Conservation status, feeding guilds, and diversity of birds in Daroji Sloth Bear Sanctuary, Karnataka, India

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M.N. Harisha 1, K.S. Abdul Samad 2 & B.B. Hosetti 3

1 2 Department of Post Graduate Studies and Research in Wildlife and Management, Kuvempu University, Jnana Sahyadri, Shankaraghatta, Shivamogga, Karnataka 577451, India.
1 harishwild@gmail.com (corresponding author), 2 samadkottur@gmail.com, 3 hosetti57@gmail.com

Abstract: The present study was carried out to investigate the importance of habitat quality for the diversity, distribution, and abundance of avifauna in Daroji Sloth Bear Sanctuary, Ballari District from February 2015 to January 2016. A total number of 189 species of birds, belonging to 62 families and 18 orders were recorded during the survey. A family-wise analysis showed that the families Accipitridae (12 species), followed by Muscicapidae (11 species), Ardeidae & Alaudidae (8 species each), and Cuculidae (7 species) dominated the avifauna of the region. The residential status of birds revealed that 74% (140 species) were resident, 23% (44 species) were winter, 2% (3 species) were summer and 1% (2 species) was passage migrant’s species. The study resulted in the recording of fives globally Near Threatened category, viz, Painted Stork, Black-headed Ibis, Oriental Darter, River Tern, and Pallid Harrier; and two Vulnerable species, viz, Yellow-throated Bulbul and Woolly-necked Stork. The feeding guild analysis revealed that the insectivorous guild has the most number of recorded avian species (33%, 63 species), followed by carnivorous (31%, 58 species) and least by nectarivorous (1%, 2 species). This study provides baseline data for monitoring the avifauna in the sanctuary and demonstrates the importance of the area in bird conservation. The study also highlights the negative impact of anthropogenic activities as the main cause for the loss of diversity of both birds and their habitat and the urgent need to conserve this biodiversity-rich area with long-term monitoring programs.

Keywords: Avifaunal diversity, Ballari District, feeding guild, relative abundance, southern Deccan Plateau, threatened fauna, Yellow-throated Bulbul.

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Author details: HARISHA. M.N, is serving as a guest faculty in the Department of Wildlife and Management, Kuvempu University, Shivamogga, Karnataka. He participated in curriculum development and various other community services. He advised more than 24 postgraduate students and published 22 articles in reputable journals. His areas of research interest include animal ecology, conservation biology, entomology and ornithology. K.S.A. SAMAD KOTTUR, currently working as a lecturer at the department of Pre-University Education, Kottur. He is a bird conservationist, freelance writer, wildlife activist and honorary president of North Karnataka Birders’ Network (NKBNN) and Society for Wildlife and Nature (SWaN), Hospet. He has authored ‘Birds of Hampi’ and ‘Daroji-an ecological destination’ and published more than 6 articles in reputed journals. B.B. HOSETTI is a retired professor in the department of Applied Zoology and Wildlife management, Kuvempu University. He conducted many researches in various fields, especially in wetland ecology, environmental pollution, biodiversity and entomology. He advised more than 22 PhD students and published more than 120 articles in reputed journals, and edited more than 12 books on biodiversity and wildlife conservation etc.

Author contributions: MNH involved in the design of the research, data collection, analysis and write up of the manuscript. ABS participated in survey, data collection and identification as well as write up of the manuscript. BBH contributed in supervision of data collection and manuscript preparation.

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INTRODUCTION

Birds are good indicators of the ecological status of any ecosystem (Bilgrami 1995). Ecologically; birds are of tremendous importance because of their key roles as pollinators and agents of seed dispersal (Nason 1992; Bibi & Ali 2013). Changes in their population, behavior patterns, and reproductive ability have been used mostly to examine the long-term effects of habitat fragmentation (Harisha & Hosetti 2009). Given the significance of birds for conservation planning and environmental assessments, there is a need for a better ecological understanding of the role of bird diversity patterns and community structure in conservation decision-making (Kati & Sekercioglu 2006).

Forests attract a significant number of birds because they provide suitable habitats for most birds, especially those birds associated with vegetation, and for most, the existence of trees is a vital component of their life cycle. The birds’ level of interest in various forests depends on the age of the stand. The composition of bird species is highly related to the vegetation structure of forests (Robertson & Hackwell 1995). The habitat type and structural complexity influence species diversity and the inter-relationship between vegetation and avian population (MacArthur & MacArthur 1961).

Approximately, 9,990 bird species are recorded on our planet and the Indian subcontinent is home to 1,263 bird species (Praveen et al. 2016a), constituting about 12% of the world avifauna. Of these, approximately 531 species of birds have been reported from Karnataka. Due to geographical variation, the Deccan Plateau region of India possesses great diversity in agricultural as well as wild floral and faunal diversity. Therefore, understanding the diversity and structure of bird communities is essential to delineate the importance of regional or local landscapes for avian conservation (Kattan & Franco 2004).

Very few avifaunal works have been done in Daroji Sloth Bear Sanctuary (DSBS). Previously, Neginhal et al. (2003) reported 90 species of birds. Later, Harisha (2013) recorded 135 bird species belonging to 43 families under 16 orders from 2009 to 2012. Except for these earlier reports, no detailed long-term studies have been made on the biodiversity of birds in the study area. In this context, the present study was undertaken to highlight the status, composition, feeding guilds, and diversity of birds of DSBS, Ballari District, Karnataka.

MATERIALS AND METHODS

Study Area

Daroji Sloth Bear Sanctuary is located between Hospet and Sandur Taluk of Ballari District of Karnataka and is spread over 82.72 km² (Figure 1). It is about 50 km from Ballari and about 15 km from the World Heritage Site Hampi. In October 1994, the Government of Karnataka declared 5587.30 ha of the Bilikallu Forest Reserve as Daroji Sloth Bear Sanctuary. After 15 years, in October 2009, the government added 2685.50 ha of the Bukkasagara Forest Reserve to the sanctuary. This resulted in the overall area increasing from 5587.3 ha to 8272.8 ha. It lies between 15.269°N and 76.571°E with an average elevation of 521 m, temperature of 20–46°C & annual rainfall of 450–500 mm. It is a strewed hilllock that stretches between Daroji of Sandur Taluk and Ramasagar of Hospet taluk in Ballari District (Image 1, 2). The sanctuary has rich floral and faunal diversity. The flora of this sanctuary is primarily dry deciduous scrub and southern thorn forests. The typical species of scrub jungle, Grewia damine is found to be the most abundant species of the plant followed by Senegalia catechu and Albizia amara in the habitat. It has a very stable population of Sloth Bears and they reside in the numerous caves found in the hillocks within the sanctuary. Leopards, monitor lizards, mongoose, pangolins, and Star Tortoises are some of the other animals that abound in the sanctuary.

Sampling method

A study on avifaunal diversity was carried out from February 2015 to January 2016. The line transect method was used, as the habitat of the study area was of open type (Sutherland et al. 2005). Six line transects were set up, which were approximately 500m in length and 20–30 meters in width. The transect line was walked at a constant pace for approximately 30 minutes. Twelve field visits (1 visit per month) were conducted observing the status and diversity of birds. The field surveys were conducted in the morning (0600–1000 h) and the evening (1600–1900 h), depending on the season when birds were most active. Birds were observed using the Olympus binoculars (10x50), and were identified with the help of field guides (Ali & Ripley 1983; Grimmett et al. 2011) and were given standardized common and scientific names (Praveen et al. 2016b). The residential status of the birds was worked out and birds are grouped under different categories like resident, summer, passage, and winter migrants or visitors depending on their timing and duration of occurrence (Grimmett et
The International Union for the Conservation of Nature (IUCN) Red List status was additionally used to compare the local status with the global status. During the surveys, other information or threats to bird conservation were noted. The data recorded in each survey were kept separate, and later analyzed for relative abundance based on the frequency of bird sightings and are categorized, as very common (Vc) sighted >10 times; common (Co) sighted 7–9 times; uncommon (Uc) sighted 3–6 times; rare (Ra) sighted 1–2 times (MacKinnon & Phillipps 1993). Feeding guilds were classified based on direct observations and available literature (Ali & Ripley 1987). The relative diversity (RDI) of families was calculated adopting the following formula (Torre-Cuadros et al. 2007):

\[ \text{RDI} = \frac{\text{Number of bird species in a family}}{\text{Total number of species}} \times 100 \]
RESULTS AND DISCUSSION

Avian diversity
A total of 189 species of birds belonging to 62 families under 18 orders were recorded from DSBS. Nonpasserine birds dominated the diversity with 98 species (52%) compared to passerine birds (91 species, 48%) (Table 1). The present investigation revealed that out of 62 families, Accipitridae dominated the study area with maximum number of species and RDI value, i.e., 12 species (RDI= 6.45%), followed by Muscicapidae with 11 species (RDI= 5.91%), Ardeidae and Alaudidae with 8 species (RDI= 4.30%) each, Cuculidae with seven species (RDI= 3.76%), Phasianidae, Scolopacidae, Cisticolidae with six species (RDI= 3.23%) each, Anatidae, Columbidae, Motacillidae, Hirundinidae, Sturnidae, Rallidae with five species (RDI= 2.69%) each, Laniidae, Estrildidae, Pycnonotidae, Leiothrichidae with four species (RDI= 2.15%) each, Ciconiidae, Phalacrocoracidae, Charadriidae, Strigidae, Pycidae, Alcedinidae, Corvidae, Emberizidae, Acrocephalidae, Phylloscopidae with three species (RDI= 1.61%) each, Pteroclididae, Apodidae, Threskiornithidae, Jacanidae, Meropidae, Falconidae, Psittaculidae, Campephagidae, Dicruridae, Dicaeidae, Nectariniidae, Ploceidae, Passeridae, Sylviidae with two species (RDI= 1.08%) each, Podicipitidae, Caprimulgidae, Anhingidae, Burhinidae, Recurvirostridae, Turnicidae, Laridae, Tytonidae, Bucerotidae, Upupidae, Ramphastidae, Coraciidae, Pittidae, Oriolidae, Vangidae, Aegithinidae, Monarchidae, Paridae, Zosteropidae, Timaliidae with one species (RDI= 0.54) each respectively (Table 2). A similar pattern of dominance of Accipitridae was observed by different authors from different protected areas in India, i.e., from Araku Valley of Ananthagiri Hills of the Eastern Ghats in Visakhapatnam, Andhra Pradesh (Kumar et al. 2010), a scrub forest of Sri Lankamallewa Wildlife Sanctuary, Andhra Pradesh (Mali et al. 2017), Tamhini Wildlife Sanctuary, the northern Western Ghats, Maharashtra (Vinayak & Mali 2018), and Bhimbandh Wildlife Sanctuary, Bihar (Khan & Pant 2017).

Avian community structure as per residential status and relative abundance
The analysis of data on the residential status revealed that out of 189 species, 140 (74%) were resident, 44 (23%) winter, 3 (2%) summer, and 2 (1%) passage migrants respectively (Figure 2). The occurrence of a significant number of winter migrant species can be attributed partly to the study area being on the Central Asian Flyway and serving as a wintering and stopover site for migratory birds that breed in the Palearctic region (Kumar et al. 2016). The spatio-temporal distribution and relative abundance of avifauna in any given habitat are determined based on the quality and quantity of food available as the major factor (Wiens 1989; Ma et
Table 1. Systematic list and status of Birds in Daroji Sloth Bear Sanctuary, Karnataka.

| Common name                      | Scientific name                        | Feeding guilds | Residential status | Relative abundance | IUCN    | WPA    |
|----------------------------------|----------------------------------------|----------------|---------------------|--------------------|---------|--------|
| **Order: Anseriformes**          |                                        |                |                     |                    |         |        |
| **Family: Anatidae**             |                                        |                |                     |                    |         |        |
| 1 Lesser Whistling Duck          | Dendrocygna javanica Horsfield, 1821   | O              | R                   | Co                 | LC Sch. IV |        |
| 2 Garganey                       | Spatula querquedula Linnaeus, 1758     | H              | Wm                  | Ra                 | LC Sch. IV |        |
| 3 Northern Shoveler              | Spatula clypeata Linnaeus, 1758        | C              | Wm                  | Ra                 | LC Sch. IV |        |
| 4 Indian Spot-billed Duck        | Anas poecilorhyncha J.R. Forster, 1781 | H              | R                   | Co                 | LC Sch. IV |        |
| 5 Northern Pintail               | Anas acuta Linnaeus, 1758              | C              | Wm                  | Ra                 | LC Sch. IV |        |
| **Order: Galliformes**           |                                        |                |                     |                    |         |        |
| **Family: Phasianidae**          |                                        |                |                     |                    |         |        |
| 6 Rain Quail                     | Coturnix coromandelica J.F. Gmelin, 1789 | G              | R                   | Co                 | LC Sch. IV |        |
| 7 Jungle Bush Quail              | Perdicula asiatica Latham, 1790        | G              | R                   | Vc                 | LC Sch. IV |        |
| 8 Rock Bush Quail                | Perdicula argoondah Sykes, 1832        | G              | R                   | Vc                 | LC Sch. IV |        |
| 9 Grey Francolin                 | Francolinus pondicerianus J.F. Gmelin, 1789 | G              | R                   | Vc                 | LC Sch. IV |        |
| 10 Painted Spurfowl              | Gallopexid lunulata Valenciennes, 1825 | O              | R                   | Vc                 | LC Sch. IV |        |
| 11 Indian Peafowl                | Pavo cristatus Linnaeus, 1758          | O              | R                   | Vc                 | LC Sch. I  |        |
| **Order: Phoenicopteriformes**   |                                        |                |                     |                    |         |        |
| **Family: Podicipitidae**        |                                        |                |                     |                    |         |        |
| 12 Little Grebe                  | Tachybaptus rufigollis Pallas, 1764     | C              | R                   | Co                 | LC Sch. IV |        |
| **Order: Columbiformes**         |                                        |                |                     |                    |         |        |
| **Family: Columbidae**           |                                        |                |                     |                    |         |        |
| 13 Rock Pigeon                   | Columba livia J.F. Gmelin, 1789         | G              | R                   | Vc                 | LC Sch. IV |        |
| 14 Spotted Dove                  | Streptopelia chinensis Scopoli, 1786   | G              | R                   | Vc                 | LC Sch. IV |        |
| 15 Eurasian Collared Dove        | Streptopelia decaocto Frivaldszky, 1838 | G              | R                   | Vc                 | LC Sch. IV |        |
| 16 Laughing Dove                 | Streptopelia senegalensis Linnaeus, 1766 | G              | R                   | Vc                 | LC Sch. IV |        |
| 17 Red Collared Dove             | Streptopelia tranquilarica Hermann, 1804 | G              | R                   | Co                 | LC Sch. IV |        |
| **Order: Pterocliformes**        |                                        |                |                     |                    |         |        |
| **Family: Pteroclidae**          |                                        |                |                     |                    |         |        |
| 18 Chestnut-bellied Sandgrouse    | Pterocles exustus Temminck, 1825        | G              | R                   | Co                 | LC Sch. IV |        |
| 19 Painted Sandgrouse            | Pterocles indicus J.F. Gmelin, 1789     | G              | R                   | Co                 | LC Sch. IV |        |
| **Order: Caprimulgiformes**      |                                        |                |                     |                    |         |        |
| **Family: Caprimulgidae**        |                                        |                |                     |                    |         |        |
| 20 Indian Nightjar               | Caprimulgus asiaticus Latham, 1790      | I              | R                   | UC                 | LC Sch. IV |        |
| **Family: Apodidae**             |                                        |                |                     |                    |         |        |
| 21 Indian House Swift            | Apus affinis J.E. Gray, 1830            | I              | R                   | Vc                 | LC Sch. IV |        |
| 22 Asian Palm Swift              | Cypsiurus balasiensis J.E. Gray, 1829   | I              | R                   | Co                 | LC Sch. IV |        |
| **Order: Cuculiformes**          |                                        |                |                     |                    |         |        |
| **Family: Cuculidae**            |                                        |                |                     |                    |         |        |
| 23 Asian Koel                    | Eudynamys scolopaceus Linnaeus, 1758    | F              | R                   | Co                 | LC Sch. IV |        |
| 24 Greater Coucal                | Centropus sinensis Stephens, 1815       | O              | R                   | Co                 | LC Sch. IV |        |
| 25 Blue-faced Malkoha            | Phoenicophaeus viridirostris Jerdon, 1840 | O              | R                   | Co                 | LC Sch. IV |        |
| 26 Common Hawk Cuckoo            | Hierooxix varius Vahl, 1797             | I              | R                   | Co                 | LC Sch. IV |        |
| 27 Sirkeer Malkoha               | Taccocua lechenuafita Lesson, 1830     | I              | R                   | UC                 | LC Sch. IV |        |
| 28 Crested Pied Cuckoo           | Clamator jacobinus Boddaert, 1783       | I              | Sm                  | UC                 | LC Sch. IV |        |
| 29 Grey-bellied Cuckoo           | Cacomantis passerinus Vahl, 1797        | I              | R                   | UC                 | LC Sch. IV |        |
| Common name | Scientific name | Feeding guilds | Residential status | Relative abundance | IUCN | WPA |
|-------------|-----------------|----------------|-------------------|-------------------|------|-----|
| **Order: Gruiformes** | | | | | | |
| | **Family: Rallidae** | | | | | |
| 30 | Common Coot | Fulica atra Linnaeus, 1758 | O | R | Co | LC | Sch. IV |
| 31 | White-breasted Waterhen | Amaurornis phoenicurus Pennant, 1769 | O | R | Co | LC | Sch. IV |
| 32 | Slaty-breasted Rail | Lewinia striata Linnaeus, 1766 | O | R | Uc | LC | Sch. IV |
| 33 | Brown Crane | Zapornia australis Sykes, 1832 | O | R | Co | LC | Sch. IV |
| 34 | Purple Swamphen | Porphyrio porphyrio Linnaeus, 1758 | O | R | Co | LC | Sch. IV |
| **Order: Pelecaniformes** | | | | | | |
| | **Family: Ciconiidae** | | | | | |
| 35 | Painted Stork | Mycteria leucocephala Pennant, 1769 | C | R | Ra | NT | Sch. IV |
| 36 | Woolly-necked Stork | Ciconia episcopus Boddaert, 1783 | C | R | Co | VU | Sch. IV |
| 37 | Asian Openbill | Anastomus oscitans | C | R | Co | LC | Sch. IV |
| **Family: Ardeidae** | | | | | | |
| 38 | Little Egret | Egretta garzetta Linnaeus, 1766 | C | R | Vc | LC | Sch. IV |
| 39 | Intermediate Egret | Ardea intermedia Wagler, 1829 | C | R | Co | LC | Sch. IV |
| 40 | Cattle Egret | Bubulcus ibis Linnaeus, 1758 | C | R | Vc | LC | Sch. IV |
| 41 | Great Egret | Ardea alba Linnaeus, 1758 | C | R | Co | LC | Sch. IV |
| 42 | Indian Pond Heron | Ardeola grayii Sykes, 1832 | C | R | Vc | LC | Sch. IV |
| 43 | Striated Heron | Butorides striata Linnaeus, 1758 | C | R | Co | LC | Sch. IV |
| 44 | Grey Heron | Ardea cinerea Linnaeus, 1758 | C | Pm | Co | LC | Sch. IV |
| 45 | Purple Heron | Ardea purpurea Linnaeus, 1766 | C | R | Co | LC | Sch. IV |
| **Family: Threskiornithidae** | | | | | | |
| 46 | Black-headed Ibis | Threskiornis melanocephalus Latham, 1790 | C | R | Co | NT | Sch. IV |
| 47 | Indian Black Ibis | Pseudibis papillosa Temminck, 1824 | C | R | Co | LC | Sch. IV |
| **Family: Phalacrocoracidae** | | | | | | |
| 48 | Little Cormorant | Microcarbo niger Vieillot, 1817 | C | R | Co | LC | Sch. IV |
| 49 | Indian Cormorant | Phalacrocorax fuscicollis Stephens, 1826 | C | R | Co | LC | Sch. IV |
| 50 | Great Cormorant | Phalacrocorax carbo Linnaeus, 1758 | C | R | Co | LC | Sch. IV |
| **Family: Anhingidae** | | | | | | |
| 51 | Oriental Darter | Anhinga melanogaster Pennant, 1769 | C | R | Co | NT | Sch. IV |
| **Order: Charadriiformes** | | | | | | |
| | **Family: Burhinidae** | | | | | |
| 52 | Indian Thick-knee | Burhinus oedicnemus Linnaeus, 1758 | C | R | Uc | LC | Sch. IV |
| **Family: Charadriidae** | | | | | | |
| 53 | Yellow-wattled Lapwing | Vanellus malabaricus Boddaert, 1783 | C | R | Uc | LC | Sch. IV |
| 54 | Red-wattled Lapwing | Vanellus indicus Boddaert, 1783 | C | R | Co | LC | Sch. IV |
| 55 | Little Ringed Plover | Charadrius dubius Scopoli, 1786 | C | Wm | Uc | LC | Sch. IV |
| **Family: Recurvirostridae** | | | | | | |
| 56 | Black-winged Stilt | Himantopus himantopus Linnaeus, 1758 | C | Wm | Uc | LC | Sch. IV |
| **Family: Jancidae** | | | | | | |
| 57 | Bronze-winged Jacana | Metopidius indicus Latham, 1790 | C | R | Co | LC | Sch. IV |
| 58 | Pheasant-tailed Jacana | Hydrophasianus chirurgus Scopoli, 1786 | C | R | Co | LC | Sch. IV |
| **Family: Scolopacidae** | | | | | | |
| 59 | Little Stint | Calidris minuta Leisler, 1812 | C | Wm | Uc | LC | Sch. IV |
| 60 | Wood Sandpiper | Tringa glareola Linnaeus, 1758 | C | Wm | Uc | LC | Sch. IV |
| 61 | Common Snipe | Gallinago gallinago Linnaeus, 1758 | C | Wm | Uc | LC | Sch. IV |
| Common name               | Scientific name                      | Feeding guilds | Residential status | Relative abundance | IUCN   | WPA    |
|---------------------------|--------------------------------------|----------------|--------------------|--------------------|--------|--------|
| 62 Common Sandpiper       | Actitis hypoleucos Linnaeus, 1758     | C              | Wm                 | Uc                 | LC     | Sch. IV |
| 63 Marsh Sandpiper        | Tringa stagnatilis Bechstein, 1803    | C              | Wm                 | Uc                 | LC     | Sch. IV |
| 64 Green Sandpiper        | Tringa ochropus Linnaeus, 1758        | C              | Wm                 | Uc                 | LC     | Sch. IV |
| Family: Turnicidae        |                                      |                |                    |                    |        |        |
| 65 Barred Buttonquail     | Turnix suscitator J.F. Gmelin, 1789   | C              | R                  | Co                 | LC     | Sch. IV |
| Family: Laridae           |                                      |                |                    |                    |        |        |
| 66 River Tern             | Sterna aurantia J.E. Gray, 1831       | C              | R                  | Co                 | NT     | Sch. IV |
| Order: Accipitriformes    |                                      |                |                    |                    |        |        |
| Family: Accipitridae      |                                      |                |                    |                    |        |        |
| 67 Oriental Honey Buzzard | Pernis ptilorhynchus Temminck, 1821   | C              | R                  | Uc                 | LC     | Sch. I  |
| 68 Black-winged Kite      | Elanus caeruleus Desfontaines, 1789   | C              | R                  | Co                 | LC     | Sch. I  |
| 69 Short-toed Snake Eagle | Circus gallicus J.F. Gmelin, 1788     | C              | R                  | Uc                 | LC     | Sch. I  |
| 70 Shikra                 | Accipiter badius J.F. Gmelin, 1788    | C              | R                  | Co                 | LC     | Sch. I  |
| 71 Black Eagle            | Ictinaeus malaiensis Temminck, 1822   | C              | R                  | Uc                 | LC     | Sch. I  |
| 72 Booted Eagle           | Hieraaetus pennatus J.F. Gmelin, 1788 | C              | Wm                 | Uc                 | LC     | Sch. I  |
| 73 Bonelli’s Eagle        | Aquila fasciata vieillot, 1822        | C              | R                  | Co                 | LC     | Sch. I  |
| 74 Pallid Harrier         | Circus macrourus S.G. Gmelin, 1770   | C              | Wm                 | Ra                 | NT     | Sch. I  |
| 75 Western Marsh Harrier  | Circus aeruginosus Linnaeus, 1758     | C              | Wm                 | Uc                 | LC     | Sch. I  |
| 76 Montagu’s Harrier      | Circus pygargus Linnaeus, 1758        | C              | Wm                 | Ra                 | LC     | Sch. I  |
| 77 Black Kite             | Milvus migrans Boddart, 1783          | C              | R                  | Co                 | LC     | Sch. I  |
| 78 Brahminy Kite          | Holistaster Indus Boddart, 1783       | C              | R                  | Co                 | LC     | Sch. I  |
| Order: Strigiformes       |                                      |                |                    |                    |        |        |
| Family: Tytonidae         |                                      |                |                    |                    |        |        |
| 79 Barn Owl               | Tyto alba Scopoli, 1769              | C              | R                  | Co                 | LC     | Sch. I  |
| Family: Strigidae         |                                      |                |                    |                    |        |        |
| 80 Indian Eagle Owl       | Bubo bengalensis Franklin, 1831       | C              | R                  | Co                 | LC     | Sch. IV |
| 81 Brown Fish Owl         | Ketupa zeylonensis J.F. Gmelin, 1788  | C              | R                  | Co                 | LC     | Sch. IV |
| 82 Spotted Owllet         | Athene brama Temminck, 1821          | C              | R                  | Co                 | LC     | Sch. IV |
| Order: Bucerotiformes     |                                      |                |                    |                    |        |        |
| Family: Bucerotidae       |                                      |                |                    |                    |        |        |
| 83 Indian Grey Hornbill   | Ocyceros bicornis Scopoli, 1786       | F              | R                  | Uc                 | LC     | Sch. I  |
| Family: Upupidae          |                                      |                |                    |                    |        |        |
| 84 Common Hoopoe          | Upupa epops Linnaeus, 1758            | I              | R                  | Co                 | LC     | Sch. IV |
| Order: Piciformes         |                                      |                |                    |                    |        |        |
| Family: Picidae           |                                      |                |                    |                    |        |        |
| 85 Eurasian Wryneck       | Jynx torquilla Linnaeus, 1758         | I              | Wm                 | Ra                 | LC     | Sch. IV |
| 86 Yellow-crowned Woodpecker| Dendrocopos maharattensis Latham, 1801| I              | R                  | Co                 | LC     | Sch. IV |
| 87 Lesser Golden-blacked Woodpecker| Dinopium benghalense Linnaeus, 1758| I | R | Co | LC | Sch. IV |
| Family: Ramphastidae      |                                      |                |                    |                    |        |        |
| 88 Coppersmith Barbet     | Psilopagon haemacephalus Muller, 1776| F              | R                  | Co                 | LC     | Sch. IV |
| Order: Coraciiformes      |                                      |                |                    |                    |        |        |
| Family: Meropidae         |                                      |                |                    |                    |        |        |
| 89 Green Bee-eater        | Merops orientalis Latham, 1801        | I              | R                  | Vc                 | LC     | Sch. IV |
| 90 Blue-tailed Bee-eater  | Merops philippinus Linnaeus, 1767     | I              | Wm                 | Uc                 | LC     | Sch. IV |
| Family: Coraciidae        |                                      |                |                    |                    |        |        |
| 91 Indian Roller          | Caracaras benghalensis Linnaeus, 1758| C              | R                  | Co                 | LC     | Sch. IV |
| Common name | Scientific name | Feeding guilds | Residential status | Relative abundance | IUCN | WPA |
|-------------|-----------------|----------------|-------------------|-------------------|------|-----|
| **Family: Alcedinidae** | | | | | | |
| 92 | Common Kingfisher | *Alcedo atthis* Linnaeus, 1758 | C | R | Co | LC | Sch. IV |
| 93 | White-throated Kingfisher | *Halcyon smyrnensis* Linnaeus, 1758 | C | R | Co | LC | Sch. IV |
| 94 | Pied Kingfisher | *Ceryle rudis* Linnaeus, 1758 | C | R | Co | LC | Sch. IV |
| **Order: Falconiformes** | | | | | | |
| 95 | Common Kestrel | *Falco tinnunculus* Linnaeus, 1758 | C | Wm | Uc | LC | Sch. IV |
| 96 | Peregrine Falcon | *Falco peregrinus* Tunstall, 1771 | C | Wm | Uc | LC | Sch. I |
| **Family: Falconidae** | | | | | | |
| 97 | Rose-ringed Parakeet | *Psittacula krameri* Scopoli, 1769 | F | R | Vc | LC | Sch. IV |
| 98 | Plum-headed Parakeet | *Psittacula cyanocephala* Linnaeus, 1766 | F | R | Uc | LC | Sch. IV |
| **Order: Psittaciformes** | | | | | | |
| 99 | Indian Pitta | *Pitta brachyura* Linnaeus, 1766 | I | Sm | Ra | LC | Sch. IV |
| **Family: Campephagidae** | | | | | | |
| 100 | Black-headed Cuckoo-shrike | *Lalage melanoptera* Ruppell, 1839 | I | R | Uc | LC | Sch. IV |
| 101 | Small Minivet | *Pericrocotus cinnamomeus* Linnaeus, 1766 | I | R | Uc | LC | Sch. IV |
| **Family: Oriolidae** | | | | | | |
| 102 | Indian Golden Oriole | *Oriolus kundoo* Sykes, 1832 | O | Sm | Co | LC | Sch. IV |
| **Family: Vangidae** | | | | | | |
| 103 | Common Woodshrike | *Tephrodornis pondicerianus* J.F. Gmelin, 1789 | I | R | Co | LC | Sch. IV |
| **Family: Aegithinidae** | | | | | | |
| 104 | Common Iora | *Aegithina tiphia* Linnaeus, 1758 | I | R | Co | LC | Sch. IV |
| **Family: Dicruridae** | | | | | | |
| 105 | Black Drongo | *Dicrurus macrocercus* Vieillot, 1817 | O | R | Co | LC | Sch. IV |
| 106 | White-bellied Drongo | *Dicrurus caerulescens* Linnaeus, 1766 | O | D | Uc | LC | Sch. IV |
| 107 | Ashy Drongo | *Dicrurus leucophaeus* Vieillot, 1817 | O | Wm | Uc | LC | Sch. IV |
| **Family: Laniidae** | | | | | | |
| 108 | Brown Shrike | *Lanius cristatus* Linnaeus, 1758 | I | Wm | Uc | LC | Sch. IV |
| 109 | Long-tailed Shrike | *Lanius schach* Linnaeus, 1758 | I | R | Co | LC | Sch. IV |
| 110 | Bay-backed Shrike | *Lanius vittatus* Valenciennes, 1826 | I | R | Co | LC | Sch. IV |
| 111 | Southern Grey Shrike | *Lanius excubitor* Linnaeus, 1758 | C | R | Co | LC | Sch. IV |
| **Family: Corvidae** | | | | | | |
| 112 | Rufous Treepie | *Dendrocitta vagabunda* Latham, 1790 | O | R | Co | LC | Sch. IV |
| 113 | House Crow | *Corvus splendens* Vieillot, 1817 | O | R | Co | LC | Sch. IV |
| 114 | Jungle Crow | *Corvus macrorhynchos* Wagler, 1827 | O | R | Co | LC | Sch. IV |
| **Family: Monarchidae** | | | | | | |
| 115 | Indian Paradise Flycatcher | *Terpsiphone paradisi* Linnaeus, 1758 | I | R | Co | LC | Sch. IV |
| **Family: Dicaeidae** | | | | | | |
| 116 | Pale-billed Flowerpecker | *Dicaeum erythrorhynchos* Latham, 1790 | N | R | Co | LC | Sch. IV |
| 117 | Thick-billed Flowerpecker | *Dicaeum agilis* Tickell, 1833 | N | R | Co | LC | Sch. IV |
| **Family: Nectariniidae** | | | | | | |
| 118 | Purple-rumped Sunbird | *Leptocoma zeylonica* Linnaeus, 1766 | N | R | Vc | LC | Sch. IV |
| 119 | Purple Sunbird | *Cinnyris asiaticus* Latham, 1790 | N | R | Vc | LC | Sch. IV |
| Common name                      | Scientific name                | Feeding guilds | Residential status | Relative abundance | IUCN  | WPA |
|---------------------------------|--------------------------------|---------------|--------------------|--------------------|-------|-----|
| **Family: Ploceidae**           |                                |               |                    |                    |       |     |
| 120 Baya Weaver                 | Ploceus philippinus Linnaeus, 1766 | G             | R                  | Vc                 | LC    | Sch. IV |
| 121 Streaked Weaver             | Ploceus manyar Horsfield, 1821  | G             | R                  | Uc                 | LC    | Sch. IV |
| **Family: Estrildidae**         |                                |               |                    |                    |       |     |
| 122 Red Avadav                  | Amandava amandava Linnaeus, 1758 | G             | R                  | Uc                 | LC    | Sch. IV |
| 123 Indian Silverbill           | Euodice malabarica Linnaeus, 1758 | G             | R                  | Vc                 | LC    | Sch. IV |
| 124 Black-headed Munia          | Lanchura Malacca Linnaeus, 1766 | G             | R                  | Co                 | LC    | Sch. IV |
| 125 Scaly-breasted Munia        | Lanchura punctulata Linnaeus, 1758 | G             | R                  | Vc                 | LC    | Sch. IV |
| **Family: Passeridae**          |                                |               |                    |                    |       |     |
| 126 House Sparrow               | Passer domesticus Linnaeus, 1758 | O             | R                  | Vc                 | LC    | Sch. IV |
| 127 Yellow-throated Sparrow     | Gymnoris xanthocollis E. Burton, 1838 | O             | R                  | Uc                 | LC    | Sch. IV |
| **Family: Motacillidae**        |                                |               |                    |                    |       |     |
| 128 White-browed Wagtail        | Motacilla maderaspatensis L. Gmelin, 1789 | I             | R                  | Co                 | LC    | Sch. IV |
| 129 Western Yellow Wagtail      | Motacilla flava Linnaeus, 1758  | I             | Wm                 | Uc                 | LC    | Sch. IV |
| 130 Grey Wagtail                | Motacilla cinerea Tunstall, 1771 | I             | Wm                 | Uc                 | LC    | Sch. IV |
| 131 White Wagtail               | Motacilla alba Linnaeus, 1758   | I             | Wm                 | Uc                 | LC    | Sch. IV |
| 132 Paddyfield Pipit            | Anthus rufulus Vieillot, 1818   | I             | R                  | Uc                 | LC    | Sch. IV |
| **Family: Emberizidae**         |                                |               |                    |                    |       |     |
| 133 Red-headed Bunting          | Granatovra bruniceps von Brandt, 1841 | I             | Wm                 | Ra                 | LC    | Sch. IV |
| 134 Black-headed Bunting        | Granatovra melanochepala Scopoli, 1769 | I             | Wm                 | Ra                 | LC    | Sch. IV |
| 135 Grey-necked Bunting         | Emberiza buchanani Blyth, 1845  | I             | Wm                 | Ra                 | LC    | Sch. IV |
| **Family: Paridae**             |                                |               |                    |                    |       |     |
| 136 Cinereous (Great) Tit       | Parus cinereus Vieillot, 1818   | I             | R                  | Co                 | LC    | Sch. IV |
| **Family: Alaudidae**           |                                |               |                    |                    |       |     |
| 137 Ashy-crowned Sparrow Lark   | Eremopterix grisea Scopoli, 1786 | I             | R                  | Vc                 | LC    | Sch. IV |
| 138 Singing Bushlark            | Mirafra cantillans Blyth, 1845  | O             | R                  | Co                 | LC    | Sch. IV |
| 139 Sykes's Lark                | Galerida deza Sykes, 1832      | O             | R                  | Co                 | LC    | Sch. IV |
| 140 Crested Lark                | Galerida cristata Linnaeus, 1758 | O             | R                  | Co                 | LC    | Sch. IV |
| 141 Jerdon's Bushlark           | Mirafra affinis Blyth, 1845     | O             | R                  | Co                 | LC    | Sch. IV |
| 142 Oriental Skylark            | Alauda gulgula Franklin, 1831   | O             | Wm                 | Uc                 | LC    | Sch. IV |
| 143 Indian Bushlark             | Mirafra erythrophala Blyth, 1845 | O             | R                  | Co                 | LC    | Sch. IV |
| 144 Rufous-tailed Finch Lark    | Ammomanes phoenicura Franklin, 1831 | O             | R                  | Co                 | LC    | Sch. IV |
| **Family: Cisticolidae**        |                                |               |                    |                    |       |     |
| 145 Zitting Cisticola           | Cisticola junciola Rafinesque, 1810 | I             | R                  | Uc                 | LC    | Sch. IV |
| 146 Grey-breasted Prinia        | Prinia hodgsonii Blyth, 1844    | I             | R                  | Co                 | LC    | Sch. IV |
| 147 Ashy Prinia                 | Prinia socialis Sykes, 1832     | I             | R                  | Co                 | LC    | Sch. IV |
| 148 Plain Prinia                | Prinia inornata Sykes, 1832     | I             | R                  | Co                 | LC    | Sch. IV |
| 149 Jungle Prinia               | Prinia sylvatica Jerdon, 1840   | I             | R                  | Co                 | LC    | Sch. IV |
| 150 Common Tailorbird           | Orthotomus sutorius Pennant, 1769 | I             | R                  | Co                 | LC    | Sch. IV |
| **Family: Acrocephalidae**      |                                |               |                    |                    |       |     |
| 151 Blyth's Reed Warbler        | Acrocephalus dumetorum Blyth, 1849 | I             | Wm                 | Ra                 | LC    | Sch. IV |
| 152 Clamorous Reed Warbler      | Acrocephalus stentoreus Hemphil & Ehrenberg, 1833 | I             | R                  | Ra                 | LC    | Sch. IV |
| 153 Booted Warbler              | Iduna caligata M.H.C. Lichtenstein, 1823 | I             | Wm                 | Ra                 | LC    | Sch. IV |
| **Family: Hirundinidae**        |                                |               |                    |                    |       |     |
| 154 Dusky Crag Martin           | Ptnyoprogne concor Sykes, 1832  | I             | R                  | Vc                 | LC    | Sch. IV |
| Common name               | Scientific name                        | Feeding guilds | Residential status | Relative abundance | IUCN   | WPA        |
|--------------------------|----------------------------------------|----------------|--------------------|--------------------|--------|------------|
| Barn Swallow             | Hirundo rustica Linnaeus, 1758         | I              | Wm                 | Ra                 | LC     | Sch. IV    |
| Wire-tailed Swallow      | Hirundo smithii Leach, 1818            | I              | R                  | Co                 | LC     | Sch. IV    |
| Red-rumped Swallow       | Cecropis daurica Laxmann, 1769         | I              | R                  | Ra                 | LC     | Sch. IV    |
| Streak-throated Swallow  | Petrochelidon fluvicola Blyth, 1855    | I              | R                  | Ra                 | LC     | Sch. IV    |
| **Family: Pycnonotidae** |                                        |                |                    |                    |        |            |
| Red-whiskered Bulbul     | Pycnonotus jocosus Linnaeus, 1758      | O              | R                  | Vc                 | LC     | Sch. IV    |
| Red-vented Bulbul        | Pycnonotus cafer Linnaeus, 1766        | O              | R                  | Vc                 | LC     | Sch. IV    |
| White-browed Bulbul      | Pycnonotus sinense Luteolus, 1841      | O              | R                  | Co                 | LC     | Sch. IV    |
| Yellow-throated Bulbul   | Pycnonotus sinensis Jerdon, 1845       | O              | R                  | Uc                 | VU     | Sch. IV    |
| **Family: Phylloscopidae**|                                        |                |                    |                    |        |            |
| Greenish Leaf Warbler    | Seicercus trochiloides Sundevall, 1837 | I              | Wm                 | Ra                 | LC     | Sch. IV    |
| Tickell's leaf warbler   | Phylloscopus affinis Tickell, 1833     | I              | Wm                 | Ra                 | LC     | Sch. IV    |
| Green Leaf Warbler       | Seicercus vitiosus Blyth, 1843         | I              | Pm                 | Ra                 | LC     | Sch. IV    |
| **Family: Sylvidae**     |                                        |                |                    |                    |        |            |
| Yellow-eyed Babbler      | Chrysomma sinense J.F. Gmelin, 1789    | I              | R                  | Co                 | LC     | Sch. IV    |
| Hume's (Lesser) Whitethroat | Currucu curruca Linnaeus, 1758       | I              | Wm                 | Ra                 | LC     | Sch. IV    |
| **Family Zosteropidae**  |                                        |                |                    |                    |        |            |
| Oriental White-eye       | Zosterops palpebrosus Temminck, 1824   | I              | R                  | Uc                 | LC     | Sch. IV    |
| **Family: Timaliidae**   |                                        |                |                    |                    |        |            |
| Common Babbler           | Argya caudata Dumont, 1823             | O              | R                  | Co                 | LC     | Sch. IV    |
| Jungle Babbler           | Turdoides striata Dumont, 1823         | O              | R                  | Vc                 | LC     | Sch. IV    |
| Large Grey Babbler       | Argya malcolmi Sykes, 1832             | O              | R                  | Vc                 | LC     | Sch. IV    |
| Yellow-billed Babbler    | Turdoides affinis Jerdon, 1845         | O              | R                  | Vc                 | LC     | Sch. IV    |
| **Family: Sturniidae**   |                                        |                |                    |                    |        |            |
| Chestnut-tailed Starling | Sturnia malabarica J.F. Gmelin, 1789   | O              | Wm                 | Uc                 | LC     | Sch. IV    |
| Brahminy Starling        | Sturnia pagodarum J.F. Gmelin, 1789    | O              | R                  | Co                 | LC     | Sch. IV    |
| Common Myna              | Acrocephalus tristis Linnaeus, 1766    | O              | R                  | Co                 | LC     | Sch. IV    |
| Jungle Myna              | Acrocephalus fuscus Wagler, 1827       | O              | R                  | Co                 | LC     | Sch. IV    |
| Rosy Starling            | Pastor roseus Linnaeus, 1758           | O              | Wm                 | Uc                 | LC     | Sch. IV    |
| **Family: Muscicapidae** |                                        |                |                    |                    |        |            |
| Bluethroat               | Luscinia svecia Linnaeus, 1758         | I              | Wm                 | Ra                 | LC     | Sch. IV    |
| Indian Robin             | Saxicoloides fulicatus Linnaeus, 1766  | I              | R                  | Co                 | LC     | Sch. IV    |
| Oriental Magpie Robin    | Capyscythus saularis Linnaeus, 1758    | I              | R                  | Co                 | LC     | Sch. IV    |
| Asian Brown Flycatcher   | Muscipula daurica Pallas, 1811         | I              | Wm                 | Ra                 | LC     | Sch. IV    |
| Tickell's Blue Flycatcher| Cyanis tickelliae Blyth, 1843          | I              | R                  | Co                 | LC     | Sch. IV    |
| Verditer Flycatcher      | Eumyias thalassinus Swainson, 1838     | I              | Wm                 | Uc                 | LC     | Sch. IV    |
| Red-breasted Flycatcher  | Ficedula parva Bechstein, 1792         | I              | Wm                 | Uc                 | LC     | Sch. IV    |
| Black Redstart           | Phoenicurus ochruros S.G. Gmelin, 1774 | I              | Wm                 | Uc                 | LC     | Sch. IV    |
| Blue Rock Thrush         | Monticola solitaria Linnaeus, 1758     | I              | Wm                 | Uc                 | LC     | Sch. IV    |
| Pied Bushchat            | Saxicola caprata Linnaeus, 1766        | I              | R                  | Co                 | LC     | Sch. IV    |
| Siberian Stonechat       | Saxicola maurus Pallas, 1773           | I              | Wm                 | Uc                 | LC     | Sch. IV    |

IUCN Red List categories: LC—Least Concern | NT—Near Threatened | VU—Vulnerable | WPA Schedules (I, II, III, IV) as per Indian Wildlife (Protection) Act, 1972 | Residential Status: R—Resident | Wm—Winter migrant | Sm—Summer migrant | Pm—Passage migrant | Feeding guilds: I—Insectivorous | C—Carnivorous | H—Herbivorous | O—Omnivorous | G—Granivorous | F—Frugivorous | N—Nectarivorous | Relative Abundance: Co—Common | Uc—Uncommon | Vc—Very common | Ra—Rare.
Table 2. Relative diversity index (RDI) of various avian families at Daroji Sloth Bear Sanctuary, Karnataka.

| Family           | No. of species | RDI |
|------------------|----------------|-----|
| 1                |                |     |
| Accipitridae     | 12             | 6.45|
| Muscicapidae     | 11             | 5.91|
| 2                |                |     |
| Ardeidae         | 8              | 4.30|
| Alaudidae        |                |     |
| 3                |                |     |
| Cuculidae        | 7              | 3.76|
| 4                |                |     |
| Phasianidae      | 6              | 3.23|
| Scolopacidae     |                |     |
| Cisticolidae     |                |     |
| 5                |                |     |
| Anatidae         | 5              | 2.69|
| Columbidae       |                |     |
| Motacillidae     |                |     |
| Hirundinidae     |                |     |
| Sturnidae        |                |     |
| 6                |                |     |
| Laridae          | 4              | 2.15|
| Estrildidae      |                |     |
| Pycnonotidae     |                |     |
| Leiothrichidae   |                |     |
| 7                |                |     |
| Ciconiidae       | 3              | 1.61|
| Phalacrocoracida |                |     |
| Charadriidae     |                |     |
| Strigidae        |                |     |
| Picidae          |                |     |
| Alcedinidae      |                |     |
| Corvidae         |                |     |
| Emberizidae      |                |     |
| Acrocephalidae   |                |     |
| Phylloscopidae   |                |     |
| 8                |                |     |
| Pteroclididae    | 2              | 1.08|
| Apodidae         |                |     |
| Threskiornithida |                |     |
| Jacanidae        |                |     |
| Meropidae        |                |     |
| Falconidae       |                |     |
| Pittidae         |                |     |
| Malaconotidae    |                |     |
| Turnicidae       |                |     |
| Laniidae         |                |     |
| Tyrannidae       |                |     |
| Bucerotidae      |                |     |
| Upupidae         |                |     |
| Ramphastidae     |                |     |
| Coraciidae       |                |     |
| Ptilidae         |                |     |
| Oroilidae        |                |     |
| Vangidae         |                |     |
| Aegithinidae     |                |     |
| Monarchidae      |                |     |
| Paridae          |                |     |
| Zosteropidae     |                |     |
| Timaliidae       |                |     |
| 9                |                |     |
| Podicipitidae    | 1              | 0.54|
| Caprimulgidae    |                |     |
| Aehingidae       |                |     |
| Burhinidae       |                |     |
| Recurvidae       |                |     |
| Tornitidae       |                |     |
| Laridae          |                |     |
| Tyrannidae       |                |     |
| Bucerotidae      |                |     |
| Upupidae         |                |     |
| Ramphastidae     |                |     |
| Coraciidae       |                |     |
| Ptilidae         |                |     |
| Oroilidae        |                |     |
| Vangidae         |                |     |
| Aegithinidae     |                |     |
| Monarchidae      |                |     |
| Paridae          |                |     |
| Zosteropidae     |                |     |
| Timaliidae       |                |     |

The analysis of relative abundance based on the frequency of sightings indicated that 89 species were common, 49 were uncommon, 28 were very common and 23 were rare species, which accounts for 47%, 26%, 15%, and 12% of the frequency of distribution in the study area (Figure 3).

Avian community structure as per habitat

From the earlier studies undertaken elsewhere, it is evident that variation in vegetation structure influences species distribution (MacArthur et al., 1962; Karr & Roth, 1971; Pearman 2002) within a habitat. Of the 189 species recorded, 139 species were associated with terrestrial habitat and 50 species were wetland-associated, which account for 74% and 26% of total bird species recorded (Table 1). Wetland characteristics like size, water depth, quality of water, trophic structure, and presence of suitable roosting and nursery sites influence the abundance and diversity of birds (Wiens 1989; Mukherjee et al. 2002; Ma et al. 2010). During the present study, wetland birds such as ducks, herons, egrets, cormorants, grebes, storks, jacanas, and kingfishers, which were observed to feed on aquatic organisms (fish, amphibians, invertebrates, etc.) at different water depths available in the wetlands and adjoining agriculture fields and marshy area.

Feeding guild structure

The diversity of avifauna in the study area may be due to the presence of a wide spectrum of food niches. The different species of birds occupying a particular feeding guild and space have evolved specialized foraging strategies to explore and obtain food resources efficiently and thus to reduce competition among diverse species (Nudds & Bowlby 1984; Jose & Zacharias 2003). An analysis of the feeding guilds of these birds revealed that 33% (63 species) were insectivorous and 31% (58 species) were carnivorous, 21% (40 species) were omnivorous, 9% (17 species) were granivorous, 3% (5 species) were frugivorous, 2% (4 species) were nectarivorous and 1% (2 species) were herbivorous respectively (Figure 3). Due to their specialized diet and low availability of preferable food resources, the nectarivores and piscivores are traditionally less represented (Wiens 1989). Occurrence of a significant number of insectivorous bird communities indicates that the area consists rich insect diversity as well as less disturbance in the form of forest fire consequences (Gregory et al. 2001) and also play a major role as important bio-control agents of insect pest of agriculture, horticulture, and forest ecosystem (Mahabal 2005; Thakur et al. 2010).

Among the 21 species of birds of prey recorded from the study area, 17 species were diurnal raptors like Oriental Honey Buzzard *Pernis ptilorhynchus*, Black-
winged Kite *Elanus caeruleus*, Short-toed Snake Eagle *Circaetus gallicus*, Shikra *Accipiter badius*, Black Eagle *Ictinaetus malaiensis*, Booted Eagle *Hieraaetus pennatus*, Bonelli’s Eagle *Aquila fasciata*, Pallid Harrier *Circus macrourus*, Western Marsh Harrier *Circus aeruginosus*, Montagu’s Harrier *Circus pygargus*, Black Kite *Milvus migrans*, Brahminy Kite *Haliastur indus*, Common Kestrel *Falco tinnunculus*, and Peregrine Falcon *Falco peregrines* and the other four were nocturnal raptors like Barn Owl *Tyto alba*, Indian Eagle Owl *Bubo bengalensis*, Brown Fish Owl *Ketupa zeylonensis*, and Spotted Owlet *Athene brama*. The presence of carnivorous species in the study area, which is primarily influenced by the availability of food sources, however, indicates the abundance of their prey. Prey bases such as small birds, lizards, snakes, rats, are among the food sources for carnivores in the area. The study area also supports four species of nectarivorous birds which include, Thick-billed Flowerpecker *Dicaeum agile*, Pale-billed Flowerpecker *Dicaeum erythrorhynchos*, Purple-rumped Sunbird *Leptocoma zeylonica*, and Purple Sunbird *Cinnyris asiaticus* have been regularly seen from the area.

**Conservation status of avian fauna**

To understand the importance of a site it is necessary to examine the significance in terms of the presence and abundance of species (Bruford 2002). DSBS supports 15 (8%) species of birds included in Schedule I, and 174 (92%) species included in Schedule IV of the Wildlife Protection Act (WPA, 1972). As per IUCN red list, Daroji supports, two globally Vulnerable (VU) species—Yellow-throated Bulbul *Pycnonotus xantholaemus* & Woolly-necked Stork *Ciconia episcopus*—five Near Threatened (NT) species—Painted Stork *Mycteria leucocephala*, Black-headed Ibis *Threskiornis melanocephalus*, Oriental Darter *Anhinga melanogaster*, River Tern *Sterna aurantia*, & Pallid Harrier *Circus macrourus* (IUCN, 2010)—and remaining 180 species are under Least Concern (LC) (Table 1).

It is evident from earlier studies that the landscape with diverse habitats provides opportunities for diverse avian fauna assemblages (Karr & Roth 1971). The study area has been selected as an important bird area in India (IBA), as it maintains a significant thriving population of a globally threatened and vulnerable species, i.e., Yellow-throated Bulbul with its fragmented population is restricted to the southern Deccan Plateau of India (Birdlife International 2001). Earlier recorded sighting (Allen 1908) of 20 pairs was in June 1901 in the Ballari District. Kottur (2014) observed this species around Matanga Hill in Hampi, Daroji Sloth Bear Sanctuary, and Sannapura Forest in the Koppal District. This species has been considered as Vulnerable because of threats caused due to degradation of its scrub forest habitats by various anthropogenic activities such as total clearance of vegetation, excessive wood-cutting, cattle-grazing and the quarrying of hillocks, etc (Subramanya et al. 1993, 1995; Stattersfield et al. 1998).

Daroji Sloth Bear Sanctuary lies in an important biogeographic zone, i.e., Deccan Peninsula with its amazingly diverse vegetation structure and environments not only attracts a variety of resident as well as migratory bird species but also influence their diversity and distribution within the habitat (MacArthur et al. 1962; Karr & Roth 1971; Pearman 2002). Anthropogenic disturbances on
forests structure and function are well on record (Bhat & Murali 2001; Chandrashekar et al. 2006) and indicated a negative influence of the anthropogenic intervention on overall bird diversity (Image 3–5). The present study also revealed that the avifauna and their habitat was under threats due to intensive anthropogenic activities, highlighted earlier along with those other disturbances like habitat alternations, construction of roads, firewood collection, and poaching in the forest areas that impacted the environment adversely which intern disturbing many threatened and migratory bird species. Hence, documentation of the bird community and identification of potential threats are the primary concerns of conservation at present.

The data recorded in the present study provides valuable information about the diversity of avifauna of Daroji Sloth Bear Sanctuary, as a baseline data for future EIA studies, and helping in formulating future conservation strategies to improve the forest habitats, which will attract the number of the resident bird as well as migratory species. Further, more long-term scientific studies and monitoring along with local participation needed to understand the ecological status, seasonal wise abundance, and diversity, and conservation of birds in this particular area.

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