



## Gaurishankar Lake (Bortalav): A paradise for avifaunal diversity in the urban area of Bhavnagar, Gujarat, India

Vishal M Makwana<sup>1\*</sup>, Pravinsang P Dodia<sup>2</sup>

<sup>1</sup> Research Scholar, Department of Zoology, Sir P. P. Institute of Science, M. K. Bhavnagar University, Bhavnagar, Gujarat, India

<sup>2</sup> Associate Professor, Department of Zoology, Sir P. P. Institute of Science, M. K. Bhavnagar University, Bhavnagar, Gujarat, India

### Abstract

Birds are distributed worldwide with their diverse ecological functions in different types of ecosystems. The present study was conducted to estimate the avifaunal diversity in one of the urban water reservoirs of Bhavnagar city - Gaurishankar Lake, popularly known as Bortalav and its adjoining areas from December 2020 to November 2021. Bortalav and its adjoining areas are situated in the urban landscape of Bhavnagar consisting of various types of habitats that attracts different varieties of avifauna. India has around 1341 species of birds recorded so far, out of which 612 are reported from Gujarat. The present study recorded 235 species (21 Orders, 65 Families and 155 Genera) with maximum diversity of order Passeriformes (84 species). Out of total 235 species, 220 species are under Least concern category, 10 species are Near threatened, 4 species are Vulnerable and a species (*Aquila nipalensis*) is under Endangered category of IUCN. Among the recorded species, 103 species are Common, 80 species are Uncommon, 41 species are Occasional and 11 species are Rare in the study area. The present study denotes the status of avifaunal diversity of Bortalav provided with its present threats to the habitat and birds which will aid in future research perspective and conservation strategies.

**Keywords:** avifauna, wetland, diversity, checklist, Bortalav, Bhavnagar

### Introduction

Birds are found in various habitats throughout the world and are ecologically diverse and well-studied than other vertebrate groups. They have a tremendous role in ecosystem services like pollination, pest control, seed dispersal, scavenging, cycling the nutrients, etc (Whelan et al., 2016) <sup>[16]</sup>. Additionally, Birds support numerous other taxa and act as indicator species of different habitats. There are 11,158 extant species of birds reported worldwide (HBW and Bird Life International, 2020) <sup>[9]</sup>, out of which 1341 species (26 orders, 113 families and 489 genera) are recorded from India (Praveen et al., 2021) <sup>[14]</sup> of which 612 species are recorded from Gujarat (Ganpule, 2021) <sup>[7]</sup>.

Bhavnagar is a coastal district situated on the western coast of the Gulf of Khambhat in the Saurashtra peninsula of Gujarat. It has a hot semi-arid climate, with an average annual temperature of 28 °C and annual precipitation of about 658 mm/year. Bortalav is a manmade water reservoir situated in the city of Bhavnagar. The eastern periphery of around 1500 m of Bortalav is separated by a road from an adjoining reserve forest area known as Victoria Park Reserve Forest. The southern and western boundaries are adjoining the agricultural fields and settlements while the northern part is developed as recreational area and garden for citizens of the city. The geography and climatic conditions of Bhavnagar provides suitable habitat for residential as well as migratory species of birds (Dodia and Chavda, 2012; Parekh and Gadhvi, 2013) <sup>[5, 12]</sup>.

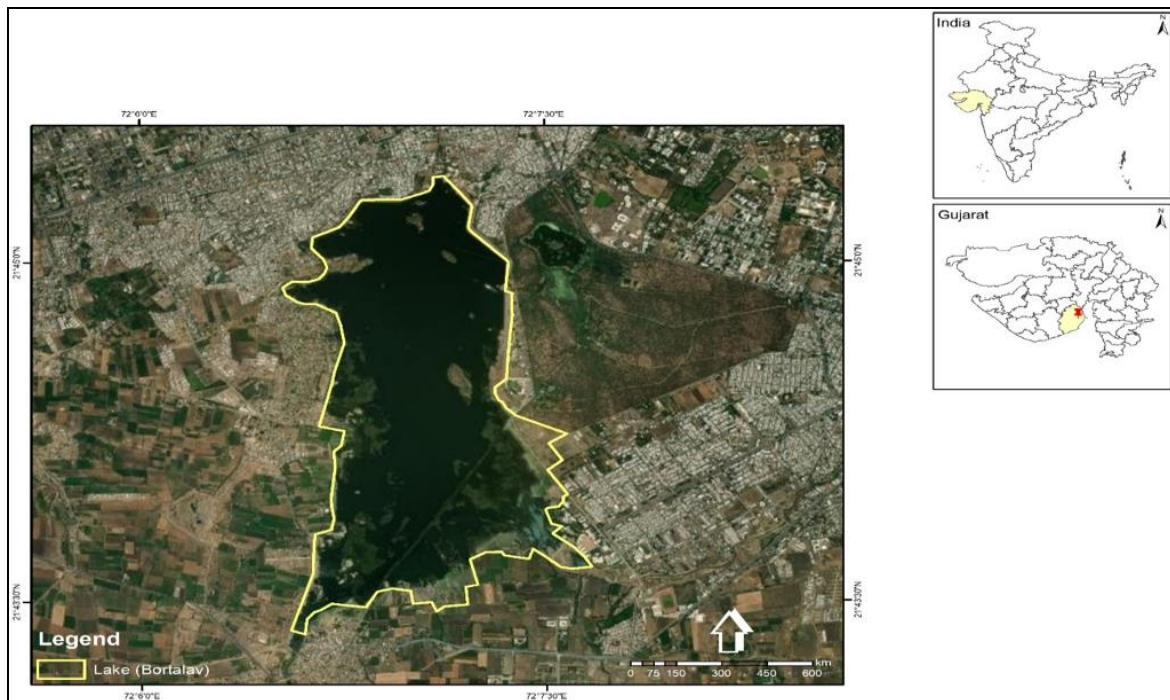
Around 2,000 species of birds occur in urban areas (Aronson et al., 2014) <sup>[3]</sup>. The increase in urban areas ultimately leads to habitat alteration, fragmentation and deprivation of native flora and fauna. Due to the significant and diverse role of birds in the ecosystem, it is anticipated that assessment of bird diversity will provide the fitness of habitat. The importance of different habitats altogether with their conservation value can be preliminarily assessed by investigating the avifaunal diversity inhabiting them (Benzizerara et al., 2013) <sup>[4]</sup>. Bortalav is under the pressure of urbanization due to developmental activities going on in the area and also facing threats of mining and agricultural expansion. Therefore, this paper presents an assessment of the avifaunal diversity of Bortalav and its adjoining areas.

### Materials and Methods

#### Study area

Bortalav (21°44'53.92"N, 72° 7'15.68"E) is situated adjoining the southern parts of Bhavnagar city. It is a water reservoir comprising about 380 ha of area. The present study was conducted in about 404 ha of area (Figure 1) covering the adjoining parts of the Bortalav except for Victoria Park Reserve Forest. Most parts of the study area

are freshwater habitats while the adjoining area comprises some agricultural fields, small patches of shrubland and grasslands. Shrubland habitat is dominated by *Prosopis juliflora*. Some of the most common plant species found in the study area are *Azadirachta indica*, *Delonix regia*, *Mimusops elengi*, *Ziziphus nummularia*, *Ziziphus mauritiana*, *Acacia nilotica*, *Acacia senegal*, *Acacia leucophloea*, *Prosopis juliflora*, *Balanites aegyptiaca*, *Cassia tora*, *Senna auriculata*, *Maytenus senegalensis*, *Calotropis procera*, *Cynodon dactylon*, *Tridax procumbens*, *Cenchrus biflorus*, *Ocimum sp.*, *Datura sp.*, *Cenchrus ciliaris*, etc.



**Fig 1:** Study Site Map: Gaurishankar Lake (Bortalav) and its adjoining areas, Bhavnagar, Gujarat, India.

### Methodology

The present study was conducted for the span of 12 months starting from December 2020 to November 2021 covering all seasons. The study area was surveyed twice a month and includes a total of 24 visits. The survey was carried out in the morning (6:30 to 9:30 hrs) and evening (15:30 to 18:30 hrs) as birds show higher activities during these times. Birds were observed with the help of Nikon Binoculars (ACULON A211 10x50), a Nikon spotting scope (20-60x80), and photographs were taken with Nikon B700 Point and Shoot Camera (60x zoom). Birds were identified using available scientific references and field guides (Ali, 1966; Ali and Ripely, 1966; Grimmett et al., 2011) [2, 1, 8]. Taxonomy of species was followed from Praveen et al., (2021) [14]. The occurrence of species in the study area was also reported based on the number of sightings during the study period as Common (> 12 visits), Uncommon (6 – 12 visits), Occasional (3 – 6 visits), and Rare (1 – 3 visits). The residential status of birds was categorized as Residential (Re), Migratory (M), Passage Migrant (PM), and Residential and Migratory (Re & M) as per Ganpule (2016) [6].

### Result and Discussion

The present study reported 235 species of birds belonging to 21 orders, 65 families, and 155 genera (Table 1) in Bortalav, Bhavnagar, Gujarat, India. The result shows that the highest number of species belongs to the order Passeriformes (28 families, 53 genera, 84 species) followed by Charadriiformes (9 families, 25 genera, 42 species), Pelecaniformes (3 families, 12 genera, 17 species), Anseriformes (1 family, 9 genera, 16 species), Accipitriformes (2 families, 12 genera, 15 species) and other families in Figure 2 and 3. Gujarat has reported 612 species of Birds (Ganpule, 2021) [7]. Bortalav approximately represents 38.4 % of avifaunal diversity found in Gujarat.

Out of all the species recorded, 220 species (~ 94 %) belong to the Least Concern (LC) category, 10 species (~ 4 %) namely *Phoenicaias minor*, *Esacus recurvirostris*, *Limosa limosa*, *Ciconia episcopus*, *Mycteria leucocephala*, *Anhinga melanogaster*, *Pelecanus crispus*, *Threskiornis melanocephalus*, *Falco chicquera*, *Psittacula eupatria* are Near Threatened (NT), 4 species (~ 2 %) namely *Aythya farina*, *Sterna aurantia*, *Clanga clanga*, and *Aquila heliaca* are in Vulnerable (VU) category, and 1 species (~ 0.4 %) namely *Aquila nipalensis* is in Endangered (EN) category of IUCN (2021) (Figure 4).

The occurrence of species (Figure 5) found in the study area suggests that 103 species (~ 44 %) are Common, 80 species (~ 34 %) are Uncommon, 41 species (~ 17 %) are Occasional, and 11 species (~ 5 %) are Rare (Figure 3). The residential status in Gujarat of the recorded species having 131 species as Residential (Re), 9 species as Residential and Migratory (Re & M), 90 species as Migratory (M), and 5 species as Passage Migrant (PM) (Ganpule, P., 2016) [6].

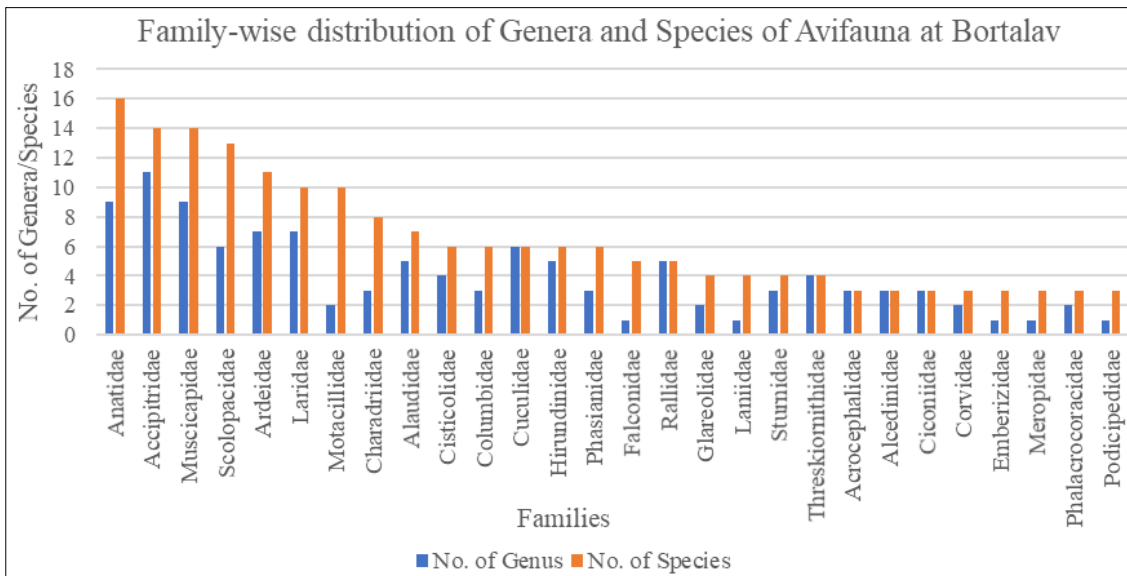


Fig 2: Family-wise distribution of Genera and Species of Avifauna at Bortalav, Bhavnagar, Gujarat.

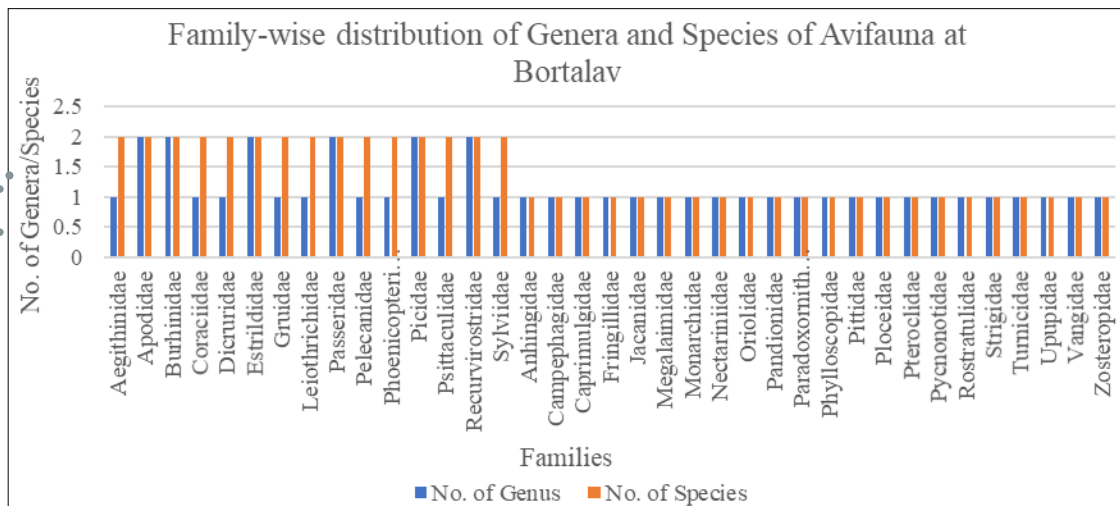


Fig 3: Family-wise distribution of Genera and Species of Avifauna at Bortalav, Bhavnagar, Gujarat.

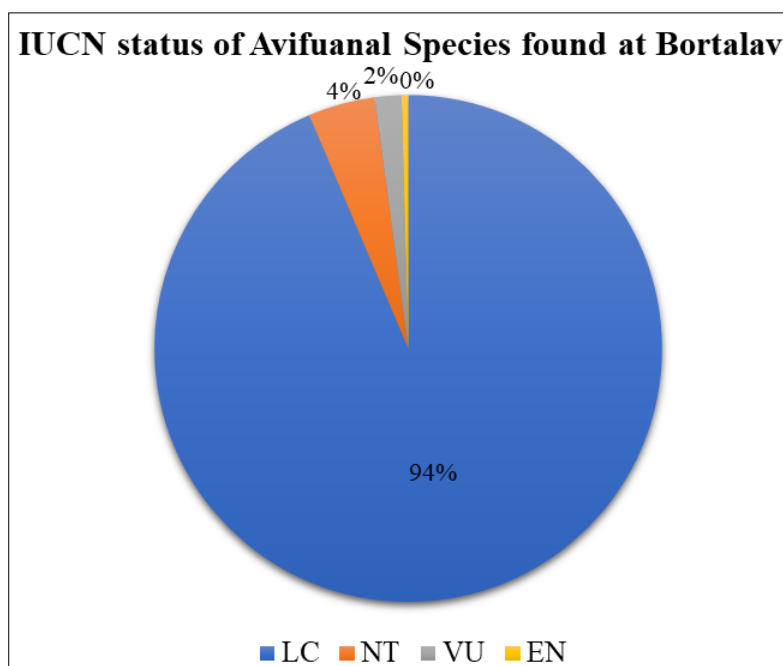
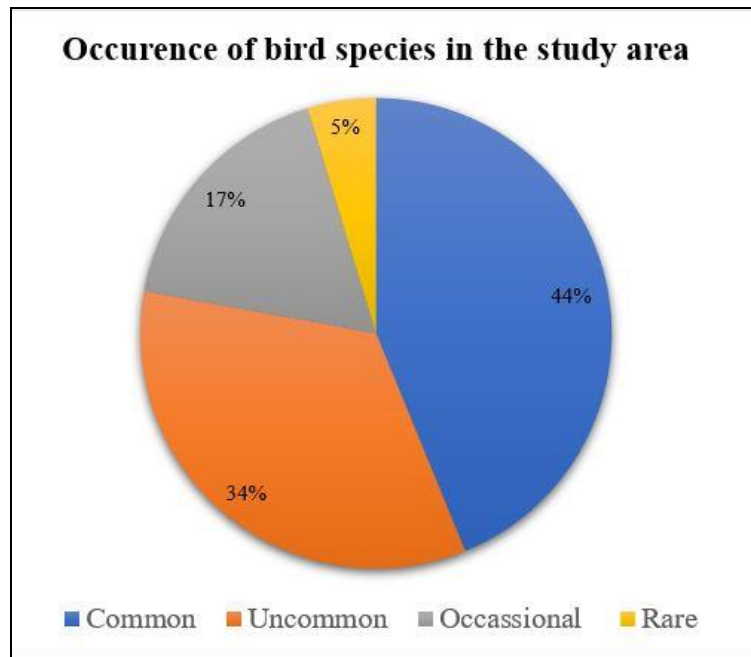


Fig 4: IUCN status of Avifauna found at Bortalav, Bhavnagar, Gujarat (LC = Least concern, NT = Near threatened, VU = Vulnerable, EN = Endangered)



**Fig 5:** Occurrence of bird species in the study area

Dodia and Chavda (2012)<sup>[5]</sup> had reported 223 species of birds from Bortalav and Victoria Park Reserve Forest which is having a diversity of 61 families. The present study reported 235 species belonging to 65 families and 155 genera from Bortalav only. The highest number of bird species belonged to the order Passeriformes (28 Families, 53 Genera, and 84 Species). In India, Order Passeriformes forms the most predominant avian taxon (Praveen et al., 2021)<sup>[14]</sup> and *Muscicapidae* is the largest family (Manakadan and Pittie, 2001)<sup>[11]</sup>. Interestingly, Anatidae showed the highest number of species (9 Genera, 16 Species) followed by Accipitridae (11 Genera, 14 Species) and Muscicapidae (9 Genera, 14 Species) in the present study. There have been many changes at the landscape level going on in Bortalav and its adjoining areas. It contributes to the diversity patterns of birds in this landscape. A similar study was conducted in another productive wetland of Bhavnagar city (Kumbharvada marshland) and had reported 71 species belonging to 27 families (Parekh and Gadhvi, 2013)<sup>[12]</sup>. Another study on the avifauna of selected sites of Visnagar city of North Gujarat (Parihar et al., 2020)<sup>[13]</sup> reported 96 species of birds from 40 different families and a study on Chhaya Rann Wetland of Porbandar (Vargiya and Chakraborty, 2019)<sup>[15]</sup> reported 70 waterbird species belonging to 21 families. Bortalav and its adjoining area holds vast avifaunal diversity and protect some really important bird species in the urban area. However, the continuous anthropogenic pressures such as construction, mining, and expansion of croplands may cause adverse effects on this highly diverse bird habitat.

**Table 1:** Checklist of Avifauna of Bortalav and its adjoining areas, Bhavnagar, Gujarat. (IUCN - LC = Least concern, NT = Near threatened, VU = Vulnerable, EN = Endangered) (Status - RE = Residential, M = Migratory, PM = Passage migrant)(Occurrence - C = Common, U = Uncommon, O = Occasional, R = Rare)

Sr. No.	Scientific Name	English Name	IUCN	Status	Occurrence
Order: Anseriformes Family: Anatidae					
1	<i>Dendrocygna javanica</i> (Horsfield, 1821)	Lesser Whistling Duck	LC	RE	C
2	<i>Anser indicus</i> (Latham, 1790)	Bar-headed Goose	LC	M	U
3	<i>Anser anser</i> (Linnaeus, 1758)	Greylag Goose	LC	M	O
4	<i>Sarkidiornis melanotos</i> (Pennant, 1769)	Knob-billed Duck	LC	RE	C
5	<i>Tadorna ferruginea</i> (Pallas, 1764)	Ruddy Shelduck	LC	M	C
6	<i>Nettapus coromandelianus</i> (J.F. Gmelin, 1789)	Cotton Pygmy Goose	LC	RE	C
7	<i>Spatula querquedula</i> (Linnaeus, 1758)	Garganey	LC	M	C
8	<i>Spatula clypeata</i>	Northern Shoveler	LC	M	C

	( <i>Linnaeus, 1758</i> )				
9	<i>Mareca strepera</i> ( <i>Linnaeus, 1758</i> )	Gadwall	LC	M	C
10	<i>Mareca penelope</i> ( <i>Linnaeus, 1758</i> )	Eurasian Wigeon	LC	M	C
11	<i>Anas poecilorhyncha</i> ( <i>J.R. Forster, 1781</i> )	Indian Spot-billed Duck	LC	RE	C
12	<i>Anas platyrhynchos</i> ( <i>Linnaeus, 1758</i> )	Mallard	LC	M	R
13	<i>Anas acuta</i> ( <i>Linnaeus, 1758</i> )	Northern Pintail	LC	M	C
14	<i>Anas crecca</i> ( <i>Linnaeus, 1758</i> )	Common Teal	LC	M	C
15	<i>Aythya ferina</i> ( <i>Linnaeus, 1758</i> )	Common Pochard	VU	M	C
16	<i>Aythya fuligula</i> ( <i>Linnaeus, 1758</i> )	Tufted Duck	LC	M	U
Order: Galliformes Family: Phasianidae					
17	<i>Pavo cristatus</i> ( <i>Linnaeus, 1758</i> )	Indian Peafowl	LC	RE	C
18	<i>Coturnix coromandelica</i> ( <i>J.F. Gmelin, 1789</i> )	Rain Quail	LC	M	O
19	<i>Perdica asiatica</i> ( <i>Latham, 1790</i> )	Jungle Bush Quail	LC	RE	R
20	<i>Perdica argoondah</i> ( <i>Sykes, 1832</i> )	Rock Bush Quail	LC	RE	O
21	<i>Francolinus pictus</i> ( <i>Jardine &amp; Selby, 1828</i> )	Painted Francolin	LC	RE	U
22	<i>Francolinus pondicerianus</i> ( <i>J.F. Gmelin, 1789</i> )	Grey Francolin	LC	RE	C
Order: Phoenicopteriformes Family: Phoenicopteridae					
23	<i>Phoenicopus roseus</i> ( <i>Pallas, 1811</i> )	Greater Flamingo	LC	RE	U
24	<i>Phoeniconaias minor</i> ( <i>E. Geoffroy Saint-Hilaire, 1798</i> )	Lesser Flamingo	NT	RE	U
Order: Podicipediformes Family: Podicipedidae					
25	<i>Tachybaptus ruficollis</i> ( <i>Pallas, 1764</i> )	Little Grebe	LC	RE	C
26	<i>Podiceps cristatus</i> ( <i>Linnaeus, 1758</i> )	Great Crested Grebe	LC	RE	C
27	<i>Podiceps nigricollis</i> ( <i>C.L. Brehm, 1831</i> )	Black-necked Grebe	LC	M	R
Order: Columbiformes Family: Columbidae					
28	<i>Columba livia</i> ( <i>J.F. Gmelin, 1789</i> )	Rock Pigeon	LC	RE	C
29	<i>Streptopelia decaocto</i> ( <i>Frivaldszky, 1838</i> )	Eurasian Collared Dove	LC	RE	C
30	<i>Streptopelia tranquebarica</i> ( <i>Hermann, 1804</i> )	Red Collared Dove	LC	RE	U
31	<i>Streptopelia chinensis</i> ( <i>Scopoli, 1786</i> )	Spotted Dove	LC	RE	U
32	<i>Streptopelia senegalensis</i> ( <i>Linnaeus, 1766</i> )	Laughing Dove	LC	RE	C
33	<i>Treron phoenicopterus</i> ( <i>Latham, 1790</i> )	Yellow-footed Green Pigeon	LC	RE	C
Order: Pteroclitiformes Family: Pteroclitidae					
34	<i>Pterocles exustus</i> ( <i>Temminck, 1825</i> )	Chestnut-bellied Sandgrouse	LC	RE	O

Order: Cuculiformes Family: Cuculidae					
35	<i>Centropus sinensis</i> (Stephens, 1815)	Greater Coucal	LC	RE	C
36	<i>Taccocua leschenaultii</i> (Lesson, 1830)	Sirkeer Malkoha	LC	RE	O
37	<i>Clamator jacobinus</i> (Boddaert, 1783)	Pied Cuckoo	LC	M	C
38	<i>Eudynamys scolopaceus</i> (Linnaeus, 1758)	Asian Koel	LC	RE	C
39	<i>Hierococcyx varius</i> (Vahl, 1797)	Common Hawk Cuckoo	LC	RE & M	C
40	<i>Cacomantis passerinus</i> (Vahl, 1797)	Grey-bellied Cuckoo	LC	RE & M	O
Order: Caprimulgiformes Family: Caprimulgidae					
41	<i>Caprimulgus asiaticus</i> (Latham, 1790)	Indian Nightjar	LC	RE	C
Family: Apodidae					
42	<i>Apus affinis</i> (J.E. Gray, 1830)	Indian House Swift	LC	RE	C
43	<i>Cypsiurus balasiensis</i> (J.E. Gray, 1829)	Asian Palm Swift	LC	RE	C
Order: Gruiformes Family: Rallidae					
44	<i>Gallinula chloropus</i> (Linnaeus, 1758)	Common Moorhen	LC	RE	C
45	<i>Fulica atra</i> (Linnaeus, 1758)	Eurasian Coot	LC	RE	C
46	<i>Porphyrio poliocephalus</i> (Latham, 1801)	Grey-headed Swamphen	LC	RE	C
47	<i>Amaurornis phoenicurus</i> (Pennant, 1769)	White-breasted Waterhen	LC	RE	C
48	<i>Zapornia pusilla</i> (Pallas, 1776)	Baillon's Crane	LC	M	U
Family: Gruidae					
49	<i>Grus virgo</i> (Linnaeus, 1758)	Demoiselle Crane	LC	M	U
50	<i>Grus grus</i> (Linnaeus, 1758)	Common Crane	LC	M	U
Order: Charadriiformes Family: Burhinidae					
51	<i>Burhinus indicus</i> (Salvadori, 1865)	Indian Thick-knee	LC	RE	U
52	<i>Esacus recurvirostris</i> (Cuvier, 1829)	Great Thick-knee	NT	RE	O
Family: Recurvirostridae					
53	<i>Himantopus himantopus</i> (Linnaeus, 1758)	Black-winged Stilt	LC	RE	C
54	<i>Recurvirostra avosetta</i> (Linnaeus, 1758)	Pied Avocet	LC	M	U
Family: Charadriidae					
55	<i>Pluvialis squatarola</i> (Linnaeus, 1758)	Grey Plover	LC	M	O
56	<i>Pluvialis fulva</i> (J.F. Gmelin, 1789)	Pacific Golden Plover	LC	M	O
57	<i>Vanellus malabaricus</i> (Boddaert, 1783)	Yellow-wattled Lapwing	LC	RE	U
58	<i>Vanellus indicus</i> (Boddaert, 1783)	Red-wattled Lapwing	LC	RE	C
59	<i>Vanellus leucurus</i> (M.H.C. Lichtenstein, 1823)	White-tailed Lapwing	LC	M	O

60	<i>Charadrius alexandrinus</i> (Linnaeus, 1758)	Kentish Plover	LC	M	O
61	<i>Charadrius mongolus</i> (Pallas, 1776)	Lesser Sand Plover	LC	M	O
62	<i>Charadrius dubius</i> (Scopoli, 1786)	Little Ringed Plover	LC	RE	U
Family: Rostratulidae					
63	<i>Rostratula benghalensis</i> (Linnaeus, 1758)	Greater Painted-snipe	LC	RE	U
Family: Jacanidae					
64	<i>Hydrophasianus chirurgus</i> (Scopoli, 1786)	Pheasant-tailed Jacana	LC	RE	C
Family: Scolopacidae					
65	<i>Limosa limosa</i> (Linnaeus, 1758)	Black-tailed Godwit	NT	M	C
66	<i>Calidris pugnax</i> (Linnaeus, 1758)	Ruff	LC	M	C
67	<i>Calidris temminckii</i> (Leisler, 1812)	Temminck's Stint	LC	M	U
68	<i>Calidris minuta</i> (Leisler, 1812)	Little Stint	LC	M	U
69	<i>Gallinago gallinago</i> (Linnaeus, 1758)	Common Snipe	LC	M	U
70	<i>Xenus cinereus</i> (Güldenstädt, 1775)	Terek Sandpiper	LC	M	R
71	<i>Actitis hypoleucos</i> (Linnaeus, 1758)	Common Sandpiper	LC	M	C
72	<i>Tringa ochropus</i> (Linnaeus, 1758)	Green Sandpiper	LC	M	C
73	<i>Tringa erythropus</i> (Pallas, 1764)	Spotted Redshank	LC	M	U
74	<i>Tringa nebularia</i> (Gunnerus, 1767)	Common Greenshank	LC	M	C
75	<i>Tringa stagnatilis</i> (Bechstein, 1803)	Marsh Sandpiper	LC	M	C
76	<i>Tringa glareola</i> (Linnaeus, 1758)	Wood Sandpiper	LC	M	C
77	<i>Tringa totanus</i> (Linnaeus, 1758)	Common Redshank	LC	M	C
Family: Turnicidae					
78	<i>Turnix suscitator</i> (J.F. Gmelin, 1789)	Barred Buttonquail	LC	RE	C
Family: Glareolidae					
79	<i>Cursorius coromandelicus</i> (J.F. Gmelin, 1789)	Indian Courser	LC	RE	O
80	<i>Glareola pratincola</i> (Linnaeus, 1766)	Collared Pratincole	LC	RE	O
81	<i>Glareola maldivarum</i> (J.R. Forster, 1795)	Oriental Pratincole	LC	RE	O
82	<i>Glareola lactea</i> (Temminck, 1820)	Small Pratincole	LC	RE	O
Family: Laridae					
83	<i>Chroicocephalus genei</i> (Breme, 1839)	Slender-billed Gull	LC	RE & M	U
84	<i>Chroicocephalus ridibundus</i> (Linnaeus, 1766)	Black-headed Gull	LC	M	C
85	<i>Chroicocephalus brunnicephalus</i> (Jerdon, 1840)	Brown-headed Gull	LC	M	C
86	<i>Ichthyaetus ichthyaetus</i> (Pallas, 1773)	Pallas's Gull	LC	M	U
87	<i>Sternula albifrons</i> (Pallas, 1764)	Little Tern	LC	RE	U

88	<i>Gelochelidon nilotica</i> (J.F. Gmelin, 1789)	Gull-billed Tern	LC	M	O
89	<i>Hydroprogne caspia</i> (Pallas, 1770)	Caspian Tern	LC	RE	U
90	<i>Chlidonias hybrida</i> (Pallas, 1811)	Whiskered Tern	LC	M	C
91	<i>Chlidonias leucopterus</i> (Temminck, 1815)	White-winged Tern	LC	M	O
92	<i>Sterna aurantia</i> (J.E. Gray, 1831)	River Tern	VU	RE	C
Order: Ciconiiformes Family: Ciconiidae					
93	<i>Anastomus oscitans</i> (Boddaert, 1783)	Asian Openbill	LC	RE	U
94	<i>Ciconia episcopus</i> (Boddaert, 1783)	Woolly-necked Stork	NT	RE	R
95	<i>Mycteria leucocephala</i> (Pennant, 1769)	Painted Stork	NT	RE	C
Order: Suliformes Family: Anhingidae					
96	<i>Anhinga melanogaster</i> (Pennant, 1769)	Oriental Darter	NT	RE	C
Family: Phalacrocoracidae					
97	<i>Microcarbo niger</i> (Vieillot, 1817)	Little Cormorant	LC	RE	C
98	<i>Phalacrocorax carbo</i> (Linnaeus, 1758)	Great Cormorant	LC	RE	C
99	<i>Phalacrocorax fuscicollis</i> (Stephens, 1826)	Indian Cormorant	LC	RE	C
Order: Pelecaniformes Family: Pelecanidae					
100	<i>Pelecanus onocrotalus</i> (Linnaeus, 1758)	Great White Pelican	LC	M	C
101	<i>Pelecanus crispus</i> (Bruch, 1832)	Dalmatian Pelican	NT	M	U
Family: Ardeidae					
102	<i>Ixobrychus sinensis</i> (J.F. Gmelin, 1789)	Yellow Bittern	LC	M	U
103	<i>Ardea cinerea</i> (Linnaeus, 1758)	Grey Heron	LC	RE	C
104	<i>Ardea purpurea</i> (Linnaeus, 1766)	Purple Heron	LC	RE	C
105	<i>Ardea alba</i> (Linnaeus, 1758)	Great Egret	LC	RE	C
106	<i>Ardea intermedia</i> (Wagler, 1829)	Intermediate Egret	LC	RE	C
107	<i>Egretta garzetta</i> (Linnaeus, 1766)	Little Egret	LC	RE	C
108	<i>Egretta gularis</i> (Bosc, 1792)	Western Reef Egret	LC	RE & M	U
109	<i>Bubulcus ibis</i> (Linnaeus, 1758)	Cattle Egret	LC	RE	C
110	<i>Ardeola grayii</i> (Sykes, 1832)	Indian Pond Heron	LC	RE	C
111	<i>Butorides striata</i> (Linnaeus, 1758)	Striated Heron	LC	RE	O
112	<i>Nycticorax nycticorax</i> (Linnaeus, 1758)	Black-crowned Night Heron	LC	RE	U
Family: Threskiornithidae					
113	<i>Plegadis falcinellus</i> (Linnaeus, 1766)	Glossy Ibis	LC	RE & M	U
114	<i>Threskiornis melanocephalus</i>	Black-headed Ibis	NT	RE	C

	<i>(Latham, 1790)</i>				
115	<i>Pseudibis papillosa</i> <i>(Temminck, 1824)</i>	Red-naped Ibis	LC	RE	C
116	<i>Platalea leucorodia</i> <i>(Linnaeus, 1758)</i>	Eurasian Spoonbill	LC	RE	C
Order: Accipitriformes Family: Accipitridae					
117	<i>Pandion haliaetus</i> <i>(Linnaeus, 1758)</i>	Osprey	LC	M	U
118	<i>Elanus caeruleus</i> <i>(Desfontaines, 1789)</i>	Black-winged Kite	LC	RE	C
119	<i>Pernis ptilorhynchus</i> <i>(Temminck, 1821)</i>	Oriental Honey Buzzard	LC	RE & M	U
120	<i>Circaetus gallicus</i> <i>(J.F. Gmelin, 1788)</i>	Short-toed Snake Eagle	LC	RE	O
121	<i>Clanga clanga</i> <i>(Pallas, 1811)</i>	Greater Spotted Eagle	VU	M	O
122	<i>Hieraaetus pennatus</i> <i>(J.F. Gmelin, 1788)</i>	Booted Eagle	LC	M	O
123	<i>Aquila nipalensis</i> <i>(Hodgson, 1833)</i>	Steppe Eagle	EN	M	O
124	<i>Aquila heliaca</i> <i>(Savigny, 1809)</i>	Eastern Imperial Eagle	VU	M	R
125	<i>Butastur teesa</i> <i>(Franklin, 1831)</i>	White-eyed Buzzard	LC	RE	O
126	<i>Circus aeruginosus</i> <i>(Linnaeus, 1758)</i>	Western Marsh Harrier	LC	M	C
127	<i>Circus pygargus</i> <i>(Linnaeus, 1758)</i>	Montagu's Harrier	LC	M	U
128	<i>Accipiter badius</i> <i>(J.F. Gmelin, 1788)</i>	Shikra	LC	RE	U
129	<i>Accipiter nisus</i> <i>(Linnaeus, 1758)</i>	Eurasian Sparrowhawk	LC	M	U
130	<i>Milvus migrans</i> <i>(Boddaert, 1783)</i>	Black Kite	LC	RE	U
131	<i>Haliastur indus</i> <i>(Boddaert, 1783)</i>	Brahminy Kite	LC	RE	O
Order: Strigiformes Family: Strigidae					
132	<i>Athene brama</i> <i>(Temminck, 1821)</i>	Spotted Owlet	LC	RE	C
Order: Coraciiformes Family: Alcedinidae					
133	<i>Alcedo atthis</i> <i>(Linnaeus, 1758)</i>	Common Kingfisher	LC	RE	C
134	<i>Halcyon smyrnensis</i> <i>(Linnaeus, 1758)</i>	White-throated Kingfisher	LC	RE	C
135	<i>Ceryle rudis</i> <i>(Linnaeus, 1758)</i>	Pied Kingfisher	LC	RE	C
Family: Meropidae					
136	<i>Merops orientalis</i> <i>(Latham, 1801)</i>	Green Bee-eater	LC	RE	C
137	<i>Merops persicus</i> <i>(Pallas, 1773)</i>	Blue-cheeked Bee-eater	LC	PM	U
138	<i>Merops philippinus</i> <i>(Linnaeus, 1767)</i>	Blue-tailed Bee-eater	LC	RE & M	U
Family: Coraciidae					
139	<i>Coracias garrulus</i> <i>(Linnaeus, 1758)</i>	European Roller	LC	PM	O
140	<i>Coracias benghalensis</i> <i>(Linnaeus, 1758)</i>	Indian Roller	LC	RE	C
Order: Piciformes					

Family: Megalaimidae					
141	<i>Psilopogon haemacephalus</i> (Statius Muller, 1776)	Coppersmith Barbet	LC	RE	C
Family: Picidae					
142	<i>Leiopicus mahrattensis</i> (Latham, 1801)	Yellow-crowned Woodpecker	LC	RE	O
143	<i>Jynx torquilla</i> (Linnaeus, 1758)	Eurasian Wryneck	LC	M	O
Order: Falconiformes Family: Falconidae					
144	<i>Falco tinnunculus</i> (Linnaeus, 1758)	Common Kestrel	LC	M	O
145	<i>Falco chicquera</i> (Daudin, 1800)	Red-necked Falcon	NT	RE	O
146	<i>Falco amurensis</i> (Radde, 1863)	Amur Falcon	LC	PM	R
147	<i>Falco subbuteo</i> (Linnaeus, 1758)	Eurasian Hobby	LC	PM	O
148	<i>Falco peregrinus</i> (Tunstall, 1771)	Peregrine Falcon	LC	RE & M	O
Order: Psittaciformes Family: Psittaculidae					
149	<i>Psittacula eupatria</i> (Linnaeus, 1766)	Alexandrine Parakeet	NT	RE	U
150	<i>Psittacula krameri</i> (Scopoli, 1769)	Rose-ringed Parakeet	LC	RE	C
Order: Passeriformes Family: Pittidae					
151	<i>Pitta brachyura</i> (Linnaeus, 1766)	Indian Pitta	LC	M	O
Family: Campephagidae					
152	<i>Pericrocotus cinnamomeus</i> (Linnaeus, 1766)	Small Minivet	LC	RE	U
Family: Oriolidae					
153	<i>Oriolus kundoo</i> (Sykes, 1832)	Indian Golden Oriole	LC	RE	U
Family: Vangidae					
154	<i>Tephrodornis pondicerianus</i> (J.F. Gmelin, 1789)	Common Woodshrike	LC	RE	O
Family: Aegithinidae					
155	<i>Aegithina tiphia</i> (Linnaeus, 1758)	Common Iora	LC	RE	C
156	<i>Aegithina nigrolutea</i> (G.F.L. Marshall, 1876)	Marshall's Iora	LC	RE	U
Family: Dicruridae					
157	<i>Dicrurus macrocercus</i> (Vieillot, 1817)	Black Drongo	LC	RE	C
158	<i>Dicrurus leucophaeus</i> (Vieillot, 1817)	Ashy Drongo	LC	M	U
Family: Monarchidae					
159	<i>Terpsiphone paradisi</i> (Linnaeus, 1758)	Indian Paradise-flycatcher	LC	RE	U
Family: Laniidae					
160	<i>Lanius isabellinus</i> (Hemprich & Ehrenberg, 1833)	Isabelline Shrike	LC	M	U
161	<i>Lanius cristatus</i> (Linnaeus, 1758)	Brown Shrike	LC	M	U
162	<i>Lanius schach</i> (Linnaeus, 1758)	Long-tailed Shrike	LC	RE	C
163	<i>Lanius vittatus</i> (Valenciennes, 1826)	Bay-backed Shrike	LC	RE	U
Family: Corvidae					

164	<i>Dendrocitta vagabunda</i> (Latham, 1790)	Rufous Treepie	LC	RE	C
165	<i>Corvus macrorhynchos</i> (Wagler, 1827)	Large-billed Crow	LC	RE	C
166	<i>Corvus splendens</i> (Vieillot, 1817)	House Crow	LC	RE	C
Family: Alaudidae					
167	<i>Ammomanes phoenicura</i> (Franklin, 1831)	Rufous-tailed Lark	LC	RE	U
168	<i>Eremopterix griseus</i> (Scopoli, 1786)	Ashy-crowned Sparrow Lark	LC	RE	C
169	<i>Mirafra erythroptera</i> (Blyth, 1845)	Indian Bushlark	LC	RE	U
170	<i>Alaudala raytal</i> (Blyth, 1845)	Sand Lark	LC	RE	U
171	<i>Alauda gulgula</i> (Franklin, 1831)	Oriental Skylark	LC	RE	U
172	<i>Galerida cristata</i> (Linnaeus, 1758)	Crested Lark	LC	RE	C
173	<i>Galerida deva</i> (Sykes, 1832)	Sykes's Lark	LC	RE	U
Family: Cisticolidae					
174	<i>Orthotomus sutorius</i> (Pennant, 1769)	Common Tailorbird	LC	RE	C
175	<i>Prinia hodgsonii</i> (Blyth, 1844)	Grey-breasted Prinia	LC	RE	U
176	<i>Prinia sylvatica</i> (Jerdon, 1840)	Jungle Prinia	LC	RE	U
177	<i>Prinia socialis</i> (Sykes, 1832)	Ashy Prinia	LC	RE	C
178	<i>Prinia inornata</i> (Sykes, 1832)	Plain Prinia	LC	RE	C
179	<i>Cisticola juncidis</i> (Rafinesque, 1810)	Zitting Cisticola	LC	RE	U
Family: Acrocephalidae					
180	<i>Iduna caligata</i> (M.H.C. Lichtenstein, 1823)	Booted Warbler	LC	M	U
181	<i>Acrocephalus dumetorum</i> (Blyth, 1849)	Blyth's Reed Warbler	LC	M	U
182	<i>Acrocephalus stentoreus</i> (Hemprich & Ehrenberg, 1833)	Clamorous Reed Warbler	LC	RE & M	U
Family: Hirundinidae					
183	<i>Riparia riparia</i> (Linnaeus, 1758)	Sand Martin	LC	M	U
184	<i>Ptyonoprogne concolor</i> (Sykes, 1832)	Dusky Crag Martin	LC	RE	C
185	<i>Hirundo rustica</i> (Linnaeus, 1758)	Barn Swallow	LC	M	U
186	<i>Hirundo smithii</i> (Leach, 1818)	Wire-tailed Swallow	LC	RE	U
187	<i>Cecropis daurica</i> (Laxmann, 1769)	Red-rumped Swallow	LC	RE	U
188	<i>Petrochelidon fluvicola</i> (Blyth, 1855)	Streak-throated Swallow	LC	RE	O
Family: Pycnonotidae					
189	<i>Pycnonotus cafer</i> (Linnaeus, 1766)	Red-vented Bulbul	LC	RE	C
Family: Phylloscopidae					
190	<i>Phylloscopus collybita</i> (Vieillot, 1817)	Common Chiffchaff	LC	M	O
Family: Sylviidae					
191	<i>Currucula curruca</i>	Lesser Whitethroat	LC	M	U

	( <i>Linnaeus, 1758</i> )				
192	<i>Curruca crassirostris</i> ( <i>Cretzschmar, 1830</i> )	Eastern Orphean Warbler	LC	M	O
Family: Paradoxornithidae					
193	<i>Chrysomma sinense</i> ( <i>J.F. Gmelin, 1789</i> )	Yellow-eyed Babbler	LC	RE	U
Family: Zosteropidae					
194	<i>Zosterops palpebrosus</i> ( <i>Temminck, 1824</i> )	Indian White-eye	LC	RE	C
Family: Leiothrichidae					
195	<i>Argya caudata</i> ( <i>Dumont, 1823</i> )	Common Babbler	LC	RE	C
196	<i>Argya malcolmi</i> ( <i>Sykes, 1832</i> )	Large Grey Babbler	LC	RE	C
Family: Sturnidae					
197	<i>Pastor roseus</i> ( <i>Linnaeus, 1758</i> )	Rosy Starling	LC	M	C
198	<i>Sturnia pagodarum</i> ( <i>J.F. Gmelin, 1789</i> )	Brahminy Starling	LC	RE	C
199	<i>Acridotheres tristis</i> ( <i>Linnaeus, 1766</i> )	Common Myna	LC	RE	C
200	<i>Acridotheres ginginianus</i> ( <i>Latham, 1790</i> )	Bank Myna	LC	RE	C
Family: Muscicapidae					
201	<i>Copsychus fulicatus</i> ( <i>Linnaeus, 1766</i> )	Indian Robin	LC	RE	C
202	<i>Copsychus saularis</i> ( <i>Linnaeus, 1758</i> )	Oriental Magpie Robin	LC	RE	C
203	<i>Cyornis tickelliae</i> ( <i>Blyth, 1843</i> )	Tickell's Blue Flycatcher	LC	RE	U
204	<i>Muscicapa muttui</i> ( <i>E.L. Layard, 1854</i> )	Brown-breasted Flycatcher	LC	M	R
205	<i>Muscicapa striata</i> ( <i>Pallas, 1764</i> )	Spotted Flycatcher	LC	PM	R
206	<i>Ficedula parva</i> ( <i>Bechstein, 1792</i> )	Red-breasted Flycatcher	LC	M	O
207	<i>Luscinia svecica</i> ( <i>Linnaeus, 1758</i> )	Bluethroat	LC	M	U
208	<i>Phoenicurus ochrurus</i> ( <i>S.G. Gmelin, 1774</i> )	Black Redstart	LC	M	U
209	<i>Monticola solitarius</i> ( <i>Linnaeus, 1758</i> )	Blue Rock Thrush	LC	M	O
210	<i>Saxicola maurus</i> ( <i>Pallas, 1773</i> )	Siberian Stonechat	LC	M	U
211	<i>Saxicola caprata</i> ( <i>Linnaeus, 1766</i> )	Pied Bushchat	LC	M	O
212	<i>Oenanthe isabellina</i> ( <i>Temminck, 1829</i> )	Isabelline Wheatear	LC	M	U
213	<i>Oenanthe deserti</i> ( <i>Temminck, 1825</i> )	Desert Wheatear	LC	M	U
214	<i>Oenanthe picata</i> ( <i>Blyth, 1847</i> )	Variable Wheatear	LC	M	R
Family: Nectariniidae					
215	<i>Cinnyris asiaticus</i> ( <i>Latham, 1790</i> )	Purple Sunbird	LC	RE	C
Family: Ploceidae					
216	<i>Ploceus philippinus</i> ( <i>Linnaeus, 1766</i> )	Baya Weaver	LC	RE	C
Family: Estrildidae					
217	<i>Lonchura punctulata</i> ( <i>Linnaeus, 1758</i> )	Scaly-breasted Munia	LC	RE	U
218	<i>Euodice malabarica</i>	Indian Silverbill	LC	RE	C

	(Linnaeus, 1758)				
Family: Passeridae					
219	<i>Passer domesticus</i> (Linnaeus, 1758)	House Sparrow	LC	RE	C
220	<i>Gymnoris xanthocollis</i> (E. Burton, 1838)	Chestnut-shouldered Petronia	LC	RE	U
Family: Motacillidae					
221	<i>Motacilla cinerea</i> (Tunstall, 1771)	Grey Wagtail	LC	RE	U
222	<i>Motacilla flava</i> (Linnaeus, 1758)	Western Yellow Wagtail	LC	M	C
223	<i>Motacilla citreola</i> (Pallas, 1776)	Citrine Wagtail	LC	M	U
224	<i>Motacilla maderaspatensis</i> (J.F. Gmelin, 1789)	White-browed Wagtail	LC	RE	U
225	<i>Motacilla alba</i> (Linnaeus, 1758)	White Wagtail	LC	M	U
226	<i>Anthus campestris</i> (Linnaeus, 1758)	Tawny Pipit	LC	M	C
227	<i>Anthus trivialis</i> (Linnaeus, 1758)	Tree Pipit	LC	M	U
228	<i>Anthus rufulus</i> (Vieillot, 1818)	Paddyfield Pipit	LC	RE	C
229	<i>Anthus similis</i> (Jerdon, 1840)	Long-billed Pipit	LC	M	U
230	<i>Anthus cervinus</i> (Pallas, 1811)	Red-throated Pipit	LC	M	R
Family: Fringillidae					
231	<i>Carpodacus erythrinus</i> (Pallas, 1770)	Common Rosefinch	LC	M	U
Family: Emberzidae					
232	<i>Emberiza melanocephala</i> (Scopoli, 1769)	Black-headed Bunting	LC	M	U
233	<i>Emberiza bruniceps</i> (von Brandt, 1841)	Red-headed Bunting	LC	M	U
234	<i>Emberiza buchanani</i> (Blyth, 1845)	Grey-necked Bunting	LC	M	O
Order: Bucerotiformes Family: Upupidae					
235	<i>Upupa epops</i> (Linnaeus, 1758)	Eurasian Hoopoe	LC	M	C

### Conclusion

Bortalav Lake, situated in the urban area of Bhavnagar harbours a large number of avifaunal diversity and is a very important wetland habitat for residents as well as migratory birds. Therefore, some precautionary measures to protect the habitat in a view to conserve bird diversity should be implemented by the local governing body. The present study encourages regular monitoring of avifauna in the study area and more exploratory research on other taxa of Bortalav. Additional studies are required to enhance the understanding of the ecology of this area and other factors to sustain avifaunal diversity and abundance.

### Acknowledgements

The authors would like to thank Dr. A. H. Shukla, Head of the Zoology Department, Sir P. P. Institute of Science, M. K. Bhavnagar University for providing constant support and motivation. The authors are also thankful to Mr. Aamir Matli, Mr. Priyank Kapdi, Ms. Prakruti Khatsuriya, Mr. Dipak Mahida and Mr. Karan Thakkar for their technical support.

### References

1. Ali S, Ripley SD. A Pictorial Guide to the Birds of the Indian Subcontinent. Bombay Natural History Society and Oxford University Press, Mumbai, 1996, 1-183.
2. Ali S. The book of Indian birds. Oxford University Press, Delhi, 1996, 140.
3. Aronson MFJ, La Sorte FA, Nilon CH, Katti M, Goddard MA, Lepczyk CA et al. A global analysis of the impacts of urbanization on bird and plant diversity reveals key anthropogenic drivers. Proc R Soc B Biol Sci, 2014;281:20133330.

4. Bensizerara D, Chenchouni H, Bachir AS, Houhamdi M. Ecological status interactions for assessing bird diversity in relation to a heterogeneous landscape structure. *Avian Biology Research*,2013;6(1):67-77.
5. Dodia PP, Chavda NH. Birds of Victoria Park Reserve Forest and Bortalav water reservoir in Bhavnagar (Gujarat-India). *Life sciences Leaflets*,2012;24:1-11. Available: <https://petsd.org/ojs/index.php/lifesciencesleaflets/article/view/260>
6. Ganpule P. The birds of Gujarat: Status and distribution. *Flamingo*,2016;8(3):2-40.
7. Ganpule P. Third update to the Gujarat checklist: December 2021. *Flamingo Gujarat* 4,2021:3&4:3-8. Available: <https://flamingogujarat.com/magazinesissues/vol-iv-3-4-july-december-2021/>
8. Grimmett R, Inskipp C, Inskipp T. *Birds of the Indian Subcontinent*. 2nd ed. London: Oxford University Press & Christopher Helm, 2011, 1-528.
9. HBW and Bird Life International. *Handbook of the Birds of the World and BirdLife International digital checklist of the birds of the world*. Version 5, 2020. Available: [http://datazone.birdlife.org/userfiles/file/Species/Taxonomy/HBW-BirdLife\\_Checklist\\_v5\\_Dec20.zip](http://datazone.birdlife.org/userfiles/file/Species/Taxonomy/HBW-BirdLife_Checklist_v5_Dec20.zip)
10. IUCN. *The IUCN Red List of Threatened Species*. Version 2021-3, 2021. Available: <https://www.iucnredlist.org>.
11. Manakadan R, Pittie A. Standardized English and scientific names of the birds of the Indian subcontinent. *Buceros*,2001;6(1):1-38.
12. Parekh H, Gadhvi IR. Water bird diversity at Kumbharvada marsh land, Bhavnagar, Gujarat. *life sciences Leaflets*44, 2013, 53-59. Available: <https://petsd.org/ojs/index.php/lifesciencesleaflets/article/view/584>
13. Parihar A, Dal P, Khandla Y, Parmar D, Parihar V, Parmar H. Checklist of avifauna from some selected sites of Visnagar city, Mehsana, North Gujarat. *Journal of Entomology and Zoology studies*,2020;8(2):1232-1243.
14. Praveen J, Jayapal R, Pittie A. Checklist of the birds of India (V 5.1), 2021. Available: <https://www.indianbirds.in/india/>
15. Vargiya D, Chakraborty A. The status of waterbird populations of Chhaya Rann Wetland Complex in Porbandar, Gujarat, India. *Journal of Threatened Taxa*,2019;11(10):14268-14278. Available: <https://doi.org/10.11609/jott.3466.11.10.14268-14278>
16. Whelan CJ, Şekercioğlu ÇH, Wenny DG. Why birds matter: from economic ornithology to ecosystem services. *Journal of Ornithology*,2015;156(1):227-238.
17. Amin A, Hasan KA. Checklist and relative diversity of avifauna of Atrai, Raninagar and Naogan Sadar Upazillas of Naogaon district of Bangladesh. *International Journal of Zoology Studies*. 2019;3(2):38-45.
18. Bhutia J, Chettri P, Sharma BK. A preliminary survey of bird communities of South Sikkim, India. *International Journal of Zoology Studies*. 2020;5(6):04-10.