



## URBAN BIRD DIVERSITY OF SHEOPUR CITY, NORTH MADHYA PRADESH, INDIA

SATYA NARAYAN RAWAT<sup>1\*</sup> AND R. J. RAO<sup>1</sup>

<sup>1</sup>Conservation Biology Lab, School of Studies in Zoology, Jiwaji University, Gwalior, India.

### AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between both authors. Author SNR designed the study, managed the literature searches performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author RJR managed the analyses of the study. Both authors read and approved the final manuscript.

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### ABSTRACT

The high rate of Urbanization and the consequent loss of bird habitat at the global level is increasing day by day. Due to this activity challenging ecosystem will create problems in the future because more people prefer to live in the cities. The main objective of the study was to know the current status of urban bird diversity, habitat and conservation plan. Point count and Line transect methods were used for the bird survey. The various bird species were sighted through binocular and species identification was done by using different identification keys. Photograph of birds was taken by the Nikon DSLR camera and GPS locations of each study site were recorded in the datasheet. The total numbers of 90 bird species were recorded from all study sites belonging to 16 orders and 43 families. In recent times some species migrated from urban to semi-urban areas because they have not existed in narrow habitat. However, some scavengers bird seen at dead animal dumping sites. Family Columbidae was found dominant with a 6% contribution followed by families like Muscicapidae, Sturnidae, Motacillidae, Scolopacidae and Anatidae with 5% contribution each and further followed by other families with less than 5% contribution. These present results indicate that Rock dove is highly habituated in the urban ecosystem while House sparrow, Golden oriole, Grey hornbill and Egyptian vulture are sensitive species. So they are seen as local migratory species. The conservation plan is needed to develop green belts at street level and with the maintenance of the old gardens; new parks should be established in urban areas. The artificial nest (wooden nest), food (mixed grains) and water properly take place in parks. Birds are also important for the maintenance of the ecosystem because they act as an effective tool for biological pest control.

**Keywords:** Bird habitat; urbanization; species; ecosystem; conservation.

### 1. INTRODUCTION

Although the study of urban birds has a fairly long history, urban ecosystems have been largely ignored throughout many decades of ecological research [1]. In most cases, diversity in urban habitats decreases or remains similar to wildlands [2,3]. Although urbanization increases total bird densities, it appears

that only a few species contribute to this increase. Only a few species can exist and thrive in the most built parts of the city where vegetation is almost absent, such as business districts and industrial zones. Thus, urbanization increases the abundance of feral pigeons, swallows, swifts and some other species that breed in walls. Bird species that cannot exist in less predictable or resource-poor environments may be

\*Corresponding author: Email: rawatsatyanarayan@gmail.com;

able to flourish in cities, where these hurdles associated with food and water resources are removed.

Threats to bird species diversity are principally due to a decline in the areas of their habitats, fragmentation of habitats and declines in habitat quality and some cases of mammals, hunting [4]. For aquatic bird species and semi-aquatic species, the declines in habitat quality are due to diversion of ground and surface water, resulting in the drying up of streams and other water bodies, from siltation and pollution from pesticides and other chemicals. In the Gwalior-Chambal Region of Northern Madhya Pradesh, four Wildlife Sanctuaries and one National Park are situated. Among them, Ghatigaon Sanctuary in Gwalior district and Karera Sanctuary in Shivpuri district are declared as the Wildlife Sanctuaries for the protection of endangered bird species (especially for Great Indian Bustard bird). As human populations spread, people convert forests, grasslands, and wetlands into developed landscapes of residential, commercial, institutional or industrial buildings and associated infrastructure. Native bird species richness typically declines as the density of human development increases [5]. As development density and habitat fragmentation increase, bird community structure shifts from development-sensitive specialists to development-adaptive generalists.

Rapid urban growth directly influences the outlook of the Indian nation, as its cities continue to evolve. This, in part, is due to a complex interplay of complementary and contradictory factors. The presence of birds also shows the biological importance or going technical, the biodiversity significance of an area [6]. Native bird species richness typically declines as the density of human development increases [5,7,8]. As development density and habitat fragmentation increase, bird community structure shifts from development-sensitive specialists to development-adaptive generalists [7]. All bird communities in the urban environments are characterized by high abundances of exotic species, resident granivores and omnivores and few insectivorous, migrant species.

## 2. METHODOLOGY

### 2.1 Study Area

Present studies were done from the year 2016 to 2018. The research work was carried out in the Sheopur city and its surrounding areas of North Madhya Pradesh.

### 2.2 Habitat Characteristics of the Surveyed Locations of Sheopur City

It has a grassland habitat with herbs, shrubs and large trees. Kans (*Saccharum spontaneum*), Bhanjura (*Apluda mutica*), Lapurse (*Aristida hystrix*), Gulmohar (*Delonix regia*), Neem (*Azadirachta indica*), Mango (*Mangifera indica*), Pipal (*Ficus religiosa*), Bahera (*Terminalia bellirica*), etc. are some floral species found in this area. Along with Sheopur city Sheep River (Banjara dam) was the most suitable habitat for different aquatic bird species.

### 2.3 Methods

The study was conducted during all seasons throughout the year (2016 – 2018) covering the winter (migratory) season. The survey was conducted mostly in the morning hours between 6.00 am to 11.00 am and late afternoon from 2.00 pm to 7.00 pm, Data of bird's species with their habitat and population was collected from all the selected sites through regular field surveys on a seasonal basis. A detail of the locality including GPS readings, common name and habitat were recorded in the field datasheet. Immediate photographs were taken with the help of a camera for the identification of species.

### 2.4 Instruments

Different research instruments were used in the present study viz. Binocular (Olympus, 7 × 50), Global Position System (GPS) (Garmin 60), Digital Camera (Nikon, 10x optical zoom and 8 megapixels).

**Table 1. GPS locations of different study sites in Sheopur city**

| S. no. | Study site name                                 | GPS location                 |
|--------|-------------------------------------------------|------------------------------|
| 1.     | Forest research and development sub centre area | 76°44'03.8" E, 25°40'26.8" N |
| 2.     | Fort area                                       | 76°41'47.7"E, 25°39'24.5" N  |
| 3.     | Govt. Nursery Park                              | 76°41'32.67"E, 25°40'57.82"N |
| 4.     | Eidgah park                                     | 76°42'09. 7"E, 25°39'51.7"N  |
| 5.     | Railway station area                            | 76°42'01. 4"E, 25°40'18.1" N |
| 6.     | Banjara dam (Seep River)                        | 76°41'19. 3"E, 25°40'10.6" N |

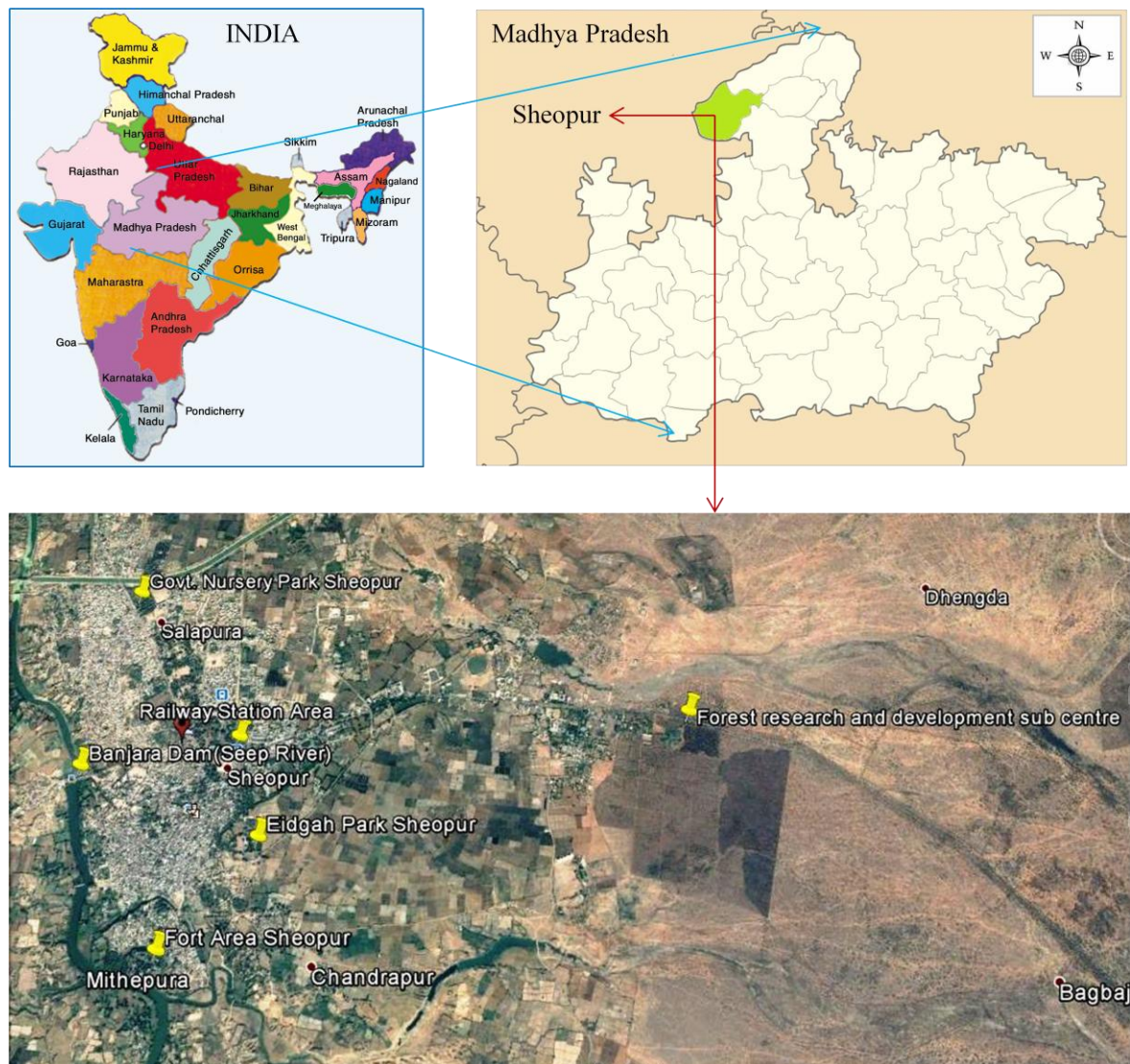


Fig. 1. Selected study sites in Sheopur city

## 2.5 Species Identification

The birds were mainly identified using books by Grimitt et al. (2015). The English, scientific and local names of the birds have been taken from Ali [9], Grewal et al. [10] and Khan [11]. The following three characteristics were applied to identify the bird species.

1. External morphology (Colour, shape, size, beak, leg, and Tail).
2. Song and calls.
3. Habitat of the birds.

## 2.6 Visual Methods

Each study site was surveyed at regular time intervals and every bird sighted was noted down along with various important parameters.

## 2.7 Line Transect Method

Line transect method offers great flexibility in use. It is simple to carry out and requires no special apparatus or tools. In this method, the observer walks on the predetermined transect and records the birds which are seen and heard. The result of these transects can be used to give information about the relative frequency of different species of the birds and the relative frequency of the same species in different habitats.

In this method, the observer made a straight line from 100 meters to 1 km long transect. The width of the sampling area was fixed as 50 m (25 m on either side) along the transect. The line transect was conducted between 06:30 to 09:30 hrs and 15:30 to 18:30 hrs. In addition to these fixed timing of surveys, some

irregular visits were also made during the other hours of the day.

All the birds sighted and heard were recorded while sampling the birds. Birds that were sighted or heard from the backside of the moving observer were also recorded. Each call from a spot is recorded as one individual bird. Repeated calls from the same spot were ignored. The number of the observer was one. No data was collected when climatic factors like rain and mist restricted the visibility considerably. If the birds were flying at 40 m high or if the birds pass above the canopy with any business in the area, they were not recorded. The number of bird species, at first sight, is recorded first and the subsequent sightings were added to it. The height at which a bird was sighted was recorded by visual estimation. The positions of birds were classified into different zones like flowers, twigs, branches, and trunk of the trees. The positions were also recorded using codes. Four general bird activities, viz., feeding, flying, resting and nesting were recorded along the transect.

## 2.8 Point Counts Method

In this method, the observer stands at a fixed point for a specific period of time (10 minutes) and makes a count of all birds, either within a specified circle of

10-15 meters or as far as the visibility permits (open radius). The observer can detect the birds by sight or by sound or by both. Vegetation condition of the point, time of observation, species sighted, number of birds, the height of occurrence and activity were noted.

## 3. RESULTS

In the present study, a total of 90 bird species were recorded belonging to 16 orders, 43 families are shown in Table 2. The family Columbidae was found to be dominant with a 6% contribution followed by families like Muscicapidae, Sturnidae, and Anatidae with a 5% contribution which is further followed by Motacillidae, Scolopacidae, Leiotrichidae and Ardeidae families with less than 5% contribution as shown in Fig. 2.

### 3.1 Urban Avian Diversity in Sheopur City

Sheopur district is the northeast part of Madhya Pradesh state and is an old city area, highly congested and few buildings habituated birds like the blue pigeon. In the present time, highest bird diversity was found in the forest department area located at Shivpuri road.

**Table 2. Showing different bird species found in urban areas of Sheopur City**

| S. no.                       | Common name               | Scientific name                  | Habitat    | Status | IUCN status |
|------------------------------|---------------------------|----------------------------------|------------|--------|-------------|
| <b>Order: Passeriformes</b>  |                           |                                  |            |        |             |
| <b>Family: Muscicapidae</b>  |                           |                                  |            |        |             |
| 1                            | Black Redstart            | <i>Phoenicurus ochruros</i>      | MV, HH     | WV     | LC          |
| 2                            | Common Stonechat          | <i>Saxicola torquatus</i>        | MV, PF     | LM     | LC          |
| 3                            | Indian Robin              | <i>Saxicoloides fulicatus</i>    | UG, MV     | R      | LC          |
| 4                            | Oriental Magpie-robin     | <i>Copsychus saularis</i>        | UG, MV     | R      | LC          |
| 5                            | Tickell's Blue-flycatcher | <i>Cyornis tickelliae</i>        | MV         | R      | LC          |
| <b>Order: Passeriformes</b>  |                           |                                  |            |        |             |
| <b>Family: Sturnidae</b>     |                           |                                  |            |        |             |
| 6                            | Asian Pied Starling       | <i>Gracupica contra</i>          | HH, UG     | R      | LC          |
| 7                            | Bank Myna                 | <i>Acridotheres ginginianus</i>  | HH, UG     | R      |             |
| 8                            | Brahminy Starling         | <i>Sturnia pagodarum</i>         | OH, HH     | R      | LC          |
| 9                            | Common Myna               | <i>Acridotheres tristis</i>      | HH, UG     | R      | LC          |
| 10                           | Jungle Myna               | <i>Acridotheres fuscus</i>       | MV, UG     | LM     | LC          |
| <b>Order: Passeriformes</b>  |                           |                                  |            |        |             |
| <b>Family: Motacillidae</b>  |                           |                                  |            |        |             |
| 11                           | Grey Wagtail              | <i>Motacilla cinerea</i>         | AH         | R      | LC          |
| 12                           | White Wagtail             | <i>Motacilla alba</i>            | AH, OH     | R      | LC          |
| 13                           | Western Yellow Wagtail    | <i>Motacilla flava</i>           | AH         | WV     | LC          |
| 14                           | White-browed Wagtail      | <i>Motacilla maderaspatensis</i> | AH         | WV     | LC          |
| <b>Order: Passeriformes</b>  |                           |                                  |            |        |             |
| <b>Family: Leiotrichidae</b> |                           |                                  |            |        |             |
| 15                           | Common Babbler            | <i>Argya caudata</i>             | HH, UG, MV | R      | LC          |
| 16                           | Yellow-billed Babbler     | <i>Turdoides affinis</i>         | HH, UG     | R      | LC          |

| S. no.                                                      | Common name                | Scientific name                | Habitat    | Status | IUCN status |
|-------------------------------------------------------------|----------------------------|--------------------------------|------------|--------|-------------|
| 17                                                          | Large Grey Babbler         | <i>Argya malcolmi</i>          | UG, MV     | R      | LC          |
| 18                                                          | Jungle Babbler             | <i>Turdoides striata</i>       | HH, MV     | R      | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Hirundinidae</b>  |                            |                                |            |        |             |
| 19                                                          | Barn Swallow               | <i>Hirundo rustica</i>         | AH, MV     | LM     | LC          |
| 20                                                          | Streak-throated Swallow    | <i>Petrochelidon fluvicola</i> | MV         | R      | LC          |
| 21                                                          | Wire-tailed Swallow        | <i>Hirundo smithii</i>         | MV         | R      | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Corvidae</b>      |                            |                                |            |        |             |
| 22                                                          | House Crow                 | <i>Corvus splendens</i>        | HH, AH     | R      | LC          |
| 23                                                          | Rufous Treepie             | <i>Dendrocitta vagabunda</i>   | MV         | R      | LC          |
| 24                                                          | Large-billed Crow          | <i>Corvus macrorhynchos</i>    | MV         | R      | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Cisticolidae</b>  |                            |                                |            |        |             |
| 25                                                          | Ashy Prinia                | <i>Prinia socialis</i>         | UG, PF     | R      | LC          |
| 26                                                          | Common Tailorbird          | <i>Orthotomus sutorius</i>     | UG, PF     | R      | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Alaudidae</b>     |                            |                                |            |        |             |
| 27                                                          | Ashy-crowned Sparrow-lark  | <i>Eremopterix griseus</i>     | PF, OG     | WV     | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Estrildidae</b>   |                            |                                |            |        |             |
| 28                                                          | Scaly-breasted Munia       | <i>Lonchura punctulata</i>     | MV, PF     | LM     | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Monarchidae</b>   |                            |                                |            |        |             |
| 29                                                          | Indian Paradise-flycatcher | <i>Terpsiphone paradisi</i>    | MV         | LM     | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Laniidae</b>      |                            |                                |            |        |             |
| 30                                                          | Bay-backed Shrike          | <i>Lanius vittatus</i>         | PF, MV     | LM     | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Ploceidae</b>     |                            |                                |            |        |             |
| 31                                                          | Baya Weaver                | <i>Ploceus philippinus</i>     | MV         | LM     | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Dicruridae</b>    |                            |                                |            |        |             |
| 32                                                          | Black Drongo               | <i>Dicrurus macrocercus</i>    | MV, AH     | R      | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Oriolidae</b>     |                            |                                |            |        |             |
| 33                                                          | Indian Golden Oriole       | <i>Oriolus kundoo</i>          | MV         | LM     | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Passeridae</b>    |                            |                                |            |        |             |
| 34                                                          | House Sparrow              | <i>Passer domesticus</i>       | PF, MV, UG | R      | LC          |
| 35                                                          | Yellow-throated Sparrow    | <i>Gymnoris xanthocollis</i>   | PF         | R      | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Nectariniidae</b> |                            |                                |            |        |             |
| 36                                                          | Purple Sunbird             | <i>Cinnyris asiaticus</i>      | MV, PF     | R      | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Pycnonotidae</b>  |                            |                                |            |        |             |
| 37                                                          | Red-vented Bulbul          | <i>Pycnonotus cafer</i>        | MV, PF     | R      | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Zosteropidae</b>  |                            |                                |            |        |             |
| 38                                                          | Oriental White-eye         | <i>Zosterops palpebrosus</i>   | MV         | LM     | LC          |
| <b>Order: Passeriformes</b><br><b>Family: Passerellidae</b> |                            |                                |            |        |             |
| 39                                                          | Field Sparrow              | <i>Spizella pusilla</i>        | PF         | R      | LC          |

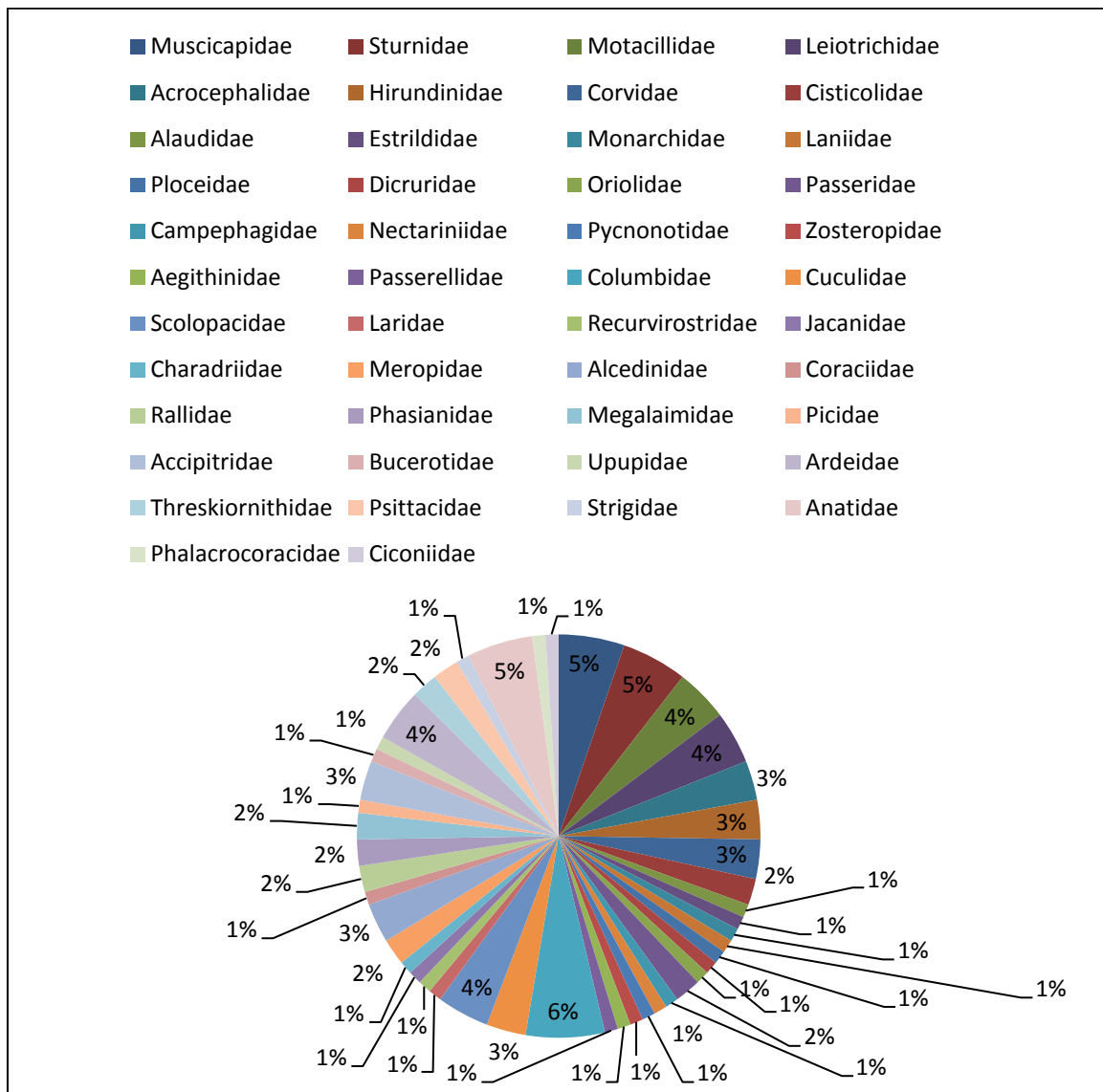
| S. no.                          | Common name                | Scientific name                   | Habitat | Status | IUCN status |
|---------------------------------|----------------------------|-----------------------------------|---------|--------|-------------|
| <b>Order: Columbiformes</b>     |                            |                                   |         |        |             |
| <b>Family: Columbidae</b>       |                            |                                   |         |        |             |
| 40                              | Rock Dove                  | <i>Columba livia</i>              | UG, PF  | R      | LC          |
| 41                              | Eurasian Collared-Dove     | <i>Streptopelia decaocto</i>      | UG, MV  | R      | LC          |
| 42                              | Laughing Dove              | <i>Spilopelia senegalensis</i>    | UG, PF  | R      | LC          |
| 43                              | Red Turtle-Dove            | <i>Streptopelia tranquebarica</i> | UG, PF  | R      | LC          |
| 44                              | Eastern Spotted Dove       | <i>Spilopelia chinensis</i>       | UG, MV  | R      | LC          |
| 45                              | Yellow-footed Green-pigeon | <i>Treron phoenicopterus</i>      | MV      | R      | LC          |
| <b>Order: Cuculiformes</b>      |                            |                                   |         |        |             |
| <b>Family: Cuculidae</b>        |                            |                                   |         |        |             |
| 46                              | Western Koel               | <i>Eudynamys scolopaceus</i>      | MV      | LM     | LC          |
| 47                              | Greater Coucal             | <i>Centropus sinensis</i>         | UG, MV  | R      | LC          |
| 48                              | Indian Cuckoo              | <i>Cuculus micropterus</i>        | MV      | R      | LC          |
| <b>Order: Charadriiformes</b>   |                            |                                   |         |        |             |
| <b>Family: Scolopacidae</b>     |                            |                                   |         |        |             |
| 49                              | Common Greenshank          | <i>Tringa nebularia</i>           | AH      | R      | LC          |
| 50                              | Green Sandpiper            | <i>Tringa ochropus</i>            | AH      | R      | LC          |
| 51                              | Common Redshank            | <i>Tringa totanus</i>             | AH      | R      | LC          |
| 52                              | Terek Sandpiper            | <i>Xenus cinereus</i>             | AH      | M      | LC          |
| <b>Order: Charadriiformes</b>   |                            |                                   |         |        |             |
| <b>Family: Laridae</b>          |                            |                                   |         |        |             |
| 53                              | Indian River Tern          | <i>Sterna aurantia</i>            | AH      | M      | NT          |
| <b>Order: Charadriiformes</b>   |                            |                                   |         |        |             |
| <b>Family: Recurvirostridae</b> |                            |                                   |         |        |             |
| 54                              | Black-winged Stilt         | <i>Himantopus himantopus</i>      | AH      | LM     | LC          |
| <b>Order: Charadriiformes</b>   |                            |                                   |         |        |             |
| <b>Family: Jacanidae</b>        |                            |                                   |         |        |             |
| 55                              | Bronze-winged Jacana       | <i>Metopidius indicus</i>         | AH      | LM     | LC          |
| <b>Order: Charadriiformes</b>   |                            |                                   |         |        |             |
| <b>Family: Charadriidae</b>     |                            |                                   |         |        |             |
| 56                              | Red-wattled Lapwing        | <i>Vanellus indicus</i>           | AH, UG  | R      | LC          |
| <b>Order: Coraciiformes</b>     |                            |                                   |         |        |             |
| <b>Family: Meropidae</b>        |                            |                                   |         |        |             |
| 57                              | Little Bee-eater           | <i>Merops pusillus</i>            | MV      | R      | LC          |
| 58                              | Asian Green Bee-eater      | <i>Merops orientalis</i>          | MV      | R      | LC          |
| <b>Order: Coraciiformes</b>     |                            |                                   |         |        |             |
| <b>Family: Alcedinidae</b>      |                            |                                   |         |        |             |
| 59                              | Pied Kingfisher            | <i>Ceryle rudis</i>               | AH      | R      | LC          |
| 60                              | Common Kingfisher          | <i>Alcedo atthis</i>              | AH, MV  | R      | LC          |
| 61                              | White-breasted Kingfisher  | <i>Halcyon smyrnensis</i>         | AH, MV  | R      | LC          |
| <b>Order: Coraciiformes</b>     |                            |                                   |         |        |             |
| <b>Family: Coraciidae</b>       |                            |                                   |         |        |             |
| 62                              | Indian Roller              | <i>Coracias benghalensis</i>      | AH, MV  | R      | LC          |
| <b>Order: Gruiformes</b>        |                            |                                   |         |        |             |
| <b>Family: Rallidae</b>         |                            |                                   |         |        |             |
| 63                              | Common Moorhen             | <i>Gallinula chloropus</i>        | AH      | R      | LC          |
| 64                              | White-breasted Waterhen    | <i>Amaurornis phoenicurus</i>     | AH      | R      | LC          |
| <b>Order: Galliformes</b>       |                            |                                   |         |        |             |
| <b>Family: Phasianidae</b>      |                            |                                   |         |        |             |
| 65                              | Indian Peafowl             | <i>Pavo cristatus</i>             | MV, UG  | R      | LC          |
| 66                              | Grey Francolin             | <i>Francolinus pondicerianus</i>  | MV      | R      | LC          |

| S. no.                           | Common name            | Scientific name                    | Habitat | Status | IUCN status |
|----------------------------------|------------------------|------------------------------------|---------|--------|-------------|
| <b>Order: Piciformes</b>         |                        |                                    |         |        |             |
| <b>Family: Megalaimidae</b>      |                        |                                    |         |        |             |
| 67                               | Brown-headed Barbet    | <i>Psilopogon zeylanicus</i>       | MV, UG  | R      | LC          |
| 68                               | Coppersmith Barbet     | <i>Psilopogon haemacephalus</i>    | MV, UG  | R      | LC          |
| <b>Order: Piciformes</b>         |                        |                                    |         |        |             |
| <b>Family: Picidae</b>           |                        |                                    |         |        |             |
| 69                               | Black-rumped Flameback | <i>Dinopium benghalense</i>        | MV, UG  | R      | LC          |
| <b>Order: Accipitriformes</b>    |                        |                                    |         |        |             |
| <b>Family: Accipitridae</b>      |                        |                                    |         |        |             |
| 70                               | Egyptian Vulture       | <i>Neophron percnopterus</i>       | RA, AH  | R      | EN          |
| 71                               | Shikra                 | <i>Accipiter badius</i>            | MV, UG  | LM     | LC          |
| 72                               | Black-winged Kite      | <i>Elanus caeruleus</i>            | MV      | LM     | LC          |
| <b>Order: Bucerotiformes</b>     |                        |                                    |         |        |             |
| <b>Family: Bucerotidae</b>       |                        |                                    |         |        |             |
| 73                               | Indian Grey Hornbill   | <i>Ocyrceros birostris</i>         | MV, UG  | R      | LC          |
| <b>Order: Bucerotiformes</b>     |                        |                                    |         |        |             |
| <b>Family: Upupidae</b>          |                        |                                    |         |        |             |
| 74                               | Common Hoopoe          | <i>Upupa epops</i>                 | OH, UG  | LM     | LC          |
| <b>Order: Pelecaniformes</b>     |                        |                                    |         |        |             |
| <b>Family: Ardeidae</b>          |                        |                                    |         |        |             |
| 75                               | Cattle Egret           | <i>Bubulcus ibis</i>               | AH, UG  | R      | LC          |
| 76                               | Little Egret           | <i>Egretta garzetta</i>            | AH, UG  | LM     | LC          |
| 77                               | Indian Pond-heron      | <i>Ardeola grayii</i>              | AH      | LM     | LC          |
| 78                               | Great White Egret      | <i>Ardea alba</i>                  | AH      | R      | LC          |
| <b>Order: Pelecaniformes</b>     |                        |                                    |         |        |             |
| <b>Family: Threskiornithidae</b> |                        |                                    |         |        |             |
| 79                               | Red-naped Ibis         | <i>Pseudibis papillosa</i>         | AH      | M      | LC          |
| 80                               | Black headed Ibis      | <i>Threskiornis melanocephalus</i> | AH      | M      | NT          |
| <b>Order: Psittaciformes</b>     |                        |                                    |         |        |             |
| <b>Family: Psittacidae</b>       |                        |                                    |         |        |             |
| 81                               | Rose-ringed Parakeet   | <i>Psittacula krameri</i>          | MV, UG  | R      | LC          |
| 82                               | Plum-headed Parakeet   | <i>Psittacula cyanocephala</i>     | MV, UG  | LM     | LC          |
| <b>Order: Strigiformes</b>       |                        |                                    |         |        |             |
| <b>Family: Strigidae</b>         |                        |                                    |         |        |             |
| 83                               | Spotted Owlet          | <i>Athene brama</i>                | MV      | R      | LC          |
| <b>Order: Anseriformes</b>       |                        |                                    |         |        |             |
| <b>Family: Anatidae</b>          |                        |                                    |         |        |             |
| 84                               | Lesser Whistling-duck  | <i>Dendrocygna javanica</i>        | AH      | R      | LC          |
| 85                               | Cotton Pygmy-goose     | <i>Nettapus coromandelianus</i>    | AH      | R      | LC          |
| 86                               | Garganey               | <i>Spatula querquedula</i>         | AH      | M      | LC          |
| 87                               | African Comb Duck      | <i>Sarkidiornis melanotos</i>      | AH      | M      | LC          |
| 88                               | Ruddy Shelduck         | <i>Tadorna ferruginea</i>          | AH      | R      | LC          |
| <b>Order: Suliformes</b>         |                        |                                    |         |        |             |
| <b>Family: Phalacrocoracidae</b> |                        |                                    |         |        |             |
| 89                               | Little Cormorant       | <i>Microcarbo niger</i>            | AH      | LM     | LC          |
| <b>Order: Ciconiiformes</b>      |                        |                                    |         |        |             |
| <b>Family: Ciconiidae</b>        |                        |                                    |         |        |             |
| 90                               | Asian Openbill         | <i>Anastomus oscitans</i>          | AH      | M      | LC          |

Habitat: AH - Aquatic Habitat, MV - Mixed vegetation, UG - Urban garden, OH - Open habitat, PF - Paddy field, HH - Human habitations

Residential Status: R - Resident, LM - Local migratory, SM - Semi migratory, M - Migratory, WV - Winter visitor

IUCN Status: LC - Least concern, NT - Near Threatened, VU - Vulnerable, EN - Endangered



**Fig. 2. Family wise distribution of birds in Sheopur city**

#### 4. DISCUSSION

Birds occupy almost all habitat types and diversity of birds often serves as a good indication of the overall diversity of a given area [12]. Birds are also known to be responsive to any kind of changes to their ambient conditions hence can be used as bioindicator [13,14].

The present study which recorded 90 bird species belonging to 16 Order and 43 Families reflects a moderately healthy overall biodiversity for the present study locations of the Sheopur city area.

Mentioned that the study locations under present investigation are facing anthropogenic disturbances in the forms of urbanization, tourist pressure, livelihood

dependence (mainly in the form of cattle grazing and fuelwood collection) and pollution [15,16,17]. Similarly, urbanization and other problems may see this study area.

It must be noted that the present study was done on a field survey basis. Thus the possibilities of recording the most common species were much higher which automatically evoked the chance of missing rare bird species. The bird diversity; activity and abundance were more in site VI Banjara dam (Seep River) with 68 species, which declined in the site I Forest research and development sub-center area with 56 species, site II Fort area with 52 species, site III Govt. Nursery Park with 48 species, site IV Eidgah park with 45 species and site V Railway station area with 34 bird species. The impact of anthropogenic alteration of the

habitats in and around the all study locations of Sheopur city also increased in recent time.

## 5. CONCLUSION

In the Sheopur city, most people are well aware of bird diversity. Indian Peafowl is highly protected there due to the religious belief of people. Through the Sheopur city, there passes a river called the Seep River on which a dam is constructed. This dam acts as a feeding and breeding ground for aquatic as well as some terrestrial birds. There is a need for proper management of green parks and insert the artificial wooden nest in green areas for the birds.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

- Collins JP, Kinzig A, Grimm NB, Fagan WF, Hope D, Wu JG, Borer ET. A new urban ecology. *Am. Sci.* 2002;88:416-425.
- Marzluff JM. Worldwide urbanization and its effects on birds. In Marzluff JM, et al. (ed.) *Avian ecology and conservation in an urbanizing world*. Kluwer Academic Publ., Boston, MA. 2001;19-38.
- Chace JF, Walsh JJ. Urban effects on native avifauna: A review. *Landscape Urban Plan.* 2006;74:46-69.
- Kumar A, Walker S, Molur S. Prioritisation of endangered species. *Setting Biodiversity Conservation Priorities for India*. New Delhi, WWF-India. 2000;2:341-425.
- Savard JPL, Clergeau P, Mennechez G. Biodiversity concepts and urban ecosystems. *Landsc. Urban Plann.* 2000;48:131-142.
- Harney NV, Bhute KB. Diversity of avifauna in and around Chalbardi (Rai) lake near Bhadrawati, district Chandrapur (M.S.), India. *Journal of Global Biosciences.* 2014;3(2):399-405.
- Nilon CH, Long CN, Zipperer WC. Effects of wildland development on forest bird communities. *Landsc. Urban Plann.* 1994;32:81-92.
- Friesen LE, Eagles PFJ, Mackay RJ. Effects of residential development on forest-dwelling neotropical migrant songbirds. *Conserv. Biol.* 1995;9:1408-1414.
- Ali S. *The book of Indian birds*. Bombay Natural History Society, Oxford University Press. 2002;326.
- Grewal B, Harvey V, Pfister O. *A photographic guide of the Birds of India*. Periplus Edition (H K) Ltd. Singapore; 2002.
- Khan JA, Khan DN, Ahmed A. Preliminary investigations of bird community structure at Aligarh, India. *Tropical Ecology.* 2008;34:217-225.
- Furness RW, Greenwood JJD. *Birds as a monitor of environmental change*. Chapman and Hall, London; 1993.
- Schwartz CW, Schwartz ER. An ecological reconnaissance of the pheasants of Hawaii. *Auk.* 1951;68: 281–314.
- Padoa-Schioppa E, Baietto M, Massa R, Bottoni L. Bird communities as bioindicators: The focal species concept in agricultural landscapes. *Ecological Indicators.* 2006;6(1): 83–93.
- Islam MZ, Rahmani AR. Important bird area in India: Priority sites for conservation. *IBCN, Bombay Natural History Society, BirdLife International, UK.* 2004;28:1133.
- Mallick JK. Past and present status of the Indian Tiger in northern West Bengal, India: An overview. *Journal of Threatened Taxa.* 2010; 2(3):739–952.
- Karmakar M. Ecotourism and its impact on the regional economy – A study of North Bengal (India). *Tourismos: An International Multidisciplinary Journal of Tourism.* 2011; 6(1):251–270.