

**DIVERSITY AND POPULATION DENSITY OF BIRDS AT THE  
JAHANGIRNAGAR UNIVERSITY CAMPUS, BANGLADESH**

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**Abstract:** Rapid urbanization is changing the habitats of many wildlife species. Even so, certain species appear to adapt and now have thriving populations within cities. To look at the capacity for these spaces to provide “habitat” we examined population density of bird species using Jahangirnagar University campus close to the Dhaka mega city, Bangladesh. Four strip transects were surveyed from March 2008 to February 2009 (12 times/transect). A total of 101 species were found along the transect areas. The density of Lesser Whistling Duck (*Dendrocygna javanica*) was the highest 107.02 indiv. /ha while Large-tailed Nightjar (*Caprimulgus macrurus*) was the lowest 0.01 indiv. /ha among resident birds of Jahangirnagar University campus. Among the migratory birds, the density of Pintail Snipe (*Gallinago stenura*) and Common Stonechat (*Saxicola torquata*) were the highest (1.99 indiv. /ha.) and the lowest (0.02 indiv. /ha.), of the different available habitats, water bodies contained the highest density (318.59 indiv. /ha) and grassland contained the lowest (2.48 indiv./ha) of bird population. The percentage of average density of non-passerine and passerine birds was 65% and 35%, respectively. Future studies of avian composition and density is recommended at a regular interval to understand changes in the carrying capacity and avian community of the campus as a function of altering habitat due urbanization.

**Key words:** Bangladesh, non-passerine, passerine, transect sampling, and urban

**INTRODUCTION**

Urbanization leads to habitat destruction, habitat loss and habitat fragmentation, as a result large continuous habitats are disconnected and divided into smaller unconnected patches. Habitat loss due to developmental activities like increase in roads and buildings exposes wildlife to new man-made stress. During the process of urbanization some animal species disappear or move other areas in search of food. Species that cannot move as fast as urbanization is expanding will disappear. Nonetheless, some species appear to adapt, increase in density and may have booming population within urban

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areas, such as crows, sparrows, doves, pigeons and so on. Thus, urbanization also filters bird communities. Natural habitat with planned plantations (like parks) within urban centers can be particularly attractive to many wildlife. This includes sometimes university campuses with diverse vegetation forming mosaic of various habitats including agricultural lands, orchards and botanical gardens in and around administrative building with human settlements. To look at the capacity for these spaces to provide “habitat” we examined population density of bird species using Jahangirnagar University campus close to the mega city of Dhaka, Bangladesh.

196 species of birds are recorded from Jahangirnagar University Campus that is almost 30% of all the bird species that found in Bangladesh (Begum 2016). Much studies had been conducted on aspects of birds of Jahangirnagar University Campus. For instance, Feeroz *et al.* (1988), Begum (1997) and Mohsanin *et al.* (2009) studied species diversity and occurrence of birds. Begum (1992) and Hossain (1999) studied breeding ecology of birds. However, no study quantified the population density of birds in the campus. Therefore, this paper aimed to record bird diversity and investigate bird population density per hectare area in the campus.

#### **MATERIAL AND METHODS**

*Study area:* Jahangirnagar University, an area of about 280 hectares, is located at 23°52.764' N latitude and 90°16.068' E longitude (Fig. 1). The existing vegetation in this area is now of secondary character, originated from a tropical deciduous ‘Sal’ (*Shorea robusta*) forest community (Begum 2016). Most of the ‘Sal’ forest are lost as a result of urbanization. However, some isolated patches can still be seen along the Dhaka-Aricha highway. The land use is limited and protected by university campus authority, which allows preserving the remnant of the past. At present, the campus formed a mosaic of various habitats such as grasslands, woodlands, agricultural lands, water bodies (ponds and lakes), scrubland, stubbles, marsh and human settlement. Therefore, the university campus offers enormous feeding and roosting habitat, provides breeding facilities and makes a safe area for the birds. As a result, the campus is rich in avifaunal diversity.

Vegetation of the campus were classified into six categories. Human settlement consisted academic and administrative buildings, hostels, staff quarters and homestead gardens, mostly contained trees like *Tectona grandis*, *Acacia auriculariformes*, *Swietenia mehogani*, *Casurina sp.* *Delonix regia*, *Artocarpus heterophyllus*, *Albizia lebbeck*, *A. procera* etc. Water body consisted mostly freshwater lakes and ponds. This habitat contained aquatic plants and dominated by water lilies during monsoon. Marshy area were low-lying areas found in

northern, southern and central part of the campus. This habitat remained dry and are used as agricultural lands during winter whereas it filled with water and become marshy during monsoon. Grass land habitat was found in the south-western portion of the campus, distributed variably behind the central library, beside the Bangabandhu Sheikh Mujib Hall, and inside the Wildlife Rescue Center. These areas were dominated by common sun grasses (*Imperata cylindrica*), mixed with diverse kinds of sedges and isolated patches of tall grasses. Woodland habitat was widely distributed in the campus. Large patch of Neem (*Azadirachta indica*) near “Gerua”, of Jackfruit (*Artocarpus heterophyllus*) in eastern and central part of the campus, of various woody plants in botanical garden and Wildlife Rescue Centre consisted major woodland habitat in the campus. *A. chaplasi*, *Acacia moniliformis*, *A. auriculiformis*, *Mangifera indica*, *Shorea robusta*, etc. were common tree species. Bushy Area comprised of herbs, shrubs and scrub jungle were widely distributed in the campus around gardens and human settlements.



**Fig.1.** Map of the study area showing position of four transects.

*Data collection:* The study was conducted from March 2008 to February 2009. Strip transect sampling method (Buckland *et al.* 2001) was found most suitable to estimate the population density. Four strip transects were selected and labeled as A, B, C and D. Start and end point's coordinates of all transects were marked by a Garmin GPS (Fig. 1). The length of the transects were 2.6, 2.3, 1.7 and 0.9 km for A, B, C and D, respectively and the width of each transect was 20 m. In every month, four days were spent surveying these transects. Survey were carried on foot at a speed of 1.5 km/h, with frequent stops for observing and counting birds. A total of 84 hours in 48 days were spent for data collection. The survey was

conducted during active period of birds i.e. early morning (0630 h to 0830h) and late afternoon (1600h to 1800 h).

*Data Analysis:* Data analysis was conducted using Excel 2007 platform. Population density was calculated by  $D = n/A$ , where  $n$  = total counts of birds and  $A$  = area covered. Relative density was calculated in percentages.

## RESULTS AND DISCUSSION

A total of 101 species were recorded within transects of which 80, 17 and 4 were common, uncommon and rare respectively. (Fifty five) were non-passerine and 46 were passerine birds. Also, 23 species were categorized as migratory, 56 as breeding resident and 22 as non-breeding resident.

*Population density:* Population density varied between species, habitats, seasons and months. The mean density of Lesser Whistling Duck (*Dendrocygna javanica*) was the highest (107.02 indiv./ha.) and Large-tailed Nightjar (*Caprimulgus macrurus*) was the lowest (0.01 indiv./ha.) among resident birds. The average density of Pintail Snipe (*Gallinago stenura*) was the highest (1.99 indiv./ha.) among migratory birds. Brown Shrike (*Lanius cristatus*) and Common Stonechat (*Saxicola torquata*) occurred in the lowest (0.02 indiv./ha.) density (Table 1). No previous study is available to compare the density of birds at JU but Mohsanin *et. al.* (2009) studied status and seasonal occurrence of birds in the campus where they reported Lesser Whistling Duck as very common species. This duck species is a winter visitor that congregates in huge number in the water bodies of the campus and therefore, it is ranked the top.

*Habitat preference:* Habitat of JU campus had been divided into grasslands and cultivated lands, woodland, marshy area, water bodies and human settlements. Water bodies contained the highest density (318.59 indiv./ha) in December due to large flocks of Lesser Whistling Duck, the winter visitors. It contained the lowest in July (2.9 indiv./ha) in absence of these waterfowls. In contrast, grasslands contained the lowest (2.48 indiv./ha) in May and highest in November (16.47 indiv./ha.). Human settlements, marshy areas, woodlands and bushy areas showed maximum density in November 33.85 indiv./ha, 47.13 indiv./ha, 58.20/ha and 23.70 indiv./ha, respectively while showed minimum density in July 15.97 indiv./ha, 6.25 indiv./ha, 25.69 indiv./ha, 8.30 indiv./ha, respectively. Grassland density increased in November due to the migratory grassland species such as stonechats, shrikes, wagtails and pipits.

*Relative density and Seasonal Variation:* Relative density of different species varied between months in different habitats (Fig.2). Water bodies possessed 70% of the total bird population in March and 2.7% in September. Human settlements contained the highest 25.5% and the lowest 5.9% of the total

**Table 1. List of birds with Mean Density(/ha.) and Maximum-Minimum range at Jahangirnagar University**

Sl.	Scientific Name	English name	Mean Density (/ha.)	Range (Max.-Min.)
<b>Order:</b> Anseriformes				
<b>Family:</b> Dendrocygnidae				
1	<i>Dendrocygna bicolor</i>	Fulvous Whistling-duck	0.19	0.28-0.14
2	<i>Dendrocygna javanica</i>	Lesser Whistling-duck	107.02	312.42-0.5
<b>Family:</b> Anatidae				
3	<i>Anus querquedula</i>	Garganey	0.33	0.43-0.28
<b>Order:</b> Piciformes				
<b>Family:</b> Picidae				
4	<i>Dendrocopos macei</i>	Fulvous-breasted Woodpecker	0.38	3.76-0.07
5	<i>Dinopium benghalense</i>	Black-rumped Flameback	0.37	0.71-0.14
6	<i>Jynx torquilla</i>	Eurasian Wryneck	0.19	0.28-0.14
7	<i>Micropternus brachyurus</i>	Rufous Woodpecker	0.07	0.07-0.07
<b>Family:</b> Megalaimidae				
8	<i>Megalaima haemacephala</i>	Coppersmith Barbet	0.66	2.77-0.07
<b>Order:</b> Upupiformes				
<b>Family:</b> Upupidae				
9	<i>Upupa epops</i>	Common Hoopoe	0.07	0.07-0.07
<b>Order:</b> Coraciiformes				
<b>Family:</b> Coraciidae				
10	<i>Coracias benghalensis</i>	Indian Roller	0.07	0.07-0.07
<b>Family:</b> Alcedinidae				
11	<i>Alcedo atthis</i>	Common Kingfisher	0.37	0.64-0.14
<b>Family:</b> Halcyonidae				
12	<i>Halcyon smyrnensis</i>	White-throated Kingfisher	0.38	0.71-0.21
13	<i>Halcyon capensis</i>	Stork-billed Kingfisher	0.24	0.5-0.07
<b>Family:</b> Cerylidae				
14	<i>Ceryle rudis</i>	Pied Kingfisher	0.35	0.35-0.35
<b>Family:</b> Meropidae				
15	<i>Merops orientalis</i>	Green Bee-eater	0.67	0.92-0.43
<b>Order:</b> Cuculiformes				
<b>Family:</b> Cuculidae				
16	<i>Cacomantis merulinus</i>	Plaintive Cuckoo	0.14	0.14-0.14
17	<i>Clamator jacobinus</i>	Jacobin	0.07	0.07-0.07

Sl.	Scientific Name	English name	Mean Density (/ha.)	Range (Max.-Min.)
		Cuckoo		
18	<i>Cuculus micropterus</i>	Indian Cuckoo	0.18	0.28-0.07
19	<i>Eudynamis scolopacea</i>	Asian Koel	1.31	2.34-0.35
20	<i>Hierococcyx varius</i>	Common Hawk Cuckoo	0.75	1.85-0.07
<b>Family:</b> Centropodidae				
21	<i>Centropus sinensis</i>	Greater Coucal	0.14	0.21-0.07
<b>Order:</b> Psittaciformes				
<b>Family:</b> Psittacidae				
22	<i>Psittacula krameri</i>	Rose-ringed Parakeet	0.48	1.28-0.14
<b>Order:</b> Apodiformes				
<b>Family:</b> Apodidae				
23	<i>Apus nipalensis</i>	House Swift	1.25	3.41-0.14
24	<i>Cypsiurus balasiensis</i>	Asian Palm Swift	0.76	1.35-0.35
<b>Order:</b> Strigiformes				
<b>Family:</b> Tytonidae				
25	<i>Tyto alba</i>	Barn Owl		
<b>Family:</b> Strigidae				
26	<i>Athene brama</i>	Spotted Owlet	0.21	0.21-0.21
<b>Family:</b> Caprimulgidae				
27	<i>Caprimulgus macrurus</i>	Large-tailed Nightjar	0.01	0.07-0.01
<b>Order:</b> Columbiformes				
<b>Family:</b> Columbidae				
28	<i>Columba livia</i>	Rock Pigeon	0.90	1.42-0.43
29	<i>Streptopelia chinensis</i>	Spotted Dove	3.16	4.47-1.14
30	<i>Streptopelia tranquebarica</i>	Red-collard Dove	0.57	0.71-0.5
31	<i>Treron phoenicoptera</i>	Yellow-footed Green Pigeon	6.17	11.07-1.28
<b>Order:</b> Gruiformes				
<b>Family:</b> Rallidae				
32	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen	0.42	0.99-0.07
33	<i>Gallinula chloropus</i>	Common Moorhen	0.62	0.99-0.28
<b>Order:</b> Ciconiformes				
<b>Family:</b> Scolopacidae				
34	<i>Actitis hypoleucos</i>	Common Sandpiper	0.28	0.57-0.14
35	<i>Gallinago stenura</i>	Pin-tailed Snipe	1.99	6.1-0.07
36	<i>Tringa ochropus</i>	Green Sandpiper	0.40	0.17-0.07
37	<i>Tringa glareola</i>	Wood Sandpiper	0.31	0.43-0.21
<b>Family:</b> Rostratulidae				

Sl.	Scientific Name	English name	Mean Density (/ha.)	Range (Max.-Min.)
38	<i>Rostratula benghalensis</i>	Painted Snipe	0.83	1.28-0.21
<b>Family:</b> Jacanidae				
39	<i>Metopidius indicus</i>	Bronze-winged Jacana	0.42	0.78-0.14
<b>Family:</b> Charadriidae				
40	<i>Vanellus cinereus</i>	Grey-headed Lapwing	1.74	2.2-1.28
41	<i>Vanellus indicus</i>	Red-wattled Lapwing	0.20	0.43-0.07
42	<i>Vanellus malabaricus</i>	Yellow-wattled Lapwing	0.23	0.28-0.07
<b>Family:</b> Accipitridae				
43	<i>Elanus caeruleus</i>	Black-shouldered Kite	0.09	0.14-0.07
44	<i>Haliastur Indus</i>	Brahminy Kite	0.26	0.35-0.14
45	<i>Milvus migrans</i>	Black Kite	0.20	0.43-0.07
46	<i>Spilornis cheela</i>	Crested Serpent Eagle	0.07	
<b>Family:</b> Phalacrocoracidae				
47	<i>Phalacrocorax niger</i>	Little Cormorant	0.16	0.35-0.07
Family: Ardeidae				
48	<i>Ardeola grayii</i>	Indian Pond Heron	1.55	2.13-0.92
49	<i>Bubulcus ibis</i>	Cattle Egret	0.55	1.85-0.21
50	<i>Butorides striatus</i>	Little Heron	0.13	0.21-0.07
51	<i>Casmerodius albus</i>	Great Egret	0.09	0.21-0.07
52	<i>Egretta garzetta</i>	Little Egret	0.59	1.63-0.07
53	<i>Ixobrychus cinnamomeus</i>	Cinnamon Bittern	0.09	0.14-0.07
54	<i>Mesophoyx intermedia</i>	Intermediate Egret	0.84	5.04-0.07
<b>Family:</b> Ciconiidae				
55	<i>Anastomus oscitans</i>	Asian Openbill	3.87	7.34-1.42
<b>Order:</b> Passeriformes				
<b>Family:</b> Laniidae				
56	<i>Lanius cristatus</i>	Brown Shrike	0.02	0.02-0.02
57	<i>Lanius schach</i>	Long-tailed Shrike	0.75	1.42-0.28
<b>Family:</b> Corvidae				
58	<i>Aegithina tiphia</i>	Common Iora	0.43	1.42-0.28
59	<i>Artamus fuscus</i>	Ashy Woods wallow	1.10	2.7-0.21
60	<i>Coracina macei</i>	Large	0.07	0.07-0.07

Sl.	Scientific Name	English name	Mean Density (/ha.)	Range (Max.-Min.)
61	<i>Coracina melanoptera</i>	Cuckoo-shrike Black-headed Cuckoo-shrike	0.37	0.57-0.07
62	<i>Corvus macrorhynchos</i>	Large-billed Crow	0.92	1.7-0.28
63	<i>Corvus splendens</i>	House Crow	4.62	8.73-1.49
64	<i>Dendrocitta vagabunda</i>	Rufous Treepie	0.57	1.06-0.28
65	<i>Dicurus macrocercus</i>	Black Drongo	3.57	5.54-2.13
66	<i>Oriolus oriolus</i>	Eurasian Golden Oriole	0.07	0.07-0.07
67	<i>Oriolus xanthornus</i>	Black-hooded Oriole	1.14	1.7-0.99
68	<i>Pericrocotus cinnamomeus</i>	Small Minivet	0.43	0.57-0.14
69	<i>Tephrodornis gularis</i>	Large Woodshrike	0.07	0.07-0.07
70	<i>Tephrodornis pondicerianus</i>	Common Woodshrike	0.14	0.14-0.14
<b>Family: Muscicapidae</b>				
71	<i>Copsychus saularis</i>	Oriental Magpie Robin	1.54	2.63-0.85
72	<i>Ficedula parva</i>	Red-throated Flycatcher	0.18	0.28-0.07
73	<i>Saxicola torquata</i>	Common Stonechat	0.02	0.02-0.02
74	<i>Zoothera citrine</i>	Orange-headed Thrush	0.20	0.5-0.07
<b>Family: Sturnidae</b>				
75	<i>Acridotheres fuscus</i>	Jungle Myna	3.04	5.82-0.92
76	<i>Acridotheres ginginianus</i>	Bank Myna	0.21	0.21-0.21
77	<i>Acridothera tristis</i>	Common Myna	9.92	19.45-7.24
78	<i>Sturnus Contra</i>	Asian Pied Starling	8.40	15.61-3.48
79	<i>Sturnus malabaricus</i>	Chestnut-tailed Starling	1.39	3.69-0.21
<b>Family: Certhidae</b>				
80	<i>Parus major</i>	Great Tit	0.23	0.57-0.07
<b>Family: Hirundinidae</b>				
81	<i>Cecropis daurica</i>	Red-rumped Swallow	0.05	0.43-0.14
82	<i>Hirundo rustica</i>	Barn Swallow	1.42	1.49-1.28



Sl.	Scientific Name	English name	Mean Density (/ha.)	Range (Max.-Min.)
<b>Family: Pycnonotidae</b>				
83	<i>Pycnonotus cafer</i>	Red-vented Bulbul	4.42	7.52-2.91
<b>Family: Cisticolidae</b>				
84	<i>Cisticola juncidis</i>	Zitting Cisticola	0.66	1.92-0.14
<b>Family: Zosteropidae</b>				
85	<i>Zosterops palpebrosus</i>	Oriental White-eye	0.30	0.71-0.14
<b>Family: Sylviidae</b>				
86	<i>Orthotomus sutorius</i>	Common Tailorbird	1.22	2.27-0.43
87	<i>Phylloscopus collybita</i>	Common Chiffchaff	0.09	0.14-0.07
88	<i>Phylloscopus fuscatus</i>	Dusky Warbler	0.11	0.14-0.07
89	<i>Turdoides earlei</i>	Striated Babbler	0.41	0.78-0.07
90	<i>Turdoides striatus</i>	Jugnlé Babbler	4.53	66.6-2.48
<b>Family: Alaudidae</b>				
91	<i>Mirafra assamica</i>	Rufous-winged Bushlark	0.28	0.57-0.07
<b>Family: Nectariniidae</b>				
92	<i>Dicaeum erythrorhynchus</i>	Pale-billed Flowerpecker	0.09	0.14-0.07
93	<i>Cinnyris asiaticus</i>	Purple Sunbird	0.12	0.28-0.07
94	<i>Leptocoma zeylonica</i>	Purple-rumped Sunbird	0.33	0.85-0.14
<b>Family: Passeridae</b>				
95	<i>Anthus hodgsoni</i>	Olive-backed Pipit	0.13	0.14-0.07
96	<i>Anthus rufulus</i>	Paddyfield Pipit	0.33	0.99-0.07
97	<i>Lonchura malacca</i>	Black-headed Munia	0.21	0.21-0.21
98	<i>Lonchura punctulata</i>	Scaly-breasted Munia	2.37	8.16-0.14
99	<i>Motacilla alba</i>	White Wagtail	0.57	1.56-0.07
100	<i>Motacilla maderaspatensis</i>	White-browed Wagtail	0.11	0.21-0.07
101	<i>Passer domesticus</i>	House Sparrow	3.94	9.72-1.56

population in July and March, respectively. Marshy areas showed the highest 25.5% and the lowest 3.6% of the total bird population in November and March,

respectively. In grassland 8.6% and 0.7% of the total bird population was found in November and February. Woodlands and bushy areas possessed the highest 42.9% and 12.9 % of the total bird population in August and September, respectively (Fig. 2). The highest population density was found during winter (947.66 indiv./ha) and the lowest was found during post monsoon (184.39/ha). Summer and monsoon showed the density of 483 indiv./ha. and 265 indiv./ha. respectively.

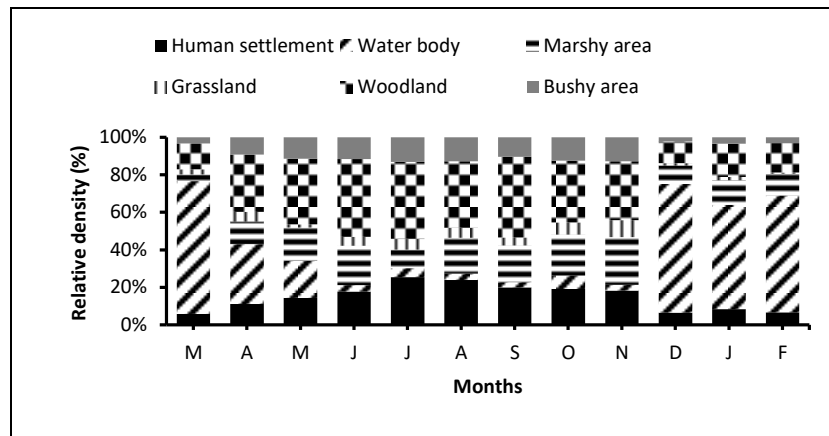


Fig. 2. Monthly relative density of bird's population of different habitats at JU campus.

Winter visitors and migrants are reason for increased density during the winter season in the campus and absence of them is the cause of lowest density in post monsoon. Presence of summer visitor such as cuckoos explain the increased density during summer and monsoon.

*Passerine and Non-passerine bird:* Non-passerines had the highest density (332.43 indiv./ha) in December but number of species of passerines were more (n=29.) than that of non-passerines (n=27). Their lowest density (8.59 indiv./ha) was found in July. The highest (82.9 indiv./ha) and lowest (33.07 indiv./ha) density of passerine birds was found in November and July respectively (Fig.3). The percentage of average density of passerine and non-passerine birds was 35% and 65%, respectively during the study period. The average density of Common Myna was found the highest (9.92 indiv./ha.) while Large Wood Shrike (*Tephrodornis gularis*) and Eurasian Golden Oriole (*Oriolus oriolus*) was found to be the lowest (0.01 indiv./ha) in passerine birds. Lesser Whistling Duck (80.25 indiv./ha.) was ranked the highest while Rufous Woodpecker and Large-tailed Nightjar ranked the lowest (0.01 indiv./ha.) in mean density among the non-passerine birds.

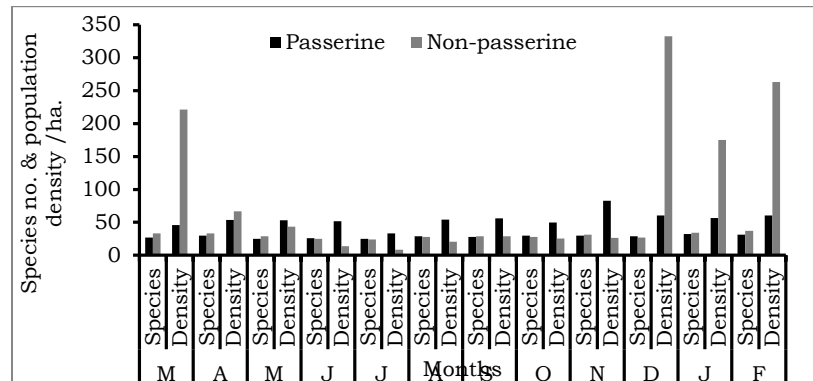


Fig. 3. Monthly species and population density variation of Passerine (dark bar) and Non-passerine (light bar) birds at JU campus.

Ducks, shorebirds and storks belongs to non-passerine group that compose large flock, disperse and migrate to short to long distances. Due to the high number of these species during winter increased the density. Even though there are migrant passerine such as warblers, pipits and wagtails but they don't form a large flock like non-passerines and explains the lower density of passerines in the campus. Common Myna is habituated with the human habitation and common in urban to semi-urban environment and therefore, was common in the campus. The habitat for Large-tailed Nightjar is not available everywhere in the campus in addition to their high camouflaging to diurnal habitat. There is possibility of underestimate of nightjar and owl for this reason. In conclusion, this study found 101 species of birds, of which only 13 species have density greater than 3 indiv./ha. Future studies of avian composition and their density is recommended at a regular interval to understand the changes in the avian community as a function of altering habitat due urbanization in the campus.

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