformes | Leiothrichidae | Jungle babbler | *Argya striata* | Granivorous | R | Least concern |
| 123 | Passeriformes | Motacillidae | White wagtail | *Motacilla alba* | Insectivorous | W | Least concern |
| 124 | Passeriformes | Motacillidae | White browed wagtail | *Motacilla maderaspatensis* | Insectivorous | R | Least concern |
| 125 | Passeriformes | Motacillidae | Citrine wagtail | *Motacilla citreola* | Insectivorous | W | Least concern |
| 126 | Passeriformes | Motacillidae | Yellow wagtail | *Motacilla flava* | Insectivorous | W | Least concern |
| 127 | Passeriformes | Motacillidae | Paddyfield pipet | *Anthus rufulus* | Insectivorous | R | Least concern |
| 128 | Passeriformes | Muscicapidae | Red-breasted flycatcher | *Ficedula parva* | Insectivorous | W | Least concern |
| 129 | Passeriformes | Muscicapidae | Bluethroat | *Luscinia svecica* | Insectivorous | W | Least concern |
| 130 | Passeriformes | Muscicapidae | Oriental magpie robin | *Copsychus saularis* | Insectivorous | R | Least concern |
| 131 | Passeriformes | Muscicapidae | Indian robin | *Copsychus fulicatus* | Insectivorous | R | Least concern |

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|---|---|---|---|---|---|---|---|
| 132 | Passeriformes | Muscicapidae | Black redstart | *Phoenicurus ochruros* | Insectivorous | W | Least concern |
| 133 | Passeriformes | Muscicapidae | Common Stonechat | *Saxicola maurus* | Insectivorous | R | Least concern |
| 134 | Passeriformes | Muscicapidae | Desert wheatear | *Oenanthe deserti* | Insectivorous | W | Least concern |
| 135 | Passeriformes | Muscicapidae | Isabelline wheatear | *Oenanthe isabellina* | Insectivorous | W | Least concern |
| 136 | Passeriformes | Muscicapidae | Variable wheatear | *Oenanthe picata* | Insectivorous | W | Least concern |
| 137 | Passeriformes | Muscicapidae | Pied bushchat | *Saxicola caprata* | Insectivorous | W | Least concern |
| 138 | Passeriformes | Muscicapidae | Brown rockchat | *Oenanthe fusca* | Insectivorous | R | Least concern |
| 139 | Passeriformes | Muscicapidae | Blue rockthrush | *Monticola solitarius* | Insectivorous | W | Least concern |
| 140 | Passeriformes | Nectariniidae | Purple sunbird | *Cinnyris asiaticus* | Nectivorous | R | Least concern |
| 141 | Passeriformes | Oriolidae | Indian oriole | *Oriolus oriolus* | Frugivorous | S | Least concern |
| 142 | Passeriformes | Paridae | Great tit | *Parus major* | Insectivorous | R | Least concern |
| 143 | Passeriformes | Passeridae | Chestnut Shouldered petronia | *Gymnoris xanthocollis* | Granivorous | R | Least concern |
| 144 | Passeriformes | Passeridae | House sparrow | *Passer domesticus* | Granivorous | R | Least concern |
| 145 | Passeriformes | Phylloscopidae | Common chiffchaff | *Phylloscopus collybita* | Insectivorous | W | Least concern |
| 146 | Passeriformes | Phylloscopidae | Sulphur- bellied warbler | *Phylloscopus griseolus* | Insectivorous | W | Least concern |
| 147 | Passeriformes | Ploceidae | Baya weaver | *Ploceus philippinus* | Insectivorous | R | Least concern |
| 148 | Passeriformes | Pycnonotidae | White eared bulbul | *Pycnonotus leucotis* | Frugivorous | R | Least concern |
| 149 | Passeriformes | Pycnonotidae | Red vented bulbul | *Pycnonotus cafer* | Insectivorous | R | Least concern |
| 150 | Passeriformes | Rhipiduridae | White browed fantail | *Rhipidura aureola* | Insectivorous | R | Least concern |
| 151 | Passeriformes | Stenostiridae | Grey headed cannery flycatcher | *Culicicapa ceylonensis* | Insectivorous | W | Least concern |
| 152 | Passeriformes | Sturnidae | Brahminy starling | *Sturnia pagodarum* | Insectivorous | R | Least concern |
| 153 | Passeriformes | Sturnidae | Asian pied starling | *Gracupica contra* | Omnivorous | R | Least concern |
| 154 | Passeriformes | Sturnidae | Common starling | *Sturnus vulgaris* | Omnivorous | W | Least concern |
| 155 | Passeriformes | Sturnidae | Rosy starling | *Pastor roseus* | Omnivorous | W | Least concern |
| 156 | Passeriformes | Sturnidae | Common myna | *Acridotheres tristis* | Omnivorous | R | Least concern |

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|---|---|---|---|---|---|---|---|
| 157 | Passeriformes | Sturnidae | Bank myna | *Acridotheres ginginianus* | Omnivorous | R | Least concern |
| 158 | Passeriformes | Sylviidae | Lesser white throat | *Sylvia curruca* | Insectivorous | W | Least concern |
| 159 | Passeriformes | Sylviidae | Yellow Eyed Babbler | *Chrysomma sinense* | Insectivorous | R | Least concern |
| 160 | Passeriformes | Vangidae | Common woodshrike | *Tephrodornis pondicerianus* | Insectivorous | S | Least concern |
| 161 | Passeriformes | Zosteropidae | Oriental white eye | *Zosterops palpebrosus* | Omnivorous | R | Least concern |
| 162 | Pelecaniformes | Ardeidae | Cattle egret | *Bubulcus ibis* | Insectivorous | R | Least concern |
| 163 | Pelecaniformes | Ardeidae | Little egret | *Egretta garzetta* | Carnivorous | R | Least concern |
| 164 | Pelecaniformes | Ardeidae | Intermediate egret | *Ardea intermedia* | Carnivorous | R | Least concern |
| 165 | Pelecaniformes | Ardeidae | Great egret | *Ardea alba* | Carnivorous | R | Least concern |
| 166 | Pelecaniformes | Ardeidae | Indian pond heron | *Ardeola grayii* | Carnivorous | R | Least concern |
| 167 | Pelecaniformes | Ardeidae | Purple Heron | *Ardea purpurea* | Carnivorous | R | Least concern |
| 168 | Pelecaniformes | Ardeidae | Grey Heron | *Ardea cinerea* | Carnivorous | R | Least concern |
| 169 | Pelecaniformes | Ardeidae | Little Green Heron | *Butorides striatus* | Carnivorous | R | Least concern |
| 170 | Pelecaniformes | Ardeidae | Black Crowned night heron | *Nycticorax nycticorax* | Carnivorous | R | Least concern |
| 171 | Pelecaniformes | Threskiornithidae | Black ibis | *Pseudibis papillosa* | Carnivorous | R | Least concern |
| 172 | Pelecaniformes | Threskiornithidae | Glossy ibis | *Plegadis falcinellus* | Carnivorous | R | Least concern |
| 173 | Pelecaniformes | Threskiornithidae | Oriental white ibis | *Threskiornis melanocephalus* | Carnivorous | R | Near Threatened |
| 174 | Pelecaniformes | Threskiornithidae | Eurasian Spoonbill | *Platalea leucorodia* | Carnivorous | R | Least concern |
| 175 | Phoenicopteriformes | Phoenicopteridae | Lesser flamingo | *Phoenicopterus minor* | Omnivorous | W | Near Threatened |
| 176 | Phoenicopteriformes | Phoenicopteridae | Greater flamingo | *Phoenicopterus ruber* | Omnivorous | W | Least concern |
| 177 | Piciformes | Megalaimidae | Coppersmith barbet | *Psilopogon haemacephalus* | Frugivorous | R | Least concern |
| 178 | Piciformes | Picidae | Eurasian wryneck | *Jynx torquilla* | Insectivorous | W | Least concern |
| 179 | Piciformes | Picidae | Yellow crowned woodpecker | *Leiopicus mahrattensis* | Frugivorous | R | Least concern |
| 180 | Piciformes | Picidae | Black rumped flamback | *Dinopium benghalense* | Insectivorous | R | Least concern |
| 181 | Podicipediformes | Podicipedidae | Little grebe | *Tachybaptus ruficollis* | Carnivorous | R | Least concern |

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|---|---|---|---|---|---|---|---|
| 182 | Psittaciformes | Psittaculidae | Rose ringed parakeet | *Psittacula krameri* | Frugivorous | R | Least concern |
| 183 | Psittaciformes | Psittaculidae | Plum headed parakeet | *Psittacula cyanocephala* | Frugivorous | R | Least concern |
| 184 | Psittaciformes | Psittaculidae | Alexandrine parakeet | *Psittacula eupatria* | Frugivorous | R | Near Threatened |
| 185 | Pteroclifomes | Pteroclidae | Chestnut bellied sand grouse | *Pterocles exustus* | Granivorous | R | Least concern |
| 186 | Strigiformes | Strigidae | Indian Eagle Owl | *Bubo bengalensis* | Carnivorous | W | Least concern |
| 187 | Strigiformes | Strigidae | Spotted owlet | *Athene brama* | Carnivorous | R | Least concern |
| 188 | Strigiformes | Tytonidae | Barn owl | *Tyto alba* | Carnivorous | R | Least concern |
| 189 | Suliformes | Phalacrocoracidae | Great cormorant | *Phalacrocorax carbo* | Carnivorous | W | Least concern |
| 190 | Suliformes | Phalacrocoracidae | Indian shag | *Phalacrocorax fuscicollis* | Carnivorous | W | Least concern |
| 191 | Suliformes | Phalacrocoracidae | Little cormorant | *Phalacrocorax niger* | Carnivorous | R | Least concern |

**Table 2:** Order wise Occurrence of observed species

| S. No. | Order | No. of Species |
|---|---|---|
| 1 | Accipitriformes | 12 |
| 2 | Anseriformes | 14 |
| 3 | Apodiformes | 1 |
| 4 | Bucerotiformes | 2 |
| 5 | Charadriiformes | 28 |
| 6 | Ciconiiformes | 3 |
| 7 | Columbiformes | 6 |
| 8 | Coraciiformes | 8 |
| 9 | Cuculiformes | 4 |
| 10 | Falconiformes | 1 |
| 11 | Galliformes | 5 |
| 12 | Gruiformes | 6 |
| 13 | Passeriformes | 71 |
| 14 | Pelecaniformes | 13 |
| 15 | Phoenicopteriformes | 2 |
| 16 | Piciformes | 4 |
| 17 | Podicipediformes | 1 |
| 18 | Psittaciformes | 3 |
| 19 | Pterocliformes | 1 |
| 20 | Strigiformes | 3 |
| 21 | Suliformes | 3 |

**Table 3:** Family wise Occurrence of observed species along with their RDi

| S. No. | Family | No. of Species | RDi% |
|---|---|---|---|
| 1 | Accipitridae | 11 | 5.76 |
| 2 | Pandionidae | 1 | 0.52 |
| 3 | Anatidae | 14 | 7.33 |
| 4 | Apodidae | 1 | 0.52 |
| 5 | Upupidae | 1 | 0.52 |
| 6 | Bucerotidae | 1 | 0.52 |
| 7 | Burhinidae | 2 | 1.05 |
| 8 | Charadriidae | 4 | 2.09 |
| 9 | Glareolidae | 1 | 0.52 |
| 10 | Laridae | 6 | 3.14 |
| 11 | Recurvirostridae | 2 | 1.05 |
| 12 | Rostratulidae | 1 | 0.52 |
| 13 | Scolopacidae | 11 | 5.76 |
| 14 | Turnicidae | 1 | 0.52 |
| 15 | Ciconiidae | 3 | 1.57 |
| 16 | Columbidae | 6 | 3.14 |
| 17 | Alcedinidae | 3 | 1.57 |
| 18 | Coraciidae | 2 | 1.05 |
| 19 | Meropidae | 3 | 1.57 |
| 20 | Cuculidae | 4 | 2.09 |
| 21 | Falconidae | 1 | 0.52 |
| 22 | Phasianidae | 5 | 2.62 |
| 23 | Gruidae | 2 | 1.05 |
| 24 | Rallidae | 4 | 2.09 |
| 25 | Alaudidae | 6 | 3.14 |
| 26 | Campephagidae | 2 | 1.05 |
| 27 | Certhiidae | 1 | 0.52 |
| 28 | Cisticolidae | 6 | 3.14 |
| 29 | Corvidae | 2 | 1.05 |
| 30 | Dicruridae | 2 | 1.05 |
| 31 | Emberizidae | 2 | 1.05 |
| 32 | Estrildidae | 1 | 0.52 |
| 33 | Hirundinidae | 4 | 2.09 |
| 34 | Laniidae | 3 | 1.57 |
| 35 | Leiothrichidae | 3 | 1.57 |
| 36 | Motacillidae | 5 | 2.62 |
| 37 | Muscicapidae | 12 | 6.28 |
| 38 | Nectariniidae | 1 | 0.52 |
| 39 | Oriolidae | 1 | 0.52 |
| 40 | Paridae | 1 | 0.52 |
| 41 | Passeridae | 2 | 1.05 |
| 42 | Phylloscopidae | 2 | 1.05 |
| 43 | Ploceidae | 1 | 0.52 |
| 44 | Pycnonotidae | 2 | 1.05 |
| 45 | Rhipiduridae | 1 | 0.52 |
| 46 | Stenostiridae | 1 | 0.52 |
| 47 | Sturnidae | 6 | 3.14 |
| 48 | Sylviidae | 2 | 1.05 |
| 49 | Vangidae | 1 | 0.52 |

| | | | |
|---|---|---|---|
| 50 | Zosteropidae | 1 | 0.52 |
| 51 | Ardeidae | 9 | 4.71 |
| 52 | Threskiornithidae | 4 | 2.09 |
| 53 | Phoenicopteridae | 2 | 1.05 |
| 54 | Megalaimidae | 1 | 0.52 |
| 55 | Picidae | 3 | 1.57 |
| 56 | Podicipedidae | 1 | 0.52 |
| 57 | Psittaculidae | 3 | 1.57 |
| 58 | Pteroclidae | 1 | 0.52 |
| 59 | Strigidae | 2 | 1.05 |
| 60 | Tytonidae | 1 | 0.52 |
| 61 | Phalacrocoracidae | 3 | 1.57 |
| | Total | 191 | 100.00 |

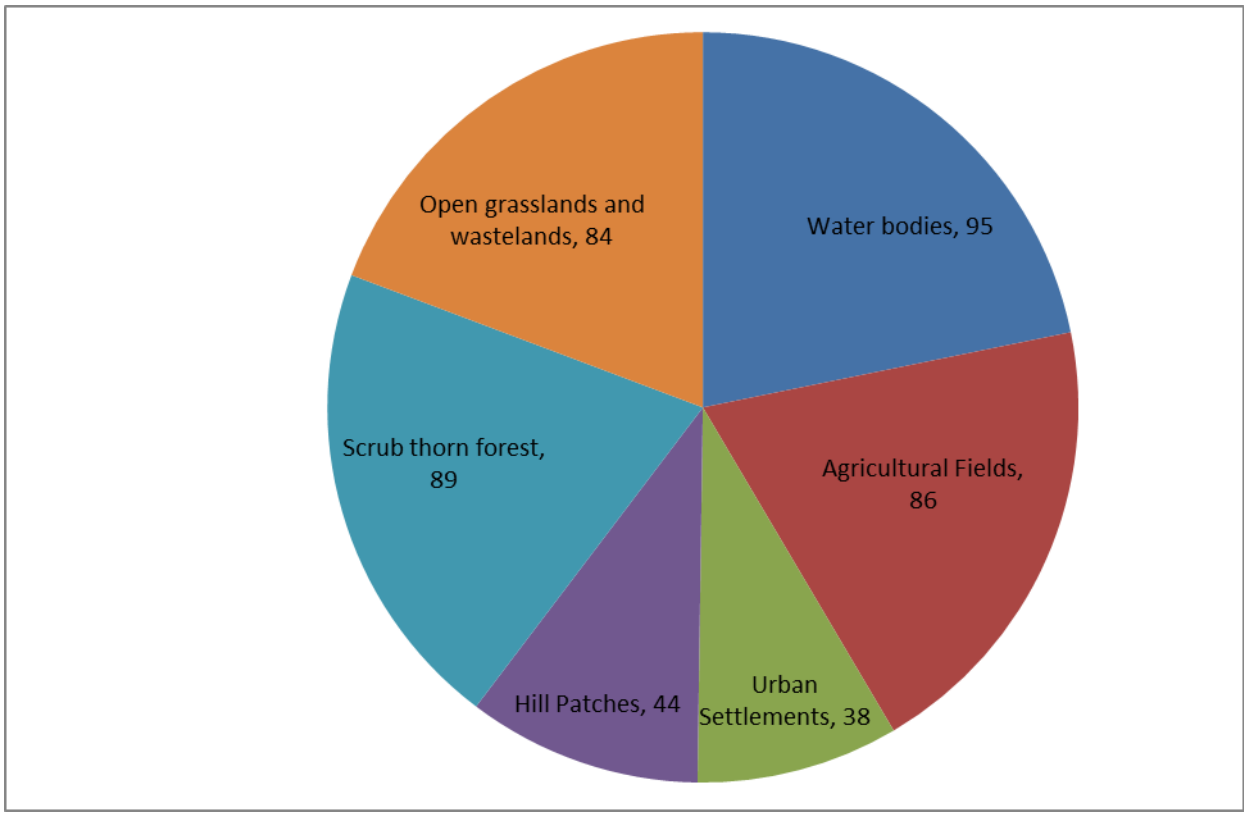


**Figure 2:** Observed Species in Different Classified Microhabitats

**Table 4:** Feeding Guild and their Percentage in Overall Population of Observed Species at Study Area

| S. No. | Feeding Guild | No. of Species | Percentage |
|---|---|---|---|
| 1 | Carnivorous | 45 | 23.5% |
| 2 | Frugivorous | 10 | 5.2% |
| 3 | Granivorous | 24 | 12.5% |
| 4 | Herbivorous | 11 | 5.7% |
| 5 | Insectivorous | 77 | 40.3% |
| 6 | Nectivorous | 1 | 0.5% |
| 7 | Omnivorous | 23 | 12% |

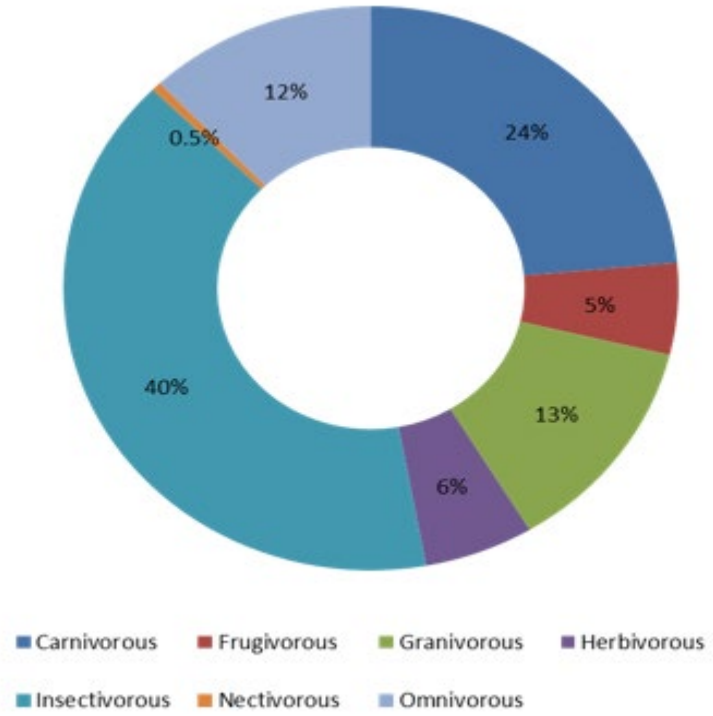


**Figure 3:** Feeding Guild of species in study area

**Table 5:** Migratory Status of Observed Species at Study Area

| S. No. | Migratory Status | No. of Species |
|---|---|---|
| 1 | Residential | 119 |
| 2 | Summer Migratory | 5 |
| 3 | Winter Migratory | 67 |

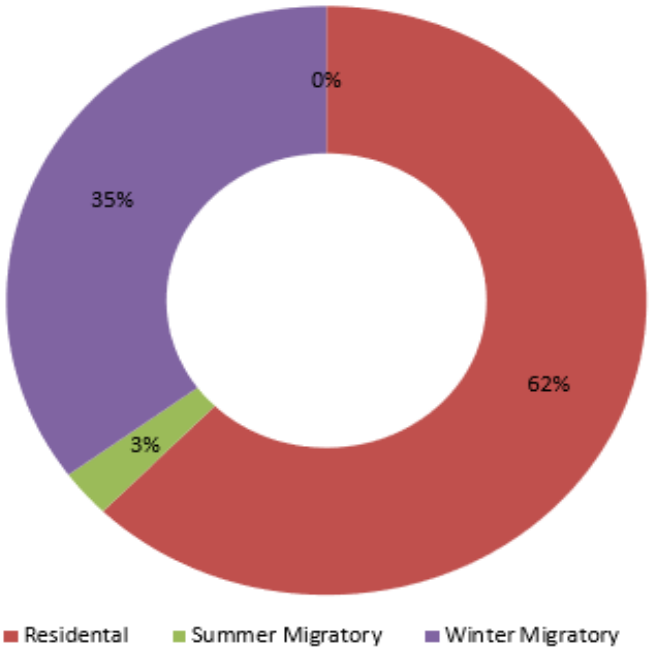


**Figure 4:** Migratory status of species in study area

**Table 6:** IUCN Status of Observed Species at Study Area

| S. No. | IUCN Status | No. of Species |
|---|---|---|
| 1 | Endangered | 2 |
| 2 | Least concern | 178 |
| 3 | Near Threatened | 8 |
| 4 | Vulnerable | 3 |

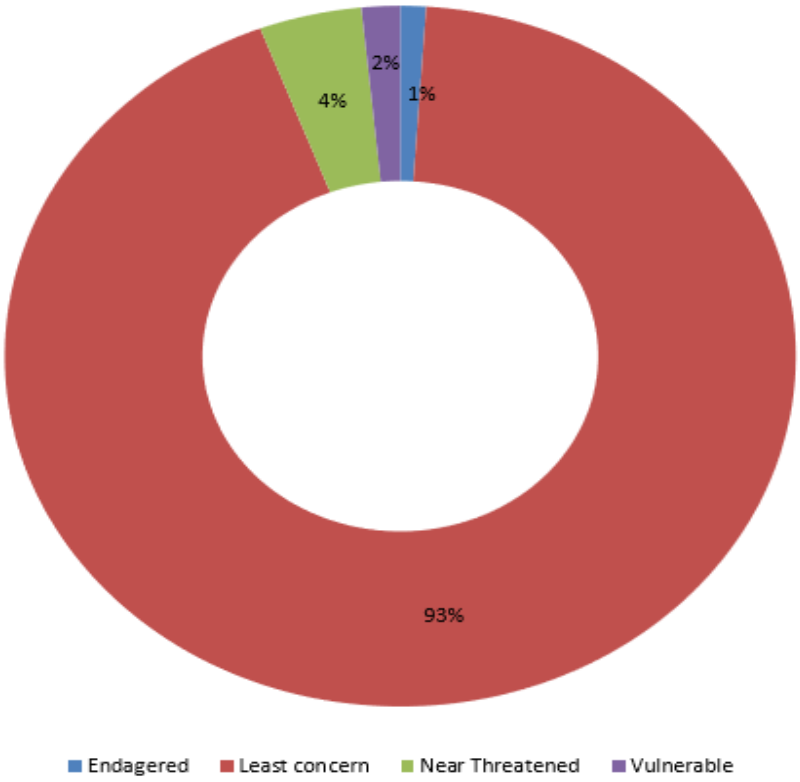


**Figure 5:** IUCN status of species in study area

## 4. CONCLUSIONS AND RECOMMENDATIONS

A total of 191 Avifaunal species belonging to 21 Orders and 61 Families were recorded from study area. The dominance among families was exhibited by family Anatidae (14 species with 7.33%, RDi) followed by Muscicapidae (12 species with 6.28% RDi), Accipitridae (11 species with 5.76% RDi) and Scolopacide (11 species with 5.76% RDi) respectively. Seven Feeding Guilds were identified during the study i.e., Insectivore (77 species) followed by Carnivores (45 species), Granivores (24 species), Omnivores (23 species), Herbivores (11 species), Frugivores (10 species) and Nectivores (1 species) based on the food preferences of the Avifauna. Out of 191 species recorded 72 species were Migratory (5 Summer Migratory & 67 Winter Migratory).

178 Species listed as Least Concern Species, 8 Species listed as Near Threatened species, 3 Species listed as Vulnerable and 2 Species were listed as Endangered under the IUCN Categories.

Most of birds inhabiting these areas are vulnerable to habitat degradation due to flaws in existing legal frameworks. In addition, community knowledge enhancements also should be strengthened for a sustainable conservation of bird species while maintaining their ecological interactions. Meanwhile Nagaur district act as a transition zone between Arid and Semi-arid habitats of Rajasthan but unfortunately still does not have any Important Bird & Biodiversity Area (IBA), it is strongly recommended to propose an Important Bird & Biodiversity Area (IBA). Simultaneously, further long-term studies are recommended that covering migratory seasons for the bird species along with and documentation and population assessment of other components of biodiversity that ultimately enhance the knowledge about the diversity and its importance to the people at the study area.

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## CONFLICT OF INTEREST

The author have declared that no competing interests exist.

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None.

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