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Studies on diversity and abundance of avifauna in and around Laxminarayan Institute of Technology campus, Nagpur, Central India

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Abstract

Nagpur city harbours wide variety of avifauna. The objective of the present study was the assessment of diversity and seasonal abundance of avifauna with vegetation, composition of habitat and foraging pattern among birds in and around Laxminarayan Institute of Technology (L.I.T.) campus, Nagpur, Central India. A total of 62 species of birds belonging to 11 orders and 38 families were recorded during January 2013 to December 2014. The species recorded included 57 residents, two passage migrants, one breeding migrant and two winter migrants. Passeriformes was recorded as the most dominating order represented by 36 species. Insectivore bird community was found to be dominant among foraging pattern.

Keywords: Avifauna, L.I.T. Campus, Diversity, Abundance

1. Introduction

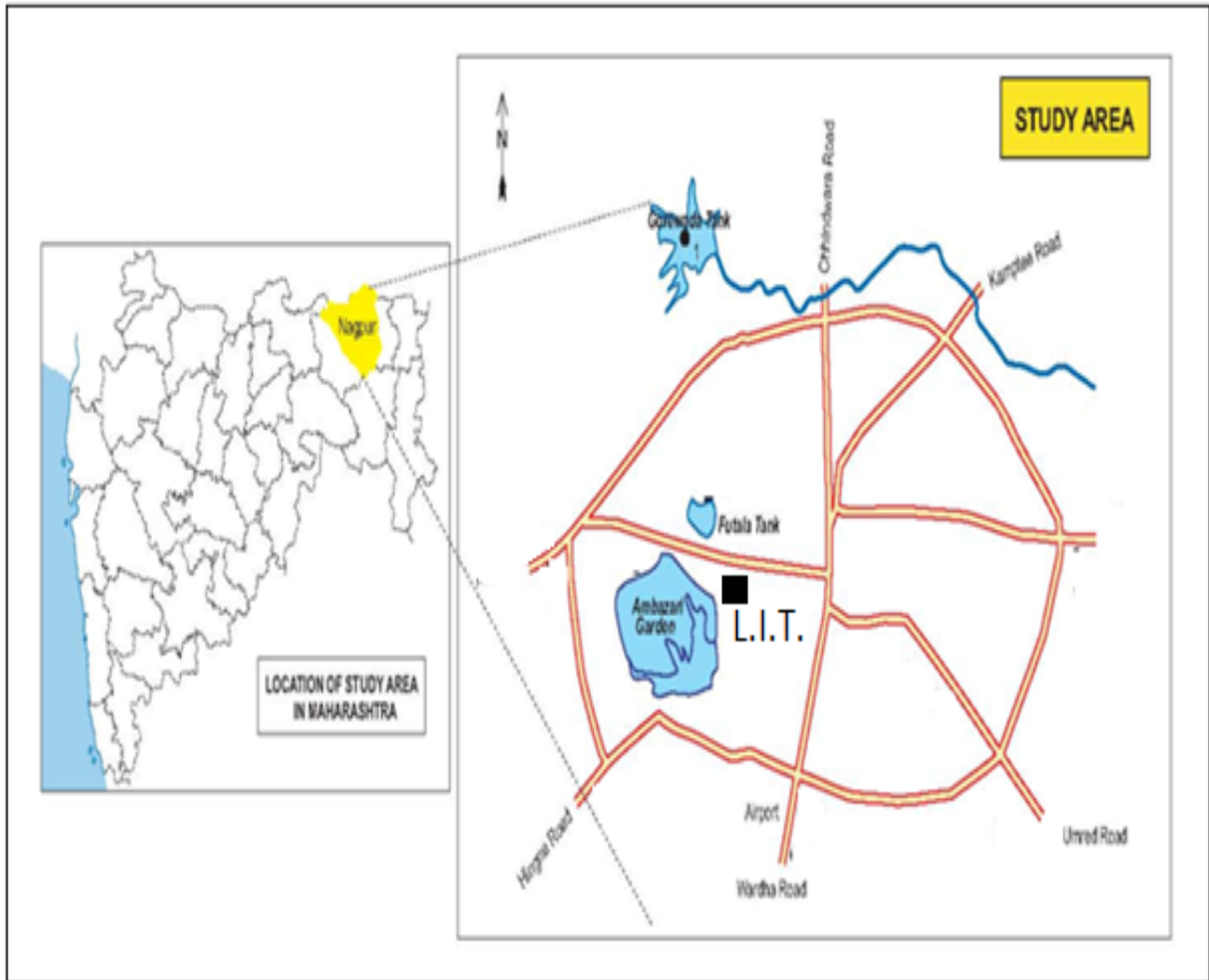
During the era of rapid expansion of urban development, it is important to understand the relationship between natural flora and fauna and urban habitats [1]. Urban biodiversity has received very little attention from conservation biologists as compared to natural and protected ecosystems [2, 3]. Many cities in India contain vast biodiversity of flora and fauna but due to rapid urbanization there has been an alarming reduction in biodiversity. Nagpur is one of them. It is situated in Vidharbha region which occupies north-eastern part of state of Maharashtra, India. It is centrally located city in India. Green spaces in cities include gardens, parks, forests and open spaces that have abundance of trees, flowers, and other natural elements. A functional network of green space is important for maintenance of the ecological dimension of a sustainable urban landscape [4]. The areas with high green-coverage rate have ecological and environmental importance since these areas can improve the urban climate [5]. These green spaces become important harbour for native and migrating bird species. Despite considerable pressure on the natural environment from land development, cities often support a surprisingly high wild bird population [6]. Educational and defence premises act as hotspots for urban biodiversity. Although educational premises occupy less than 5% of the total urban area, such area may harbour up to half the biodiversity of urban biota [7, 8]. Nagpur has been endowed with natural and manmade lakes and gardens and is one of the top green cities in India. Laxminarayan Institute of Technology (L.I.T.) (established 1942) is a government aided institute of higher education in the field of chemical engineering and technology in West Nagpur.

The area generally has dry or mildly humid climate with great variation in seasonal temperature. Summers approach from the beginning of March and end to June. In summer the mercury rises rapidly up to 47 °C usually in May. The monsoon season lasts for four months duration and city receives 1,205 mm of annual rainfall in the months of June and September. Dry and cold winter season comprises the month of December, January & February. In winters the day temperature drops below 15 degrees Celsius. The present work was intended to reveal the diversity, status and abundance of avifauna studied annually along with vegetation, composition of habitat and foraging pattern among birds in and around L.I.T. campus, Nagpur, Central India.

Study area

The Institute (21°147' N and 79°049' E) has a campus of about 78 acres located at Amravati Road National Highway (NH 46). Area of L.I.T. campus is surrounded by Ambazari Lake and

Garden, Futala Lake, Botanical garden and Telankhedhi garden and Rashtrasant Tukdoji Maharaj Nagpur university campus along the periphery. All these areas were reported to have large number of avian biodiversity [9, 10, 11].



Map 1: Location of Nagpur in Maharashtra and geographical position of L.I.T. campus.

2. Material and methods

Binocular Olympus 10*50 X, was used for close observation of birds and for photography Cannon-EOS 550 D camera, with Lens 100-400 mm. Book of Indian Birds by Salim Ali and Birds of the Indian Subcontinent by Grimmett, Inskipp and Inskipp were used as field guides and for preparing check list [12,13].

Avifauna in and around L.I.T. college campus was recorded during January 2013 to December 2014. Sampling was carried out for two years to record seasonal variation in avifaunal diversity and vegetation. Regular field trips were made throughout this period. Visits were carried out for two days a week during all the months of the year to make checklist of seasonal diversity. Two different methods were adapted to study avifaunal diversity. The first method was Line transect

method and second method was Point count method. Following these methods check list was prepared [14].

Line transect method

In this method large areas are divided into small transect or sections of hundred meters or more. Detecting and identifying bird while walking on these transect required ornithological skill [12, 13]. Birds were counted at constant time of the day (0.5-3 h. after sunrise), while walking at a slow and uniform pace to complete each transect.

Point count method

If we stand at one place, it is possible to count all the birds seen and heard. At its simplest such a method was repeated over several places so as to record bird species present in the area.

3. Results and Discussion

Table 1: Checklist of birds found in L.I.T. college campus.

	Common name	Scientific name	Season	Abundance	Status	Diet Habit
Order : Charadriiformes						
Family: Charadriidae						
1	Red Wattled Lapwing	<i>Vanellus indicus</i>	Monsoon	U	R	I
Order: Ciconiiformes						
Family: Ardeidae						
2	Little Egrets	<i>Egretta garzetta</i>	Monsoon	U	R	P
3	Cattle Egret	<i>Bubulcus ibis</i>	Monsoon	U	R	I,P
Order: Gruiformes						
Family: Rallidae						
4	White Breasted Waterhen	<i>Amaurornis phoenicurus</i>	Winter	U	R	O
Family: Accipitridae						
5	Oriental Honey Buzzard	<i>Pernis ptilorhynchus</i>	All	U	R	C
6	Shikra	<i>Accipiter badius</i>	All	U	R	C
Family: Phasianidae						
7	Grey Francolin	<i>Francolinus pondicerianus</i>	All	C	R	G,I
8	Indian Peafowl	<i>Pavo cristatus</i>	Winter	U	R	O
Order: Coraciiformes						
Family: Coraciidae						
9	Indian Roller	<i>Coracias benghalensis</i>	All	C	R	I
Family: Bucerotidae						
10	Indian Grey Hornbill	<i>Ocyrceros birostris</i>	All	U	R	F,I
Family: Alcedinidae						
11	Common Kingfisher	<i>Alcedo atthis</i>	Summer	U	R	P
12	White Breasted Kingfisher	<i>Halcyon smyrnensis</i>	All	C	R	P
13	Pied Kingfisher	<i>Ceryle rudis</i>	Monsoon	U	R	P
Family: Meropidae						
14	Green Bee-Eater	<i>Merops orientalis</i>	All	C	R	I
Family: Upupidae						
15	Common Hoopoe	<i>Upupa epops</i>	All	U	R	I
Order: Psittaciformes						
Family: Psittacidae						
16	Plum Headed Parakeet	<i>Psittacula cyanocephala</i>	Monsoon	U	R	F
17	Rose Ringed Parakeet	<i>Psittacula krameri</i>	All	C	R	F
Order: Cuculiformes						
Family: Cuculidae						
18	Pied Cuckoo	<i>Clamator jacobinus</i>	Monsoon	U	BM	F,I
19	Asian Koel	<i>Eudynamis scolopacea</i>	All	U	R	F,I
20	Greater Coucal	<i>Centropus sinensis</i>	All	FC	R	F,I
Order: Columbiformes						
Family: Columbidae						
21	Spotted Dove	<i>Stigmatopelia chinensis</i>	Summer	FC	R	G,F
22	Laughing Dove	<i>Stigmatopelia senegalensis</i>	All	C	R	G,F
23	Yellow Footed Green Pigeon	<i>Treron phoenicopterus</i>	Winter	U	R	G,F
Order: Apodiformes						
Family: Apodidae						
24	House Swift	<i>Apus nipalensis</i>	All	FC	R	I
Order: Picidae						
Family: Picidae						
25	Lesser Goldenback Woodpecker	<i>Dinopium benghalense</i>	Summer	U	R	F
Family: Ramphastidae						
26	Coppersmith Barbet	<i>Megalaima haemacephala</i>	All	C	R	I,F
Order: Strigiformes						
Family: Strigidae						
27	Spotted Owlet	<i>Athene brama</i>	Winter	U	R	I
Order: Passeriformes						
Family: Sturnidae						

28	Common Myna	<i>Acridotheres tristis</i>	All	C	R	O
29	Brahminy Myna	<i>Sturnia pagodarum</i>	All	FC	R	O
30	Indian Pied Starling	<i>Gracupica contra</i>	All	U	R	O
31	Chestnut Tailed Starling	<i>Sturnia malabarica</i>	Winter	U	R	F
32	Rosy Starling	<i>Pastor roseus</i>	Spring	FC	PM	O
Family: Pycnonotidae						
33	Red Vented Bulbul	<i>Pycnonotus cafer</i>	All	C	R	F,G,I
Family: Timaliidae						
34	Common Babbler	<i>Turdoides caudata</i>	Winter	U	R	I,G,F
35	Jungle Babbler	<i>Turdoides striata</i>	All	C	R	I,G,F
Family: Turdidae						
36	Orange Headed Thrush	<i>Zosterops citrina</i>	All	FC	R	I,F
Family: Aegithinidae						
37	Common Iora	<i>Aegithina tiphia</i>	All	U	R	I,F,N
Family: Dicruridae						
38	Black Drongo	<i>Dicrurus macrocercus</i>	All	FC	R	I
Family: Corvidae						
39	Rufous Treepie	<i>Dendrocitta vagabunda</i>	All	FC	R	I
Family: Passeridae						
40	House Sparrow	<i>Passer domesticus</i>	All	FC	R	G
41	Chestnut-Shouldered Petronia	<i>Gymnoris xanthocollis</i>	All	U	R	G
Family: Zosteropidae						
42	Oriental White-Eye	<i>Zosterops palpebrosus</i>	Summer	FC	R	I,N
Family: Oriolidae						
43	Indian Golden Oriole	<i>Oriolus (oriolus)kundoo</i>	All	U	R	I,F
Family: Monarchidae						
44	Asian Paradise-Flycatcher	<i>Terpsiphone paradisi</i>	Winter	U	R	I
Family: Pittidae						
45	Indian Pitta	<i>Pitta brachyura</i>	Monsoon	U	PM	I
Family: Nectariniidae						
46	Purple Sunbird	<i>Cinnyris asiaticus</i>	All	C	R	N
47	Purple Rumped Sunbird	<i>Leptocoma zeylonica</i>	All	C	R	N
Family: Cisticolidae						
48	Ashy Prinia	<i>Prinia socialis</i>	All	C	R	I
Family: Muscicapidae						
49	Indian Robin	<i>Saxicoloides fulicatus</i>	All	C	R	I
50	Oriental Magpie Robin	<i>Copsychus saularis</i>	All	C	R	O
51	Black Redstart	<i>Phoenicurus ochruros</i>	Winter	FC	R	I
52	Brown Rockchat	<i>Cercomela fusca</i>	All	C	R	I
53	Red breasted Flycatcher	<i>Ficedula parva</i>	Winter	U	WM	I
54	Verditer Flycatcher	<i>Eumyias thalassinus</i>	Winter	U	WM	I,F
Family: Estrildidae						
55	Scaly Breasted Munia	<i>Lonchura punctulata</i>	Summer	C	R	G
56	Indian Silver Bill	<i>Euodice malabarica</i>	All	FC	R	I,G
Family: Rhipiduridae						
57	White Browed Fantail	<i>Rhipidura aureola</i>	Winter	U	R	I
Family: Campephagidae						
58	Small Minivet	<i>Pericrocotus cinnamomeus</i>	All	FC	R	I
Family: Ploceidae						
59	Baya Weaver Bird	<i>Ploceus philippinus</i>	All	C	R	I,G
Family: Cisticolidae						
60	Common Tailor Bird	<i>Orthotomus sutorius</i>	All	C	R	I
Family: Laniidae						
61	Bay Backed Shrike	<i>Lanius vittatus</i>	Winter	U	R	I
62	Long Tailed Shrike	<i>Lanius schach</i>	All	U	R	I

C-Common, U-Uncommon, FC-Fairly Common, L-Local, R - Resident, PM-Passage migrant, BM-Breeding migrant, WM-Winter migrant, I-Insectivores, G-Granivores, N-Nectarivores,

F-Frugivores, O-Omnivores, C-Carnivores

The following formula was used for determining percentage of occurrence of bird families ^[15, 16].

$$\text{Percent occurrence} = \frac{\text{No. of individual species}}{\text{Total No. of species}} \times 100$$

Table 2: Percentage occurrence of birds represented by families in L.I.T. campus.

Sr. No	Families	Percent occurrence
1	Charadriidae	1.2
2	Ardeidae	0.83
3	Rallidae	0.27
4	Accipitridae	1.6
5	Phasianidae	0.6
6	Coraciidae	0.7
7	Alcedinidae	2.18
8	Meropidae	1.5
9	Upupidae	0.2
10	Ramphastidae	1.1
11	Pisttaciidae	5.1
12	Laniidae	0.78
13	Apodidae	2.3
14	Cuculidae	1.16
15	Bucerotidae	1.2
16	Columbidae	7.9
17	Meropidae	2.3
18	Picidae	0.2
19	Strigidae	0.7
20	Sturnidae	11.8
21	Pycnonotidae	4.1
22	Timaliidae	6.4
23	Turdidae	0.7
24	Aegithinidae	1.4
25	Dicruidae	4.5
26	Passeridae	2.1
27	Megalaimidae	2.7
28	Zosteropidae	0.9
29	Oriolidae	0.7
30	Monarchidae	0.09
31	Pittidae	0.6
32	Nectarinidae	3.1
33	Cisticolidae	2.5
34	Muscicapidae	10.3
35	Estrilidae	5.3
36	Campephagidae	2.4
37	Rhipiduridae	0.3
38	Ploceidae	2.6

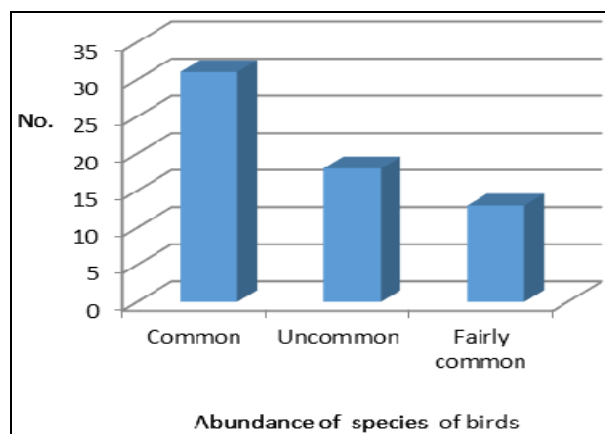


Fig 1: Abundance of avifaunal population.

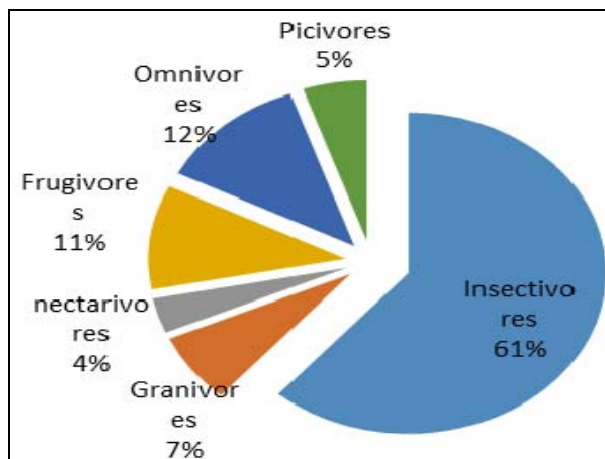


Fig 2: Dietary pattern of avifaunal population

In the present study a total of sixty two species of birds belonging to eleven orders and thirty eight families have been recorded (Table1). Residential status showed that 59 species were resident. Certain species of birds like Pied cuckoo was breeding migrant. Indian pitta and Rosy starling were passage migrant and Red breasted flycatcher and Verditer flycatcher were winter migrant. It was also noted that 37 species were present in all seasons. A total of 49 species were observed in winter season. In monsoon 44 species and in summer season 42 species were seen. The least number 38 species was observed during spring season. A distinct seasonal variation pattern showed richness of migratory species during winter and monsoon season along with residential birds. Among these 31 species (50%) were commonly found, 18 species (29%) were uncommon and 13 species (21%) were fairly common (Figure 1). Maximum abundance was noted from order Passeriformes which included 61% of total avifaunal species and was represented by 35 species belonging to 21 families. Dominant species were found from families Sturnidae, Muscicapidae, Columbidae and Timaliidae (Table 2). It was observed that family Muscicapidae of order Passeriformes showed highest species richness with six species within the campus followed by order Coraciiformes and Gruiformes respectively. Dietary pattern of birds showed that insectivores were dominating bird community followed by omnivores, frugivores, granivores, and nectarivores respectively (Figure 2). Such trend was also observed in other studies on avifauna [17, 18]. Common Myna, Indian Robin, Oriental Magpie Robin, Purple Sunbird, Jungle Babbler were found in high frequencies in the campus. The distribution and occurrence of avifauna appeared to be associated with the vegetation patterns of the area, which is of great significance [19]. The mixed types of light dense forest including thorny bushes of *Acacia nilotica* were found in this area. Dominated trees in the study area were *Ficus benghalensis*, *Ficus religiosa*, *Butea monosperma*, *Pithecellobium dulce*, *Albizia lebbek*, *Azadirachta indica*, *Polyalthia longifolia*, *Aegle marmelos*, *Psidium guajava*, *Tamarindus indica*, *Arecaceae*, *Plumeria obtusa*, *Delonix regia*, *Cassia fistula*, *Bauhinia racemosa*, various flowering and exotic species of plants, small patches grass land, which provided variety of habitat and diet for birds. Nests of birds like Scaly Breasted Munia, Swallows, Red Vented Bulbul, Shikra, Baya Weaver Birds, Francolin, Spotted Owlet, Greater Coucal were observed in the college campus during the investigation period. Species richness appeared to vary due to changes in weather conditions or availability of food [17, 18, 21]. In the present study maximum richness was recorded during winter and rainy season. In the present study it was found that

college campus provide ground for feeding, breeding and nesting for avifauna which was similar to the findings of Dey A. *et al.* 2013, Lila R. *et al.* 2009, Sethy J. *et al.* 2015^[17, 20, 22]. These findings suggest that the L.I.T. campus, a prominent green space in Nagpur is abode for various local and few migratory birds. It appears that this area can be considered for conservation and research programmes in future.

4. Conclusion

Rich avian diversity was recorded for L.I.T. campus which is attributed to its geographical location. This region appears to provide a corridor for birds. The dietary pattern of some birds was monophagous while that of others was polyphagous. This shows that there is a need to protect, each and every habitat present in and around college campus as these are nutritional niches of bird species. Generally urbanization results in homogenisation of species with few species far more abundant than others but L.I.T. college campus is not yet highly homogenized and supports high species diversity. This study highlights importance of green space of college campus for maintenance of the ecological balance for sustainable urban development.

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