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Avian diversity in urban, periurban and rural residential areas of Ludhiana

KEYWORDS: Avifauna, urbanization, periurban, rural areas

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ABSTRACT *Habitat structure and complexity are the two main components for determining community and its diversity. As urbanization continues, urban avifauna is becoming increasingly appropriate target for research and conservation efforts. As a result of urbanization, landscapes and land-use patterns are changing the world over. The extreme form of land use alteration has affected species composition and abundance, moulding few species to dominate the urban environment. In this paper we look into species richness and abundance of bird species and their variation along urban-rural gradient. Three residential areas of different locations were studied. During the study, total of eleven, eight and six bird species were recorded from urban, periurban and rural residential areas. Abundance of granivorous and omnivorous birds were recorded to be highest in urban and semiurban areas respectively. City planners need to pay more attention towards preserving habitats in urban areas as they provide suitable corridors for various activites of birds and their movement.*

Introduction

The avifauna of India has more than 1300 bird species (Ali 1969). Comparative studies of avian community composition in different habitats, including urbanized and natural, improve our knowledge of general patterns and processes that characterize bird species and communities. The growth of urban centres has profound effects on natural landscapes. Urban planners need better information about the factors affecting the distribution of species and structure of communities in order to create or maintain biodiversity in urban areas (Bohning and Gaese 2000). Increase in urban population results in wholesale conversion of agricultural and forest tracts into urban and suburban environments. Urbanization often modifies landscapes and land use patterns, leading to changes in the vegetation and altering species composition (Olden 2006, Kler and Kumar 2015a). Studying faunal composition along an urban-rural gradient helps in understanding various ecosystem processes at landscape level. This is a unique area of research (Blair 2004). In the concept of urban-rural gradient, suburban habitats play a unique role in biodiversity conservation. In general, human activities have produced similar ecological structures in urban areas even in different biogeographical regions. The response of birds to these environmental changes could lead to the dominance of bird communities by a few very abundant species (Bezzel 1985, Kler and Kumar 2015b).

Materials and Methods

Data on bird community structure was taken from the residential areas of three locations viz: urban, periurban and rural areas of Ludhiana district. Urban location was divided into two sites i.e. Model Gram (30°89'77, 75°83'88) and Sarabha Nagar (30° 89'27, 75° 81'88). Periurban location was divided into two sites i.e. Daad (30°86'44, 75°79'23) and Thakkarwal (31°36'50, 75°91'58) villages and rural location was divided into two sites i.e. Lalton (30°84'12, 75°77'53) and Jhameri (30°90'06, 75° 85'72) villages. Residential areas of Model Gram and Sarabha Nagar, Daad and Thakkarwal village and Lalton and Jhameri village were marked as study areas-I, II and III respectively.

Point count method was used for the data collection (Ralph 1995). Data was collected from March 2014- February 2015. All the three areas were thoroughly studied to observe bird community structure. Different bird species were identified during the data collection from all the residential areas of three different locations.

Results and Discussion

In the present study, total of eleven bird species were recorded at the residential areas of urban location belonging to order Passeriformes (48.70%), Columbiformes (35.28%), Ciconiiformes (6.25%), Cuculiformes (5.55%) and Psittaciformes (4.22%). Urban bird communities are often composed of omnivorous bird species. As per annual relative abundance of bird species, Blue Rock Pigeon (28.78%) was recorded to be most abundant species followed by House Crow (22.79%) and Common Myna (13.52%) (Table1). The population of the Blue Rock Pigeon has increased worldwide in larger cities, due to the availability of variety of food, mostly due to feeding by pigeon enthusiasts, food discarded by humans, accidental food spillage and availability of easier and more nesting sites (Kler and Kumar 2013). Abundance of Jungle Babbler, Red collared Dove, Black Kite and Eurasian collared Dove were found to be 8.64%, 6.50%, 6.25% and 5.81%. Least values of annual abundance were recorded in Rose ringed Parakeet (3.45%) ,Red-vented Bulbul (3.25%) , Purple Sunbird (0.50%) and Asian Koel (0.17%). Species diversity (H=1.99) was recorded to be highest in the month of February (2015). Evenness (E=0.90) was also recorded to be highest in the month of February.

Total of eight bird species were recorded in the residential areas of periurban location belonging to order Passeriformes (72.71%), Cuculiformes (21.77%), Columbiformes(5.48%). Omnivorous bird species were found in abundance. As per annual relative abundance of bird species House Crow (40.37%) was found to be the dominating species followed by Common Myna (21.93%) and Eurasian collared Dove (13.29%). Studies have shown that House Crow prefers periurban environment for residing

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due to the presence of city as well as village refuse which provides an easy source of food (Gurwinder *et al* 2015). House Crow feeds on refuse thrown away by human in cities and villages (Nathan and Emery 2004). Abundance was found to be 9.63%, 8.48% and 4.35% in House sparrow, Blue Rock Pigeon and Crow Pheasent. Least value for relative abundance was recorded in Asian Koel (1.13%) and Ashy Prinia (0.78%). Species diversity (H= 1.80) was recorded to be highest in the month of March,2014. Evenness (E=0.96) was recorded to be highest in the month of November, 2014.

Total of six bird species were recorded in the residential areas of rural location belonging to order Passeriformes (57.89%), Cuculiformes (1.46%) and Columbiformes (39.87%). Omnivorous bird species were found in abundance. As per the annual relative abundance of the bird species Blue-rock Pigeon was found to be the most abundant species with relative abundance of 38.72% followed by House Crow (34.13%). Studies have revealed that the increase in abundance is related to the increase in food abundance and probably due to the reduction in predation pressure (Kler 2006). Abundance of Bank Myna and House Sparrow were recorded to be 12.68% and 11.08% respectively. Least value for relative abundance was recorded for Asian Koel (1.15%) and Yellow legged Green Pigeon (1.46%). Species Diversity (H= 1.49) was recorded to be highest in the month of March (2015) and Evenness (E= 0.99) was recorded to be highest in the month of May, 2014.

Study involving foraging guild revealed that granivorous birds were recorded to be abundant in urban location with abundance of 44.54% (Fig. 1). This is because exotic vegetation, refuse, and bird feeders may all provide food sources for urban birds (Leston 2006). In semiurban location, omnivorous birds were recorded to be abundant with abundance of 73.06%. This is because omnivorous species adapted to the periurban environment and its particular food resources such as garbage (Gurwinder *et al* 2015). In rural location omnivorous birds were recorded to be abundant with abundance of 46.67%.

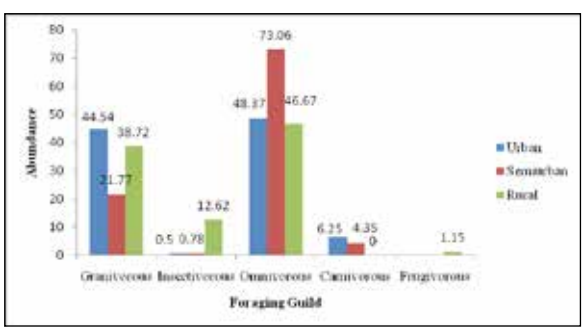

Fig 1. Relative abundance of different avian species according to their foraging guild at urban, semiurban and rural locations.

Conclusion

From the present study it was observed that bird species richness was highest in the residential areas of urban location. Some prime factors that affect bird community composition and abundance along urban areas include proximity to the roads, developmental activities and density of buildings (Mazumdar and Kumar 2014). Landscape modification and diversity of habitats for various life forms, makes urban areas a priority area for conservation (Miller and Hoobs 2002). At the same time, urbanization has a positive impact on the bird abundance of few species which are adapted to urbanization and particularly those that need nesting sites resembling to those of the cliffs or ledges (Wadatakar 2002). Higher resource abundance, lower predator abundance, or a combination of both factors may result in higher bird population densities in urban areas (Sutherland 1976).Blair (2004) reported that species richness and diversity peaked at moderate levels of urbanization due to abundance and diversity of resources available to birds. Thus, diversity in the availability of resources in a particular habitat may be an important factor that determines the structure and diversity of bird communities.

Table 1. Annual relative abundance (%age) of different avian species at three study areas

Annual relative abundance (%age)				
Sr.No	**Species**	**Area-I**	**Area-II**	**Area-III**
	Asian Koel	0.17	1.13	1.46
	Ashy Prinia	-	0.78	-
	Bank Myna	-	-	12.68
	Black Kite	6.25	-	-
	Blue Rock Pigeon	28.78	8.48	38.72
	Common Myna	13.52	21.93	-
	Eurasian collared Dove	5.81	13.29	-
	House Crow	22.79	40.37	34.13
	House Sparrow	-	9.63	11.08
	Jungle Babbler	8.64	-	-
	Purple Sunbird	0.50	-	-
	Red vented Bulbul	3.25	-	-
	Red collared Dove	6.50	-	-
	Rose ringed Parakeet	3.45	-	-
	Yellow-legged green Pigeon	-	-	1.15
Species Richness		8 - 10	3 - 8	3 - 5
Diversity		1.82 - 1.99	1.26 – 1.80	1.01 – 1.49
Evenness		0.81 - 0.90	0.81 – 0.96	0.84 – 0.99

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