



Avifaunal Diversity around Urban and Rural Areas of District Patiala, Punjab, India

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Abstract: The present study was conducted for assessing the avifaunal diversity in district Patiala, Punjab. Patiala being the princely state, many thick forest patches had been conserved by the Royals of Patiala. These sites are still protected but due to unprecedented rise of human population have consequently started altering natural habitat which adversely affects biodiversity. Survey includes Patiala, Nabha, Ghanaur, Rajpura, Sunam and Patran owning eight protected areas and five sanctuaries. Total 204 bird species belonging to 18 orders and 58 families along with other details like their feeding habits, occurrence, distribution status and conservation status have been recorded. The majority of the birds found during survey were listed under Least Concern category of Red List of IUCN, but few of them were listed under vulnerable notably Indian Spotted Eagle (*Clanga hastate*), White-Necked Stork (*Ciconia episcopus*), Common Pochard (*Aythya ferina*), near threatened are Black-tailed Godwit (*Limosa limosa*), Painted Stork (*Mycteria leucocephala*), Black Headed White Ibis (*Threskiornis melanocephalus*), Oriental Darter (*Anhinga melanogaster*), Alexandrine Parakeet (*Psittacula eupatria*) and endangered species Steppe Eagle (*Aquila nipalensis*), Egyptian Vulture (*Neophron percnopterus*) categories. The Passeriformes order is the most prevalent, followed by the Charadriiformes, Anseriformes, Pelecaniformes and Accipitriformes.

Keywords: Avian diversity, Patiala, Rural, Urban, Threatened

Birds are ideal indicators to evaluate environmental health and can be found in many habitats within human settlements, Indian subcontinent harbor 1408 bird species which are considered to be 13% of total birds of the world (Praveen et al 2020). However, most of the work regarding bird diversity is limited to natural and protected areas (Bal and Dua 2010, Mehta 2014, Braich and Kaur 2016, Braich and Singh 2021a, Singh and Braich 2021) and these semi-natural unprotect urban areas get very little attention by researchers hence, remains undocumented. Most of these semi-natural landscapes in urban and semi-urban areas of human settlements have diverse flora and fauna which usually remains unexplored. Rapid increase in human population lead to occupy maximum space by humans, and alter these natural habitats to make suitable for ourselves, but their consequences are ultimately faced by wild creature especially birds, as they are among the most common species that are affected by minor changes (Brambilla et al 2010). Rise in noise level, habitat fragmentation, collision with automobiles, electric shocks from electric wires and other sources are most common disturbances which cause loss of avian diversity (Ortega 2012, Francis et al 2012, Boukrouma et al 2017, Perillo et al 2017, Bernat-Ponce et al 2021). There are many studies worldwide as in to understand the distribution of birds in urban non-protected habitats

Cornel is and Hermy (2004), Tryjanowski et al (2017), Callaghan et al (2018), Lee et al (2021) but in India, only a few studies are reported (Khera et al 2009, Turaga 2015, Braich and Singh 2021b). For conservation of bird species, it is important to recognize the bird diversity present in particular area and then to start affective conservation measures. Hitherto, no previous report is available on the avian diversity of district Patiala, hence the current study provides large overview of avian diversity and set a baseline to the further studies.

MATERIAL AND METHODS

Study area: Geographically district Patiala is located in between 29°49'-30°40' North latitudes and 75°58'-76°48' East longitudes with 3218 sq.km geographical area having tropical, semi-arid, hot and subtropical monsoon climatic conditions and experience five seasons i.e. summer, rainy, autumn, winter and spring. Study area is divided into six blocks such as (Patiala, Nabha, Ghanaur, Rajpura, Sunam and Patran) which also includes eight protected areas locally called Birs (Kharabgarh, Miranpur and Ghogpur, Kule Majra, Majal, Sanaur, Bahadurgarh and Mallehwal) and five sanctuaries (Bhuner Heri, Moti Bhag, Mehas, Dosanj and Bhadson). These areas have diverse range of habitats and they include forests, woodlands, canals, village ponds,

agricultural lands, and some temporary or permanent small water bodies. Major water bodies include River Ghaggar, Badi Nadi, Sirhind Canal and their extensions. Large Woodland are as mainly include protected areas and sanctuaries beside that, public parkland, dense vegetation along rivers, avenue vegetation was also explored.

Methods: During the study, bimonthly surveys were conducted from 2018 to 2020 by visual encounter surveys, point count, and line transects method in visited areas, for observation and data collection (Bibby et al 2000). Photography of birds was done during the survey with DSLR cameras Canon EOS 7D (100-400mm zoom lens), Canon (1200D) (75-300mm zoom lens) and binocular (Olympus 8-16*40 zoom DPS-I) were used for spotting, and field notes were prepared, followed by identification of birds using field guides (Ali and Ripley 1983, Grimmett et al 2012) and classification was followed according to Clements et al (2021). On the basis of frequency of their occurrence, they were divided to very common (recorded in more than 45%), common (25% to 44%), uncommon (10% to 24%) and rare (recorded once or twice) (McKinnon and Philips 1993).

RESULTS AND DISCUSSION

The district Patiala support 204 species of birds which belong to 18 orders and 58 families. Most of the birds were under least concern category of Red list of IUCN. Five species belongs to near threatened category which were Black-tailed Godwit (*Limosa limosa*), Painted Stork (*Mycteria leucocephala*), Black Headed White Ibis (*Threskiornis melanocephalus*), Oriental Darter (*Anhinga melanogaster*), Alexandrine Parakeet (*Psittacula eupatria*) and three species falls under vulnerable category i.e. Indian Spotted Eagle (*Clanga hastate*), White-Necked Stork (*Ciconia episcopus*), Common Pochard (*Aythya ferina*) and two species were reported under endangered category i.e. Steppe Eagle (*Aquila nipalensis*), Egyptian Vulture (*Neophron percnopterus*) (Table 1). Egyptian Vulture found breeding in Patiala from last few years. Order wise analysis shows that, the order Passeriformes was dominant (28 families with 91 species of birds) followed by Charadriiforms with 7 families (25 species), Anseriformes 1 family (16 species). Pelecaniformes 2 families (14 species), Accipitriformes one family (12 species).

Feeding data reveals that 41.68% were insectivorous followed by 22.54% omnivorous birds, 22.54% carnivorous, 6.86% were grainivorous, 3.92% were frugivorous and 3.43% were herbivorous. Based on their distribution in Punjab 42.64% of birds are common resident of Punjab, 1.53% of birds are common passage migrant, 1.53% of birds are common summer visitor, 7.17% are common winter

visitor, 2.05% are locally common resident, 1.53% of birds are locally common winter visitor, 3.58% birds species are not common passage migrant, 13.84% of birds are not common resident, 5.12% of birds are not common summer visitor, 17.94 % of birds are not common winter visitor, 1.02 % of birds are not common winter visitor and passage migrant, 2.05% of birds are vagrant in Punjab. Most of birds fall under common and very common category (35.78 and 29.90% respectively) followed by 19.16% and 11.76% in uncommon and rare category.

The order wise analysis shows that Passeriformes birds were dominates and insectivorous birds were dominating over others on the basis of their feeding. Similar observations have been also reported from Khajjiar lake, district Chamba Himachal Pradesh, Nangal Wetland Ramsar site Punjab, and Chillavariipalli and Ellutla Reserve forests Reserve Anantapur district of Andhra Pradesh, respectively (Singh and Banyal 2013, Braich and Kaur 2016, Subramanyam and Khan 2016, Kukreti 2021). Breeding pair of Egyptian Vulture was spotted during the survey (Kumar et al 2020).The maximum species were from forest areas, woodlands and water bodies (village ponds and rivers) followed by agriculture land and least from the residential areas. Species spotted in residential area were common at all the sites. Several factors like size of habitat, food availability and human interference determine the species diversity and abundance. Similarly, as per existing literature on bird diversity, rural areas always show higher species diversity than the urban with increase in urbanization, bird diversity become more distinct and homogenous between urban areas. As urbanization cause habitat fragmentation and alter their original state and because biodiversity loses, but at the same time also offers foraging and cover to some bird

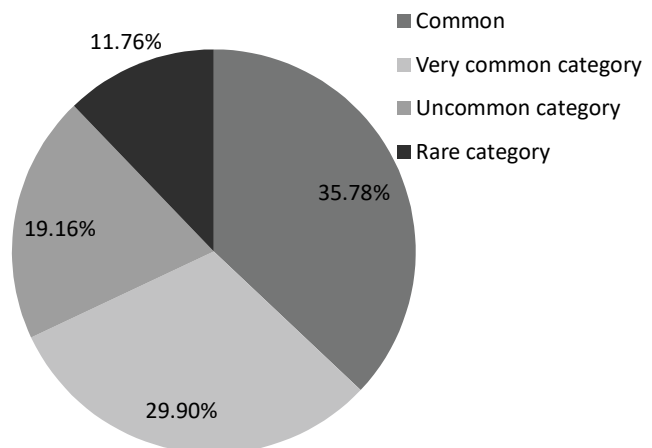


Fig. 1. Relative abundance of birds in district Patiala

Table 1. Birds with their feeding habits, distribution, occurrence and IUCN status

Name	Scientific name	Family	Feeding habits	Status	Occurrence	IUCN
Order: Accipitriformes						
Black Kite	<i>Milvus lineatus</i> (Boddaert 1783)	Accipitridae	Carnivorous	cr	Very common	Least concern
Black-shouldered Kite	<i>Elanus caeruleus</i> (Desfontaines 1789)	Accipitridae	Carnivorous	nr	Common	Least concern
Booted Eagle	<i>Hieraaetus pennatus</i> (Gmelin 1788)	Accipitridae	Carnivorous	np	Uncommon	Least concern
Egyptian Vulture	<i>Neophron percnopterus</i> (Linnaeus 1758)	Accipitridae	Carnivorous	nr	Common	Endangered
Eurasian Sparrowhawk	<i>Accipiter nisus</i> (Linnaeus 1758)	Accipitridae	Carnivorous	nw	Uncommon	Least concern
Shikra	<i>Accipiter badius</i> (Gmelin 1788)	Accipitridae	Carnivorous	cr	Very common	Least concern
Steppe Eagle	<i>Aquila nipalensis</i> Hodgson 1833	Accipitridae	Carnivorous	nw	Rare	Endangered
Indian Spotted Eagle	<i>Clanga hastate</i> (Pallas 1811)	Accipitridae	Carnivorous	nr	Uncommon	Vulnerable
Bonelli's Eagle	<i>Hieraaetus fasciatus</i> (Vieillot 1822)	Accipitridae	Carnivorous	nw	Uncommon	Least concern
Oriental Honey-Buzzard	<i>Pernis ptilorhynchus</i> (Temminck 1821)	Accipitridae	Carnivorous	lcr	Uncommon	Least concern
Common Buzzard	<i>Buteo</i> Linnaeus 1758	Accipitridae	Carnivorous	nw	Uncommon	Least concern
Crested Serpent-Eagle	<i>Spilornis cheela</i> (Latham 1790)	Accipitridae	Carnivorous	nr	Uncommon	Least concern
Order: Anseriformes						
Bar-headed Goose	<i>Anser indicus</i> (Latham 1790)	Anatidae	Herbivorous	lcw	Common	Least concern
Comb Duck	<i>Sarkidiornis melanotos</i> (Pennant 1769)	Anatidae	Omnivorous	ns	Very common	Least concern
Common Pochard	<i>Aythya ferina</i> (Linnaeus 1758)	Anatidae	Omnivorous	cw	Common	Vulnerable
Common Teal	<i>Anas crecca</i> Linnaeus 1758	Anatidae	Omnivorous	cw	Common	Least concern
Cotton Teal	<i>Nettapus coromandelianus</i> (Gmelin 1789)	Anatidae	Omnivorous	ns	Rare	Least concern
Eurasian Wigeon	<i>Anas penelope</i> Linnaeus 1758	Anatidae	Herbivorous	nw	Uncommon	Least concern
Gadwall	<i>Anas strepera</i> Linnaeus 1758	Anatidae	Omnivorous	cw	Common	Least concern
Garganey	<i>Anas querquedula</i> Linnaeus 1758	Anatidae	Omnivorous	cp	Uncommon	Least concern
Greylag Goose	<i>Anser</i> (Linnaeus 1758)	Anatidae	Herbivorous	cw	Common	Least concern
Spot-billed Duck	<i>Anas poecilorhyncha</i> J.R. Forester 1781	Anatidae	Herbivorous	cr	Very common	Least concern
Lesser Whistling-Duck	<i>Dendrocygna javanica</i> (Horsfield 1821)	Anatidae	Omnivorous	nw	Very common	Least concern
Northern Shoveller	<i>Anas clypeata</i> Linnaeus 1758	Anatidae	Omnivorous	cw	Very common	Least concern
Northern Pintail	<i>Anas acuta</i> Linnaeus 1758	Anatidae	Herbivorous	nw	Very common	Least concern
Red-crested Pochard	<i>Netta rufina</i> (Pallas 1773)	Anatidae	Herbivorous	lcw	Common	Least concern
Brahminy Shelduck	<i>Tadorna ferruginea</i> (Pallas 1764)	Anatidae	Omnivorous	lcw	Common	Least concern
Common Shelduck	<i>Tadorna</i> (Linnaeus 1758)	Anatidae	Omnivorous	nw	Uncommon	Least concern
Order: Apodiformes						
House Swift	<i>Apus affinis</i> (J.E. Gray 1830)	Apodidae	Insectivorous	cr	Common	Least concern
Alpine Swift	<i>Tachymarptis melba</i> (Linnaeus 1758)	Apodidae	Insectivorous	nr	Common	Least concern
Order: Charadriiformes						
Black-tailed Godwit	<i>Limosa</i> (Linnaeus 1758)	Scolopacidae	Carnivorous	nwp	Rare	Near
Black-winged Stilt	<i>Himantopus</i> (Linnaeus 1758)	Recurvirostridae	Insectivorous	cr	Very common	Least concern
Common Redshank	<i>Tringa totanus</i> (Linnaeus 1758)	Scolopacidae	Insectivorous	nw	Very common	Least concern
Common Sandpiper	<i>Actitis hypoleucos</i> Linnaeus 1758	Scolopacidae	Insectivorous	nw	Very common	Least concern
Common Snipe	<i>Gallinago</i> (Linnaeus 1758)	Scolopacidae	Insectivorous	nw	Very common	Least concern
Dunlin	<i>Calidris alpina</i> (Linnaeus 1758)	Scolopacidae	Insectivorous	nw	Uncommon	Least concern
Stone-Curlew	<i>Burhinus oedichnemus</i> (Linnaeus 1758)	Burhinidae	Insectivorous	cr	Common	Least concern

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Name	Scientific name	Family	Feeding habits	Status	Occurrence	IUCN
Green Sandpiper	<i>Tringa ochropus</i> Linnaeus 1758	Scolopacidae	Carnivorous	nw	Common	Least concern
Common Greenshank	<i>Tringa nebularia</i> (Gunner 1767)	Scolopacidae	Carnivorous	nw	Common	Least concern
Small Pratincole	<i>Glareola lactea</i> Temminck 1820	Glareolidae	Insectivorous	nr	Uncommon	Least concern
Little Ringed Plover	<i>Charadrius dubius</i> Scopoli 1786	Charadriidae	Insectivorous	np	Common	Least concern
Little Stint	<i>Calidris minuta</i> (Leisler 1812)	Scolopacidae	Insectivorous	nw	Common	Least concern
Marsh Sandpiper	<i>Tringa stagnatilis</i> (Bechstein 1803)	Scolopacidae	Insectivorous	nw	Common	Least concern
Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i> (Scopoli 1786)	Jacanidae	Omnivorous	nr	Common	Least concern
Pied Avocet	<i>Recurvirostra avosetta</i> Linnaeus 1758	Recurvirostridae	Insectivorous	nwp	Uncommon	Least concern
Red-wattled Lapwing	<i>Vanellus indicus</i> (Boddaert 1783)	Charadriidae	Insectivorous	cr	Very common	Least concern
Ruff	<i>Philomachus pugnax</i> (Linnaeus 1758)	Scolopacidae	Omnivorous	np	Very common	Least concern
Spotted Redshank	<i>Tringa erythropus</i> (Pallas 1764)	Scolopacidae	Insectivorous	nw	Common	Least concern
Temminck's Stint	<i>Calidris temminckii</i> (Leisler 1812)	Scolopacidae	Insectivorous	nw	Uncommon	Least concern
White-tailed Lapwing	<i>Vanellus leucurus</i> (Lichtenstein 1823)	Charadriidae	Insectivorous	nw	Uncommon	Least concern
Wood Sandpiper	<i>Tringa glareola</i> Linnaeus 1758	Scolopacidae	Insectivorous	nw	Common	Least concern
Eurasian Curlew	<i>Numenius arquata</i> (Linnaeus 1758)	Scolopacidae	Insectivorous	nw	Uncommon	Least concern
Yellow-wattled Lapwing	<i>Vanellus malabaricus</i> (Boddaert 1783)	Charadriidae	Insectivorous	nr	Uncommon	Least concern
Oriental Pratincole	<i>Glareola maldivarum</i> J.R. Forster 1795	Glareolidae	Insectivorous	np	Uncommon	Least concern
Greater Painted-Snipe	<i>Rostratula benghalensis</i> (Linnaeus 1758)	Rostratulidae	Omnivorous	nw	Common	Least concern
Order: Ciconiiformes						
Asian Openbill-Stork	<i>Anastomus oscitans</i> (Boddaert 1783)	Ciconiidae	Carnivorous	nr	Uncommon	Least concern
Painted Stork	<i>Mycteria leucocephala</i> (Pennant 1769)	Ciconiidae	Carnivorous	nr	Common	Near threatened
White-necked Stork	<i>Ciconia episcopus</i> (Boddaert 1783)	Ciconiidae	Carnivorous	nw	Common	Vulnerable
Order: Columbiformes						
Blue Rock Pigeon	<i>Columba livia</i> Gmelin 1789	Columbidae	Granivorous	cr	Very common	Least concern
Eurasian Collared-Dove	<i>Streptopelia decaocto</i> (Fridvaldszky 1838)	Columbidae	Granivorous	cr	Common	Least concern
Laughing Dove	<i>Streptopelia senegalensis</i> (Linnaeus 1766)	Columbidae	Granivorous	cr	Common	Least concern
Red Collared-Dove	<i>Streptopelia tranquebarica</i> (Hermann 1804)	Columbidae	Granivorous	cr	Common	Least concern
Spotted Dove	<i>Streptopelia chinensis</i> (Scopoli 1786)	Columbidae	Granivorous	cr	Common	Least concern
Yellow-legged Green-Pigeon	<i>Treron phoenicoptera</i> (Latham 1790)	Columbidae	Frugivores	cr	Very common	Least concern
Order: Coraciiformes						
Common Kingfisher	<i>Alcedo atthis</i> (Linnaeus 1758)	Alcedinidae	Carnivorous	cr	Uncommon	Least concern
Common Hoopoe	<i>Upupa epops</i> Linnaeus 1758	Upupidae	Insectivorous	cr	Very common	Least concern
Small Bee-eater	<i>Merops orientalis</i> Latham 1801	Meropidae	Insectivorous	cr	Very common	Least concern
Indian Grey Hornbill	<i>Ocyrceros birostris</i> (Scopoli 1786)	Bucerotidae	Frugivores	cr	Very common	Least concern
Indian Roller	<i>Coracias benghalensis</i> (Linnaeus 1758)	Coraciidae	Insectivorous	cr	Common	Least concern
White-breasted Kingfisher	<i>Halcyon smyrnensis</i> (Linnaeus 1758)	Alcedinidae	Carnivorous	cr	Very common	Least concern
Stork-billed Kingfisher	<i>Halcyon capensis</i> (Linnaeus 1766)	Alcedinidae	Carnivorous	nr	Rare	Least concern
Blue-tailed Bee-eater	<i>Merops philippinus</i> Linnaeus 1766	Meropidae	Insectivorous	ns	Uncommon	Least concern

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Name	Scientific name	Family	Feeding habits	Status	Occurrence	IUCN
Order: Cuculiformes						
Asian Koel	<i>Eudynamys scolopacea</i> (Linnaeus 1758)	Cuculidae	Omnivorous	ns	Very common	Least concern
Greater Coucal	<i>Centropus sinensis</i> (Stephens 1815)	Cuculidae	Insectivorous	cr	Very common	Least concern
Pied Crested Cuckoo	<i>Clamator jacobinus</i> (Boddaert 1783)	Cuculidae	Insectivorous	cs	Very common	Least concern
Common Hawk-cuckoo	<i>Hierococcyx varius</i> (Vahl 1797)	Cuculidae	Insectivorous	nr	Uncommon	Least concern
Order: Falconiformes						
Peregrine Falcon	<i>Falco peregrinus</i> Tunstall 1771	Falconidae	Carnivorous	nr	Rare	Least concern
Order: Galliformes						
Grey Francolin	<i>Francolinus pondicerianus</i> (Gmelin 1789)	Phasinidae	Omnivorous	Cr	Very common	Least concern
Indian Peafowl	<i>Pavo cristatus</i> Linnaeus 1758	Phasinidae	Omnivorous	Cr	Very common	Least concern
Black Francolin	<i>Francolinus</i> (Linnaeus 1766)	Phasianidae	Omnivorous	Cr	Uncommon	Least concern
Order: Gruiformes						
Common Coot	<i>Fulica atra</i> Linnaeus 1758	Rallidae	Herbivorous	Cr	Very common	Least concern
Common Moorhen	<i>Gallinula chloropus</i> (Linnaeus 1758)	Rallidae	Omnivorous	Cr	Very common	Least concern
Purple Moorhen	<i>Porphyrio</i> (Linnaeus 1758)	Rallidae	Omnivorous	Cr	Very common	Least concern
White-Breasted Waterhen	<i>Amauornis phoenicurus</i> (Pennant 1769)	Rallidae	Omnivorous	Cr	Very common	Least concern
Watercock	<i>Gallixrex cinerea</i> (Gmelin 1789)	Rallidae	Omnivorous	Ns	Rare	Least concern
Order: Passeriformes						
Long-Tailed Shrike	<i>Lanius schach</i> Linnaeus 1758	Laniidae	Carnivorous	Cr	Common	Least concern
Ashy Prinia	<i>Prinia socialis</i> Sykes 1832	Cisticolidae	Insectivorous	Cr	Common	Least concern
Asian Pied Starling	<i>Sturnus contra</i> Linnaeus 1758	Sturnidae	Omnivorous	Cr	Very common	Least concern
Bank Myna	<i>Acridotheres ginginianus</i> (Latham 1790)	Sturnidae	Insectivorous	Cr	Very common	Least concern
Barn Swallow	<i>Hirundo rustica</i> Linnaeus 1758	Hirundinidae	Insectivorous	Cw	Very common	Least concern
Baya Weaver	<i>Ploceus philippinus</i> (Linnaeus 1766)	Ploceidae	Omnivorous	Cr	Very common	Least concern
Bay-backed Shrike	<i>Lanius vittatus</i> Valenciennes 1826	Laniidae	Carnivorous	Cr	Common	Least concern
Bengal Bushlark	<i>Mirafra assamica</i> Horsfield 1840	Alaudidae	Omnivorous	Nr	Common	Least concern
Black Drongo	<i>Dicrurus macrocercus</i> Vieillot 1817	Dicruridae	Omnivorous	Cr	Very common	Least concern
Black Redstart	<i>Phoenicurus ochruros</i> (Gmelin SG 1774)	Muscicapidae	Insectivorous	Cw	Very common	Least concern
Black-headed Bunting	<i>Emberiza melanocephala</i> Scopoli 1769	Emberizidae	Granivorous	Np	Common	Least concern
Blue Rock Thrush	<i>Monticola solitarius</i> (Linnaeus 1758)	Muscicapidae	Omnivorous	Nr	Rare	Least concern
Bluethroat	<i>Luscinia svecica</i> (Linnaeus 1758)	Muscicapidae	Insectivorous	Nw	Common	Least concern
Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i> Blyth 1849	Acrocephalidae	Insectivorous	Cp	Uncommon	Least concern
Booted Warbler	<i>Hippolais caligata</i> (Lichtenstein 1823)	Acrocephalidae	Insectivorous	Ns	Common	Least concern
Brahminy Myna	<i>Sturnus pagodarum</i> (Gmelin 1789)	Sturnidae	Omnivorous	Cr	Very common	Least concern
Brown Rock-Chat	<i>Cercomela fusca</i> (Blyth 1851)	Muscicapidae	Insectivorous	Cw	Common	Least concern
Brown Shrike	<i>Lanius cristatus</i> Linnaeus 1758	Laniidae	Insectivorous	V	Rare	Least concern
Cinereous Tit	<i>Parus cinereus</i> Vieillot 1818	Paridae	Omnivorous	Cp	Rare	Least concern
Citrine Wagtail	<i>Motacilla citreola</i> Pallas 1776	Motacillidae	Insectivorous	Cw	Common	Least concern
Common Babbler	<i>Turdoides caudatus</i> (Dumont 1823)	Leiostichidae	Omnivorous	Cr	Common	Least concern
Common Chiffchaff	<i>Phylloscopus collybita</i> (Vieillot 1817)	Phylloscopidae	Insectivorous	Cw	Common	Least concern
Common Myna	<i>Acridotheres tristis</i> (Linnaeus 1766)	Sturnidae	Omnivorous	Cr	Very common	Least concern

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Table 1. Birds with their feeding habits, distribution, occurrence and IUCN status

Name	Scientific name	Family	Feeding habits	Status	Occurrence	IUCN
Greater Whitethroat	<i>Sylvia communis</i> (Latham 1787)	Sylviidae	Insectivorous	V	Rare	Least concern
Crested Lark	<i>Galerida cristata</i> (Linnaeus 1758)	Alaudidae	Omnivorous	Cr	Common	Least concern
Indian Golden Oriole	<i>Oriolus kundoo</i> (Linnaeus 1758)	Oriolidae	Omnivorous	Cs	Common	Least concern
Gray-Throated Martin	<i>Riparia chinensis</i> (Gray JE 1830)	Hirundinidae	Insectivorous	Cr	Uncommon	Least concern
Grey Necked Bunting	<i>Emberiza buchanani</i> Blyth 1845	Emberizidae	Granivorous	V	Uncommon	Least concern
Grey Wagtail	<i>Motacilla cinerea</i> Tunstall 1771	Motacillidae	Insectivorous	Nw	Common	Least concern
House Crow	<i>Corvus splendens</i> Vieillot 1817	Corvidae	Omnivorous	Cr	Very common	Least concern
Indian Robin	<i>Saxicoloides fulicata</i> (Linnaeus 1776)	Muscicapidae	Insectivorous	Cr	Very common	Least concern
Indian Silverbill	<i>Lonchura malabarica</i> (Linnaeus 1758)	Estrildidae	Granivorous	Cr	Very common	Least concern
Jungle Babbler	<i>Turdoides striatus</i> (Dumont 1823)	Leiotherichidae	Omnivorous	Cr	Very common	Least concern
Large Grey Babbler	<i>Turdoides malcolmi</i> (Sykes 1832)	Leiotherichidae	Omnivorous	Cr	Very common	Least concern
Common Lesser Whitethroat	<i>Sylvia curruca</i> (Linnaeus 1758)	Sylviidae	Insectivorous	Nw	Common	Least concern
Oriental Magpie- Robin	<i>Copsychus saularis</i> (Linnaeus 1758)	Muscicapidae	Omnivorous	Cr	Very common	Least concern
Indian White Eye	<i>Zosterops palpebrosa</i> (Temminck 1824)	Zosteropidae	Omnivorous	Nr	Common	Least concern
Paddyfield Pipit	<i>Anthus rufulus</i> Vieillot 1818	Motacillidae	Insectivorous	Cr	Common	Least concern
Pied Bushchat	<i>Saxicola caprata</i> (Linnaeus 1766)	Muscicapidae	Insectivorous	Cr	Common	Least concern
Plain Prinia	<i>Prinia inornata</i> Sykes 1832	Cisticolidae	Insectivorous	Nr	Very common	Least concern
Purple Sunbird	<i>Nectarinia asiatica</i> (Latham 1790)	Nectariniidae	Omnivorous	Cr	Very common	Least concern
Red-Rumped Swallow	<i>Hirundo daurica</i> Linnaeus 1771	Hirundinidae	Insectivorous	Nr	Common	Least concern
Red-vented Bulbul	<i>Pycnonotus cafer</i> (Linnaeus 1766)	Pycnonotidae	Omnivorous	Cr	Very common	Least concern
Richard's Pipit	<i>Anthus richardi</i> Vieillot 1818	Motacillidae	Insectivorous	Np	Common	Least concern
Rock Bunting	<i>Emberiza cia</i> Linnaeus 1766	Emberizidae	Granivorous	V	Uncommon	Least concern
Rosy Pipit	<i>Anthus roseatus</i> Blyth 1847	Motacillidae	Insectivorous	Nw	Common	Least concern
Indian Tree Pie	<i>Dendrocitta vagabunda</i> (Latham 1790)	Corvidae	Omnivorous	Cr	Very common	Least concern
Scaly Thrush	<i>Zoothera dauma</i> (Latham 1790)	Turdidae	Insectivorous	Nw	Rare	Least concern
Siberian Chiffchaff	<i>Phylloscopus tristis</i> (Blyth 1843)	Phylloscopidae	Insectivorous	Cw	Common	Least concern
Siberian Stonechat	<i>Saxicola maurus</i> (Pallas 1773)	Muscicapidae	Insectivorous	Cr	Very common	Least concern
Sind Sparrow	<i>Passer pyrrhonotus</i> Blyth 1844	Passeridae	Granivorous	Lcr	Uncommon	Least concern
Scaly- breasted Munia	<i>Lonchura punctulata</i> (Linnaeus 1758)	Estrildidae	Omnivorous	Cr	Very common	Least concern
Zitting Cisticola	<i>Cisticola juncidis</i> (Rafinesque 1810)	Cisticolidae	Insectivorous	Cr	Very common	Least concern
Sykes's Warbler	<i>Iduna rama</i> (Sykes 1832)	Acrocephalidae	Insectivorous	Cr	Common	Least concern
Tailor Bird	<i>Orthotomus sutorius</i> (Pennant 1769)	Cisticolidae	Omnivorous	Cr	Very common	Least concern
Eurasian Tree Pipit	<i>Anthus trivialis</i> (Linnaeus 1758)	Motacillidae	Omnivorous	Nw	Very common	Least concern
Verditer Flycatcher	<i>Eumyias thalassina</i> (Swainson 1838)	Muscicapidae	Insectivorous	Nw	Rare	Least concern
Western Yellow Headed Wagtail	<i>Motacilla flava</i> Linnaeus 1758	Motacillidae	Insectivorous	Cw	Common	Least concern
White Tailed Stonechat	<i>Saxicola leucurus</i> (Blyth 1847)	Muscicapidae	Insectivorous	Lcr	Common	Least concern
White Wagtail	<i>Motacilla alba</i> Linnaeus 1758	Motacillidae	Insectivorous	Cw	Common	Least concern
Wire-Tailed Swallow	<i>Hirundo smithii</i> Leach 1818	Hirundinidae	Insectivorous	Cs	Common	Least concern
Yellow Eyed Babbler	<i>Chrysomma sinense</i> (Gmelin 1789)	Paradoxornithidae	Omnivorous	Cr	Uncommon	Least concern
Streaked Weaver	<i>Ploceus manyar</i> (Horsfield 1821)	Ploceidae	Insectivorous	Cr	Uncommon	Least concern
Asian Paradise-Flycatcher	<i>Terpsiphone paradisi</i> (Linnaeus 1758)	Monarchidae	Insectivorous	Ns	Rare	Least concern

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Table 1. Birds with their feeding habits, distribution, occurrence and IUCN status

Name	Scientific name	Family	Feeding habits	Status	Occurrence	IUCN
European Starling	<i>Sturnus vulgaris</i> Linnaeus 1758	Sturnidae	Insectivorous	Cr	Very common	Least concern
Grey Headed CanaryFlycatcher	<i>Culicicapa ceylonensis</i> (Swainson 1820)	Stenostiridae	Insectivorous	Nw	Rare	Least concern
Common Woodshrike	<i>Tephrodornis pondicerianus</i> (Gmelin 1789)	Vangidae	Insectivorous	Cr	Uncommon	Least concern
House Sparrow	<i>Passer domesticus</i> (Linnaeus 1758)	Passeridae	Granivorous	Cr	Uncommon	Least concern
Jungle Myna	<i>Acridotheres fuscus</i> (Wagler 1827)	Sturnidae	Insectivorous	Cr	Rare	Least concern
Blue Whistling Thrush	<i>Myophonus caeruleus</i> (Scopoli 1786)	Muscicapidae	Insectivorous	Nw	Rare	Least concern
Indian Pitta	<i>Pitta brachyura</i> (Linnaeus 1766)	Pittidae	Insectivorous	Ns	Rare	Least concern
Red-Headed Bunting	<i>Emberiza bruniceps</i> Brandt 1841	Emberizidae	Granivorous	Np	Rare	Least concern
Red Avadavat	<i>Amandava amandava</i> (Linnaeus 1758)	Estrildidae	Granivorous	Nr	Uncommon	Least concern
Streak Throated Swallow	<i>Hirundo fluvicola</i> Blyth 1855	Hirundinidae	Insectivorous	Nr	Common	Least concern
Indian Bushlark	<i>Mirafra erythroptera</i> Blyth 1845	Alaudidae	Insectivorous	Cr	Common	Least concern
Rufous-fronted Prinia	<i>Prinia buchanani</i> Blyth 1844	Cisticolidae	Insectivorous	Cr	Uncommon	Least concern
Gray-breasted Prinia	<i>Prinia hodgsonii</i> Blyth 1844	Cisticolidae	Insectivorous	Nr	Uncommon	Least concern
Long-billed Pipit	<i>Anthus similis</i> Jerdon 1840	Motacillidae	Insectivorous	Nw	Common	Least concern
Hume's Warbler	<i>Phylloscopus humei</i> (Brooks 1878)	Phylloscopidae	Insectivorous	Nw	Common	Least concern
Red-breasted Flycatcher	<i>Ficedula parva</i> (Bechstein 1792)	Muscicapidae	Frugivores	Nw	Uncommon	Least concern
Black Breasted weaver	<i>Ploceus benghalensis</i> (Linnaeus 1758)	Ploceidae	Granivorous	Cr	Uncommon	Least concern
Graceful Prinia	<i>Prinia gracilis</i> (Lichtenstein 1823)	Cisticolidae	Insectivorous	Nr	Common	Least concern
Asian brown flycatcher	<i>Muscicapa dauurica</i> Pallas 1811	Muscicapidae	Insectivorous	Nw	Uncommon	Least concern
Variable wheatear	<i>Oenanthe picata</i> (Blyth 1847)	Muscicapidae	Insectivorous	Cw	Common	Least concern
Greenish Leaf-Warbler	<i>Phylloscopus trochiloides</i> (Sundevall 1837)	Phylloscopidae	Insectivorous	Cp	Uncommon	Least concern
Oriental Tree Pipit	<i>Anthus hodgsoni</i> Richmond 1907	Motacillidae	Insectivorous	Cw	Common	Least concern
Great Tit	<i>Parus major</i> Linnaeus 1758	Paridae	Insectivorous	Cw	Common	Least concern
Eurasian Skylark	<i>Alauda arvensis</i> Linnaeus 1758	Alaudidae	Insectivorous	Nw	Common	Least concern
Desert Wheatear	<i>Oenanthe deserti</i> (Temminck 1825)	Muscicapidae	Insectivorous	Nw	Uncommon	Least concern
White-eared Bulbul	<i>Pycnonotus leucotis</i> (Gould 1836)	Pycnonotidae	Insectivorous	Nr	Uncommon	Least concern
Black-headed Oriole	<i>Oriolus xanthornus</i> (Linnaeus 1758)	Oriolidae	Omnivorous	Nr	Common	Least concern
Order: Pelecaniformes						
Black Headed White Ibis	<i>Threskiornis melanocephalus</i> (Latham 1790)	Threskiornithidae	Carnivorous	Nr	Common	Near threatened
Cattle Egret	<i>Bubulcus ibis</i> (Linnaeus 1758)	Ardeidae	Carnivorous	Cr	Very common	Least concern
Eurasian Spoonbill	<i>Platalea leucorodia</i> Linnaeus 1758	Threskiornithidae	Carnivorous	Nr	Rare	Least concern
Grey Heron	<i>Ardea cinerea</i> Linnaeus 1758	Ardeidae	Carnivorous	Cr	Uncommon	Least concern
Indian Pond Heron	<i>Ardeola grayii</i> (Sykes 1832)	Ardeidae	Carnivorous	Cr	Very common	Least concern
Intermediate Egret	<i>Egretta intermedia</i> Wagler 1829	Ardeidae	Carnivorous	Cr	Very common	Least concern
Great Egret	<i>Egretta alba</i> Linnaeus 1758	Ardeidae	Carnivorous	Cr	Uncommon	Least concern
Little Egret	<i>Egretta garzetta</i> (Linnaeus 1766)	Ardeidae	Carnivorous	Cr	Very common	Least concern
Night Heron	<i>Nycticorax nycticorax</i> (Linnaeus 1758)	Ardeidae	Carnivorous	Cr	Very common	Least concern
Purple Heron	<i>Ardea purpurea</i> Linnaeus 1766	Ardeidae	Carnivorous	Nr	Common	Least concern

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Table 1. Birds with their feeding habits, distribution, occurrence and IUCN status

Name	Scientific name	Family	Feeding habits	Status	Occurrence	IUCN
Red- Naped Ibis	<i>Pseudibis papillosa</i> (Temminck 1824)	Threskiornithidae	Carnivorous	Nr	Very common	Least concern
Yellow Bittern	<i>Ixobrychus sinensis</i> (Gmelin 1789)	Ardeidae	Carnivorous	Ns	Rare	Least concern
Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i> (Gmelin 1789)	Ardeidae	Carnivorous	Ns	Rare	Least concern
Striated Heron	<i>Butorides striata</i> (Linnaeus 1758)	Ardeidae	Carnivorous	Nr	Rare	Least concern
Order: Piciformes						
Brown Headed Barbet	<i>Megalaima zeylanica</i> (Gmelin 1788)	Megalaimidae	Frugivores	Cr	Common	Least concern
Coppersmith Barbet	<i>Megalaima haemacephala</i> (P.L.S. Müller 1776)	Megalaimidae	Frugivores	Cr	Common	Least concern
Lesser Goldenbacked Woodpecker	<i>Dinopium benghalense</i> (Linnaeus 1758)	Picidae	Omnivorous	Cr	Common	Least concern
Yellow Crowned Woodpecker	<i>Leipicus mahattensis</i> (Latham 1801)	Picidae	Insectivorous	Cr	Rare	Least concern
Order: Podicipediformes						
Little Grebe	<i>Tachybaptus ruficollis</i> (Pallas 1764)	Podicipedidae	Carnivorous	Cr	Very common	Least concern
Order: Psittaciformes						
Alexandrine Parakeet	<i>Psittacula eupatria</i> (Linnaeus 1766)	Psittaculidae	Frugivores	Cr	Common	Near threatened
Plum Headed Parakeet	<i>Psittacula cyanocephala</i> (Linnaeus 1766)	Psittaculidae	Frugivores	Cr	Uncommon	Least concern
Rose Ringed Parakeet	<i>Psittacula krameri</i> (Scopoli 1769)	Psittaculidae	Frugivores	Cr	Very common	Least concern
Order: Strigiformes						
Barn Owl	<i>Tyto alba</i> (Scopoli 1769)	Tytonidae	Carnivorous	Cr	Uncommon	Least concern
Indian Scops Owl	<i>Otus bakkamoena</i> Pennant 1769	Strigidae	Carnivorous	Nr	Common	Least concern
Spotted Owlet	<i>Athene brama</i> (Temminck 1821)	Strigidae	Carnivorous	Cr	Very common	Least concern
Order: suliformes						
Great Cormorant	<i>Phalacrocorax carbo</i> (Linnaeus 1758)	Phalacrocoracidae	Carnivorous	Cr	Uncommon	Least concern
Little Cormorant	<i>Phalacrocorax niger</i> (Vieillot 1817)	Phalacrocoracidae	Carnivorous	Cr	Common	Least concern
Oriental Darter	<i>Anhinga melanogaster</i> Pennant 1769	Anhingidae	Carnivorous	Lcr	Rare	Near threatened

Common resident (cr), common passage migrant (cp), common summer visitor (cs), common winter visitor (cw), locally common resident (lcr), locally common winter visitor (lcw), not common passage migrant (np), not common resident (nr), not common summer visitor (ns), not common winter visitor (nw), not common winter visitor and passage migrant (nwp), vagrant (v)

species. It is believed that moderate level of urban development shows higher species diversity and abundance, moreover species diversity decreases with urban development but at the same time abundance of urban dwelling birds increases Sengupta et al (2014). Most of the species unused or partially used land for residence shows more species diversity. The species which shows multiple broods per year such as pigeons increased with urban development as this phenomenon offers maximum nesting and foraging to these birds (Blair 2004).

CONCLUSION

Total of 204 bird species belonging to 18 orders and 58 families were recorded. Most of the birds found during survey were listed under Least Concern category of Red List of IUCN, but few of them were listed under vulnerable, near

threatened and endangered categories. The maintaining more woodlands and green areas with more heterogeneity is the only way to conserve the avian biodiversity. Similarly, most of the earlier workers have suggested the importance of green spaces with structural diversity in vegetation, which help to develop various resources to bird diversity and other wildlife animals. It is a major responsibility of the state government, Municipal Corporation and state agencies to develop the habitats with native species of plants and maintain structural diversity that can help to restore the biodiversity.

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