

Bird diversity of Betawade, Thane, a Natural urban habitat.

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Abstract : Mumbai, one of the largest metro cities in the world, holds rich biodiversity in few green fragmented natural or manmade habitats. Betawade, an area, situated towards Northeast of Mumbai near Dombivli, attracts rich biodiversity due to various habitats such as shrubby grasslands, paddy fields, creek tributaries, mangroves and wetlands. A preliminary data of avifauna was collected between August 2012 to July 2013. A total of 135 species were sighted during the survey. They include residents, winter and summer migrants and even some IUCN red list categorized species. From conservation point of view, the study area which was once undisturbed with rich faunal diversity, has been however, now impacted by urbanization pressures. The present study can establish baseline data for future effective management and planning.

Key words: Biodiversity, Betawade, avifauna, urbanization, baseline data

Introduction

Biodiversity is the variety and variability of life on Earth. Quantitative documentation of biodiversity is an important aspect of ecology and a popular topic in recent times. The Indian subcontinent, a part of the vast Oriental biogeographic regions, is very rich in biodiversity. Out of the more than 9,000 birds of the world, the Indian subcontinent contains about 1,300 species, or over 13% of the world's birds (Grimmet *et al.*, 1998). Birds and their diversity constitute a main part of the natural environment and play a functional role as agents of flower pollination, seed dispersal, source of food chain and agents in breaking seed dormancy (Nason, 1992). Birds are good environmental indicators revealing the state of the ecosystems. They also act as dispersal agents in transferring nutrients and spores from one place to another during their migration and local movements (Niemi, 1985). Unfortunately global diversity of birds is decreasing incessantly primarily due to anthropogenic disturbances (Rapoport, 1993).

Studies are available on avifaunal diversity in India; however paucity exists in study of Mumbai. Verma *et al* (2004) studied biodiversity of avifauna of Mahul Creek, while Chauhan *et al* (2008) surveyed the avifauna of Borivali Mangroves. Pawar (2011) reported the species diversity of birds in Uran. Recently Kushwaha *et al* (2013) documented the bird diversity of Bhandup pumping station. However this is the first documented report on the diversity of bird species in Betawade region of Thane.

Betawade, the area under study, is a rapidly developing area with substantial biodiversity values which are under urbanization pressures. It is marked by variety of habitats such as shrubby grasslands, paddy fields, creek tributaries, artificial water bodies, wetlands and mangroves. Existing habitat is likely to be impacted by human activities such as construction, industrial pollution and physical alteration of land use. Since most of its ecosystems are now influenced by various anthropogenic activities, it is essential

for the land users to know overall diversity of an area along with rare and sensitive species.

To slow down the loss of biodiversity and to enhance its contribution to development, any strategy must integrate the conservation of biodiversity, sustainable use of its components and the equitable sharing of resources. This would need on priority to know the actual biodiversity surviving in the area. Hence, the study was set out to obtain information on the presence, richness, diversity and activities of various bird species in Betawade region of Thane. This is because outside the system of protected areas, India's biodiversity has often found refuge in many private lands. The study will also help to increase the local awareness towards biodiversity issues and prove to be fruitful in conservation efforts.

Materials and Methodology

(i) Study Area

Betawade village (19°11'40"N–73°4'44"E), is situated in Dombivli, a city in Kalyan Tehsil of Thane District, in Maharashtra, India (Fig.1). The total area of the study site is approximately 8 Km². The prevailing climatic conditions in Betawade is typically tropical with mean annual temperature of 24.3°C (min) to 32.9°C (max). The temperature varies between 25-38°C in summer, whereas between 20-30°C during winter. The average annual rainfall in the region is in the range of 1286 to 1233mm.

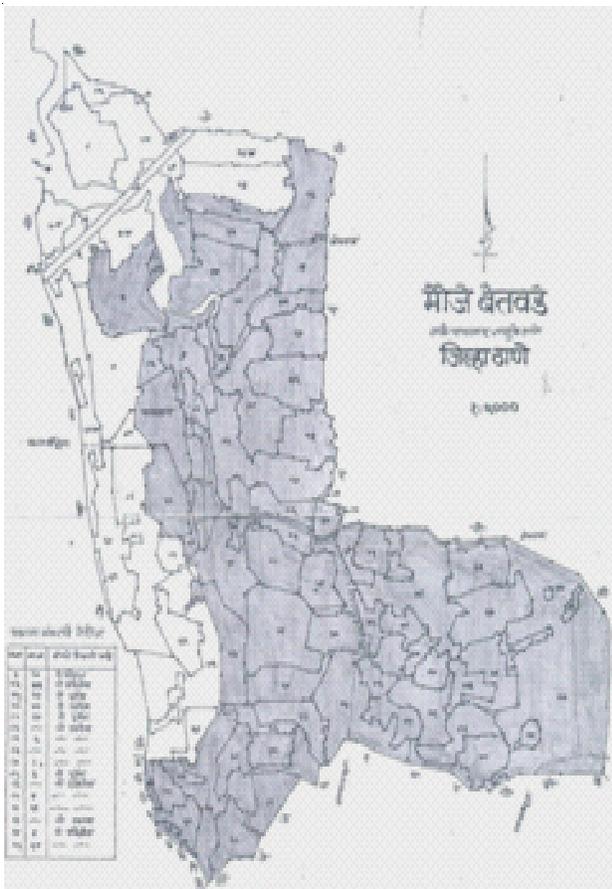
(ii) Data Collection

Betawade was surveyed from August 2012 to July 2013 at the regular interval of fifteen days covering all the seasons. The visits were carried out in the morning from 7.00 am to 10.00 am. and in the evening from 4.00 pm to 6.00 pm. Some of the basic methods used in this study as described by Bibby *et al.* (1992) are: (a) point counts - undertaking a bird count from a fixed location for a fixed period of time. The bird species seen or heard are recorded.

(b) line transect - moving along a fixed route (transect) and recording the bird species seen and heard on both sides of transect. Besides visits were also made during different hours of the day. The birds were photographed if not identified immediately. Observations were carried out with the help of 10x50 Olympus binocular and photography was done with Nikon P500 digital zoom camera. Identification of birds was done using field guides [1, 5]. The following formula was used for determining percentage of occurrence of Families (Basavarajappa, 2006).

$$\text{Percentage Occurrence} = \frac{\text{No of Species of each family}}{\text{Total no of Different species seen}} \times 100$$

Figure1: Map of Betawade, Thane



(Note: Shaded area indicates the areas surveyed in Betawade, Thane)

Result and Discussion:

During the present period of study a total of 135 bird species belonging to 47 families were recorded which includes 45 winter and 06 summer visitors [Fig.2]. Among these, the family Accipitridae contributed the highest number of species (14) followed by the family Ardeidae (09), whereas

15 families were found to be represented by single bird species [Table2]. Based on the food/foraging, from the present data it is apparent that the avifauna of this region is dominated by insectivorous (50 species), followed by piscivorous, frugivorous, grainivorous, carnivorous and omnivorous birds (30, 22, 21, 17 and 14 species respectively) [Fig.3]. R - Residents, species found in the study area throughout the year; WM – Winter Migrants, species found during the winter and SM - Summer Migrants, species visiting the area during the summer season.

Figure2: Numbers of resident, winter and summer migrant bird species in the study area.

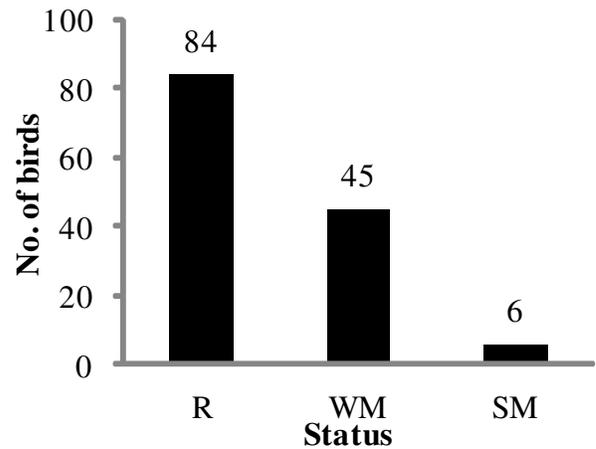


Table1a: Relative percentage of number of species in various families of birds in the study area.

Relative percentage of species			
0-2	2-4	4-6	6 and above
Podicipedidae	Phasianidae	Anatidae	Ardeidae
Phoenicopteridae	Ciconiidae	Strunidae	Accipitridae
Phalacrocoracidae	Threskiornithidae	Muscicapidae	
Charadriidae	Rallidae		
Psittacidae	Scolopacidae		
Strigidae	Columbidae		
Hemiprocnidae	Cuculidae		
Upupidae	Alcedinidae		
Coraciidae	Hirundinidae		
Meropidae	Alaudidae		
Ramphastidae	Cisticolidae		
Picidae	Slyviidae		
Pittidae	Nectariniidae		
Aegithinidae	Estrildidae		
Laniidae	Motacillidae		
Dicruridae			
Oriolidae			
Rhipiduridae			
Pycnonotidae			
Corvidae			
Leiothrichidae			
Timaliidae			
Zosteropidae			
Chloropscidae			
Dicaedidae			
Passeridae			
Ploceidae			

Table 1b: Percentage occurrence of avifauna represented in families

Sr. No.	Families	Percentage Occurrence
1	Phasianidae	2.22
2	Anatidae	4.44
3	Podicipedidae	0.74
4	Ciconiidae	2.22
5	Phoenicopteridae	0.74
6	Threskiornithidae	2.22
7	Ardeidae	6.67
8	Phalacrocoracidae	1.48
9	Accipitridae	10.37
10	Rallidae	2.22
11	Charadriidae	1.48
12	Scolopacidae	3.70
13	Columbidae	2.97
14	Psittacidae	1.48
15	Cuculidae	2.97
16	Strigidae	1.48
17	Hemiprocnidae	1.48
18	Upupidae	0.74
19	Coraciidae	0.74
20	Alcedinidae	2.97
21	Meropidae	1.48
22	Ramphastidae	1.48
23	Picidae	1.48
24	Pittidae	0.74
25	Aegithinidae	0.74
26	Laniidae	1.48
27	Dicruridae	0.74
28	Oriolidae	0.74

29	Rhipiduridae	0.74
30	Corvidae	1.48
31	Hirundinidae	2.22
32	Alaudidae	2.97
33	Pycnonotidae	1.48
34	Cisticolidae	3.70
35	Sylviidae	2.22
36	Leiothrichidae	0.74
37	Timaliidae	0.74
38	Zosteropidae	0.74
39	Strunidae	4.44
40	Muscicapidae	4.44
41	Chloropseidae	0.74
42	Dicaedidae	0.74
43	Nectariniidae	2.22
44	Passeridae	1.48
45	Ploceidae	0.74
46	Estrildidae	2.22
47	Motacillidae	3.70

Table 2: A systematic list of birds with their habitat type, status, abundance and food/foraging in Betawade, Thane during the study period.

Sr.No	Common Name	Scientific Name	Type of Habitat	Status	Abundance	Food/Foraging
Family: Phasianidae						
1	Painted Francolin	<i>Francolinus pictus</i>	Grassland	R	U	O
2	Grey Francolin	<i>Francolinus pondicerianus</i>	Grassland	R	U	O
3	Jungle Bush Quail	<i>Perdicula asiatica</i>	Grassland	R	C	O
Family: Anatidae						
4	Lesser Whistling Duck	<i>Dendrocygna javanica</i>	Water	R	C	P
5	Indian Spot-billed Duck	<i>Anas poecilorhyncha</i>	Water	R	C	P
6	Northern Shoveler	<i>Anas clypeata</i>	Water	WM	C	P
7	Northern Pintail	<i>Anas acuta</i>	Water	WM	C	P
8	Garganey	<i>Anas querquedula</i>	Water	WM	C	P
9	Common Teal	<i>Anas crecca</i>	Water	WM	C	P
Family: Podicipedidae						
10	Little Grebe	<i>Tachybaptus ruficollis</i>	Water	R	C	P
Family: Ciconiidae						
11	Painted Stork	<i>Mycteria leucocephala</i>	Wetland	WM	C	P
12	Asian Openbill Stork	<i>Anastomus oscitans</i>	Wetland	WM	C	P
13	Wolly-necked Stork	<i>Ciconia episcopus</i>	Wetland	WM	U	P
Family: Phoenicopteridae						
14	Lesser Flamingo	<i>Phoenicopus minor</i>	Water	WM	Rr	P-NT
Family: Threskiornithidae						
15	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Water	R	U	P-NT
16	Red-naped Ibis	<i>Pseudibis papillosa</i>	Water	R	C	P
17	Glossy Ibis	<i>Plegadis falcinellus</i>	Water	WM	C	P
Family: Ardeidae						
18	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	Wetland	SM	U	P
19	Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	Water	R	A	P
20	Indian Pond Heron	<i>Ardeola grayii</i>	Water	R	A	P
21	Grey Heron	<i>Ardea cinerea</i>	Wetland	WM	C	P
22	Purple Heron	<i>Ardea purpurea</i>	Wetland	R	C	P
23	Cattle Egret	<i>Bubulcus ibis</i>	Wetland	R	A	P
24	Great Egret	<i>Casmerodius albus</i>	Wetland	R	A	P
25	Intermediate Egret	<i>Mesophoyx intermedia</i>	Wetland	R	A	P
26	Little Egret	<i>Egretta garzetta</i>	Wetland	R	C	P
Family: Phalacrocoracidae						
27	Little Cormorant	<i>Phalacrocorax niger</i>	Water	R	A	P
28	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	Water	R	A	P
Family: Accipitridae						
29	Black-winged Kite	<i>Elanus caeruleus</i>	Raptor	R	C	C
30	Black Kite	<i>Milvus migrans</i>	Raptor	R	A	C
31	Black-eared Kite	<i>Milvus (migrans) lineatus</i>	Raptor	WM	U	C
32	Brahminy Kite	<i>Haliastur indus</i>	Raptor	SW	C	C
33	Black Eagle	<i>Ictinaetus malayensis</i>	Raptor	WM	Rr	C
34	Oriental Honey Buzzard	<i>Pernis ptilorhynchus</i>	Raptor	R	C	C
35	Short-toed Snake Eagle	<i>Circaetus gallicus</i>	Raptor	WM	Rr	C
36	Eurasian Marsh Harrier	<i>Circus aeruginosus</i>	Raptor	WM	C	C
37	Shikra	<i>Accipiter badius</i>	Raptor	R	C	C
38	White-eyed Buzzard	<i>Butastur teesa</i>	Raptor	R	C	C
39	Indian Spotted Eagle	<i>Aquila hastata</i>	Raptor	WM	Rr	C-V

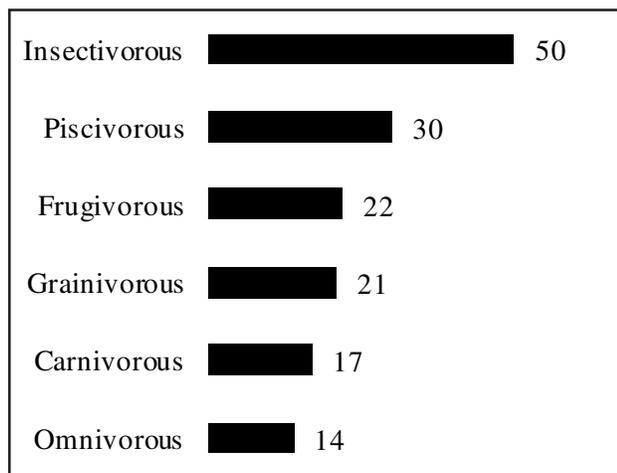
40	Greater Spotted Eagle	<i>Aquila clanga</i>	Raptor	WM	Rr	C-V
41	Bonellis Eagle	<i>Aquila fasciata</i>	Raptor	WM	Rr	C
42	Booted Eagle	<i>Hieraaetus pennatus</i>	Raptor	WM	C	C
Family: Rallidae						
43	White-brested Waterhen	<i>Amauornis phoenicurus</i>	Wetland	R	A	O
44	Purple Swamphen	<i>Porphyrio porphyrio</i>	Wetland	R	C	O
45	Eurasian Coot	<i>Fulica atra</i>	Water	R	C	O
Family: Charadriidae						
46	Red-wattled Lapwing	<i>Vanellus indicus</i>	Wetland	R	A	I
47	Pacific Golden Plover	<i>Pluvialis fulva</i>	Water	WM	Rr	P,I
Family: Scolopacidae						
48	Wood Sandpiper	<i>Tringa glareola</i>	Water	WM	U	I
49	Common Sandpiper	<i>Actitis hypoleucos</i>	Water	WM	C	I
50	Marsh Sandpiper	<i>Tringa stagnatilis</i>	Water	WM	C	I
51	Common Redshank	<i>Tringa totanus</i>	Water	WM	C	I
52	Common Greenshank	<i>Tringa nebularia</i>	Water	WM	U	I
Family: Columbidae						
53	Common Pigeon	<i>Columba livia</i>	Forest	R	A	F,G
54	Spotted Dove	<i>Streptopelia chinensis</i>	Forest	R	A	F,G
55	Laughing Dove	<i>Streptopelia senegalensis</i>	Forest	R	A	F,G
56	Yellow Footed Green Pigeon	<i>Treron phoenicopetra</i>	Forest	WM	U	F,G
Family: Psittacidae						
57	Alexandrine Parakeet	<i>Psittacula eupatria</i>	Forest	R	A	F
58	Rose-ringed Parakeet	<i>Psittacula krameri</i>	Forest	R	C	F
Family: Cuculidae						
59	Jacobin Cuckoo	<i>Clamator jacobinus</i>	Forest	SM	U	F
60	Common Hawk Cuckoo	<i>Hierococcyx varius</i>	Forest	WM	C	F
61	Asian Koel	<i>Eudynamis scolopacea</i>	Forest	R	C	F
62	Greater Coucal	<i>Centropus sinensis</i>	Forest	R	C	F
Family: Strigidae						
63	Barn Owl	<i>Tyto alba</i>	Forest	R	C	C
64	Short Eared Owl	<i>Asio flammeus</i>	Scrubland	WM	Rr	C
Family: Hemiprocnidae						
65	Asian Palm Swift	<i>Cypsiurus balasiensis</i>	Forest	R	C	I
66	House Swift	<i>Apus affinis</i>	Forest	R	A	I
Family: Upupidae						
67	Common Hoopoe	<i>Upupa epops</i>	Forest	WM	U	I
Family: Coraciidae						
68	Indian Roller	<i>Coracias benghalensis</i>	Forest	R	A	I
Family: Alcedinidae						
69	White Throated Kingfisher	<i>Halcyon smyrnensis</i>	Forest	R	A	P
70	Black-capped Kingfisher	<i>Halcyon pileata</i>	Mangrove	WM	Rr	P
71	Common Kingfisher	<i>Alcedo atthis</i>	Wetland	R	C	P
72	Pied Kingfisher	<i>Ceryle rudis</i>	Mangroves	R	C	P
Family: Meropidae						
73	Green Bee-eater	<i>Merops orientalis</i>	Forest	R	C	I

74	Blue-tailed Bee-eater	<i>Merops philippinus</i>	Forest	WM	U	I
Family: Ramphastidae						
75	Brown-headed Barbet	<i>Megalaima zeylanica</i>	Forest	R	U	F
76	Coppersmith Barbet	<i>Megalaima haemacephala</i>	Forest	R	A	F
Family: Picidae						
77	Eurasian Wryneck	<i>Jynx torquilla</i>	Forest	WM	C	F
78	Yellow-crowned Woodpecker	<i>Dendrocopos mahrattensis</i>	Forest	R	C	F
Family: Pittidae						
79	Indian Pitta	<i>Pitta brachyura</i>	Forest	SM	U	I
Family: Aegithinidae						
80	Common Iora	<i>Aegithinia tiphia</i>	Forest	R	U	I
Family: Laniidae						
81	Isabellian Shrike	<i>Lanius isabellinus</i>	Grassland	WM	U	I
82	Long-tailed Shrike	<i>Lanius schach</i>	Grassland	R	A	I
Family: Dicruridae						
83	Black Drongo	<i>Dicrurus macrocercus</i>	Forest	R	A	C
Family: Oriolidae						
84	Indian Golden Oriole	<i>Oriolus oriolus</i>	Forest	R	C	O
Family: Rhipiduridae						
85	White-throated Fantail	<i>Rhipidura albicollis</i>	Forest	R	A	F
Family: Corvidae						
86	Indian Jungle Crow	<i>Corvus macrorhynchos</i>	Forest	R	A	O
87	House Crow	<i>Corvus splendens</i>	Forest	R	A	O
Family: Hirundinidae						
88	Wire-tailed Swallow	<i>Hirundo smithii</i>	Water	R	C	I
89	Barn Swallow	<i>Hirundo rustica</i>	Water	R	C	I
90	Red-rumped Swallow	<i>Hirundo daurica</i>	Water	R	C	I
Family: Alaudidae						
91	Rufous-tailed Lark	<i>Ammomanes phoenicurus</i>	Scrubland	R	C	G,I
92	Greater short-toed Lark	<i>Calandrella brachydactyla</i>	Scrubland	WM	U	G,I
93	Ashy-crowned Sparrow Lark	<i>Eremopterix grisea</i>	Scrubland	R	C	G,I
94	Malabar Lark	<i>Galerida malabarica</i>	Scrubland	WM	U	G,I
Family: Pycnonotidae						
95	Red-whiskered Bulbul	<i>Pycnonotus jacosus</i>	Forest	R	C	F
96	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Forest	R	A	F
Family: Cisticolidae						
97	Ashy Prinia	<i>Prinia socialis</i>	Paddy field	R	A	G
98	Plain Prinia	<i>Prinia inornata</i>	Paddy field	R	C	G
99	Grey-brested Prinia	<i>Prinia hodgsonii</i>	Paddy field	R	C	G
100	Zitting Cisticola	<i>Cisticola juncidis</i>	Paddy field	R	A	I
101	Common Tailorbird	<i>Orthotomus sutorius</i>	Paddy field	R	A	I

Family: Sylviidae						
102	Clamorous Reed Warbler	<i>Acrocephalus stentoreus</i>	Grassland	WM	C	I
103	Paddy-field Warbler	<i>Acrocephalus agricola</i>	Paddy field	WM	U	I
104	Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i>	Paddy field	WM	C	I
Family: Leiothrichidae						
105	Jungle Babbler	<i>Turdoides striata</i>	Scrubland	R	C	I
Family: Timaliidae						
106	Tawny bellied Babbler	<i>Dumetia hyperythra</i>	Grassland	WM	U	I
Family: Zosteropidae						
107	Oriental White-eye	<i>Zosterops palpebrosus</i>	Forest	R	U	I
Family: Strunidae						
108	Jungle Myna	<i>Acridotheres fuscus</i>	Forest	R	A	O
109	Common Myna	<i>Acridotheres tristis</i>	Forest	R	A	O
110	Asian Pied Starling	<i>Sturnus contra</i>	Forest	R	A	O
111	Chestnut-tailed Starling	<i>Sturnus malabaricus</i>	Forest	SM	C	F
112	Brahminy Starling	<i>Sturnus sturninus</i>	Forest	SM	C	O
113	Rosy Starling	<i>Sturnus roseus</i>	Forest	WM	C	O
Family: Muscipidae						
114	Bluethroat	<i>Luscinia svecica</i>	Wetland	WM	C	I
115	Oriental Magpie Robin	<i>Copsychus saularis</i>	Forest	R	C	I
116	Indian Robin	<i>Saxicoloides fullicata</i>	Grassland	R	C	I
117	Common Stonechat	<i>Saxicola torquata</i>	Paddy field	R	C	I
118	Pied Bushchat	<i>Saxicola caprata</i>	Grassland	R	C	I
119	Desert Wheatear	<i>Oenanthe deserti</i>	Grassland	WM	U	I
Family: Chloropseidae						
120	Golden fronted Leafbird	<i>Chloropsis aurifrons</i>	Forest	R	C	F,I
Family: Dicaeidae						
121	Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>	Forest	R	A	F,G,I
Family: Nectariniidae						
122	Purple-rumped Sunbird	<i>Nectarinia zeylonica</i>	Forest	R	A	F,G,I
123	Purple Sunbird	<i>Nectarinia asiatica</i>	Forest	R	A	F,G,I
124	Loten's Sunbird	<i>Nectarinia lotenia</i>	Forest	R	C	F,G,I
Family: Passeridae						
125	House Sparrow	<i>Passer domesticus</i>	Forest	R	A	G,I
126	Chestnut-shouldered Petronia	<i>Petronia xanthocollis</i>	Forest	R	A	G,I
Family: Ploceidae						
127	Baya Weaver	<i>Ploceus philippinus</i>	Forest	R	A	G
Family: Estrildidae						
129	Red Avadavat	<i>Amandava amandava</i>	Grassland	R	A	G
130	Scaly-breasted Munia	<i>Lonchura punctulata</i>	Grassland	R	A	G
131	Black-headed Munia	<i>Lonchura malacca</i>	Grassland	R	C	G
Family: Motacillidae						
131	Yellow Wagtail	<i>Motacilla flava</i>	Grassland	WM	C	I
132	White Wagtail	<i>Motacilla alba</i>	Wetland	WM	C	I
133	Paddy-field Pipit	<i>Anthus rufulus</i>	Forest	R	C	I
134	Tree Pipit	<i>Anthus trivialis</i>	Forest	WM	C	I
135	Olive-backed Pipit	<i>Anthus hodgsoni</i>	Forest	WM	C	I

[P- Piscivorous, I-Insectivorous, C- Carnivorous, G- Grainivorous, F- Frugivorous, O- Omnivorous, A- Abundant, C-Common, U- Uncommon, Rr- Rare, NT- Near Threatened, V- Vulnerable]

Figure3: Distribution of birds according to their feeding habits in the study area.



Betawade is a resident area and is now invaded by commercial activity due to expanding city limits. A lot of human interferences like constructional activities, deforestation, noise due to vehicles and people are posing threat to avifauna. The present work revealed that even though the urban sites are continuously disturbed, these sites have supported significant number of avifauna which is excellent indicator of ecosystem health. However human disturbances can damage birds in many ways, including disrupting foraging or social behavior, increasing nest predation, interfering with parent-offspring and pair bonds, increasing nesting failures, and reducing the viability of fledglings. Additionally, birds may perceive humans as predators and leave an area; resulting in decline in species abundance. Due to urbanization pressures, it is difficult for avifauna to find the nesting locations and sheltering place or foraging habitats in this urban site. To save the urban avifauna, reforestation is required to create gardens, parks and lakes besides the human habitation to facilitate the foraging, sheltering and breeding for birds. Fast growing species and fruit bearing trees suitable to the local environment should be planted within residential area to attract many frugivorous and insectivorous species of birds. Thus a conservation plan could be undertaken to save the urban species of birds.

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