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## RESEARCH ARTICLE

## Bird composition in urban landscape of Punjab

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**Abstract**

Habitat structure and complexity are two main components determining bird community and its diversity. As urbanization continues, urban avifauna is becoming increasingly appropriate targets for research and conservation efforts. Bird population in six towns of Punjab was studied to identify habitat characteristics that define the distribution of various common bird species. Survey has revealed the presence of 25 avian species with maximum 17 in Begowal and 15 in Balachaur towns. Blue Rock Pigeon and House Crow were the most abundant species in urban areas. Active nests of seven bird species were observed in study areas during the survey. The urban features were observed to be more important in predicting nest-site selection and nest success within our study area than tree characteristics. It was concluded that food availability is a key driver of differences in avian demography and nest-site selection between landscapes. However, better-targeted research and monitoring is needed in areas that are at greatest threat from urbanization.

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## INTRODUCTION

The avifauna of India includes around 1314 species (Oleti, 2010). Punjab has a rich bird fauna comprising 328 species of birds (Jerath and Chadha, 2006). As cities grow and expand, urbanization replaces native habitats with new man-made systems where natural and anthropogenic components interact (Parsons et al., 2006). Bird communities respond to this environmental variation in several ways. Habitat loss, destruction and degradation are the major threats to avian species richness and diversity. But there are a number of bird species that survive successfully in the urban matrix. Consequently, urban environments can no longer be viewed as lost habitat for wildlife, but rather as new habitat that, with proper management, has the potential to support diverse bird communities. Most of the earlier research directed towards determining the habitat needs of various birds has centered on 'natural' communities, while urban ecosystems have been largely ignored. Now a days, urban avifauna are becoming increasingly appropriate targets for research and conservation efforts (Mortberg and Wallentius, 2000) particularly when human population, social and demographic trends predict further urbanization. The city buildings are well documented to provide nesting, roosting and perching sites for some bird species. However, permanent presence of humans and higher densities of non-native predators have potential to affect avian nest placement (Mazumdar and Kumar, 2014). With the rapid expansion of urban development, the importance of understanding the relationship between avian fauna and urban habitats is evident.

Keeping this objective in mind, it was planned to determine the avian community structure and their nesting sites in urban habitats from different districts of Punjab state so as to generate data that will provide baseline information.

## Material and Methods

The present study was carried out under the mandate of All India Network Project (AINP) on Vertebrate Pest Management (Ornithology section) sponsored by ICAR, New Delhi.

### Study site

The Study was conducted over a period of two years (January 2013-December 2014) in the six towns namely Rayya (31.54°N 75.23°E), Sirhind (30.22°N 76.14°E), Kartarpur (31.44°N 75.5°E), Begowal (31.62°N 75.52°E), Muktsar city (30.475°N 74.515°E) and Balachaur (31.0667°N 76.3167°E) falling in six districts i.e. Amritsar, Fatehgarh Sahib, Jalandhar, Kapurthala, Muktsar and Shaheed Bhagat Singh (SBS) Nagar respectively, of Punjab state. The selected sites were surveyed for avian species quarterly (n=6 for each site).

### Survey method

Line Transect Method (Verner, 1985) was used for survey of different bird species. About 500 to 1,000 m length of line transect were selected on each study site and walked slowly for taking observations. All birds sighted or heard, including those in flight were counted and recorded. The birds inhabiting and visiting the area under study were observed with naked eye or through Bushnell Binocular (8X42) whenever found necessary to record the data from a long distance in order to avoid any interference. Identification of birds was based on keys described by Ali (2002). Total numbers of bird species and their abundance have been estimated. Relative abundance (%) was calculated as:  $(n_i/N) \times 100$ , where  $n_i$  is the number of birds of  $i$ th species and  $N$  is the total number of birds of all species. Active nesting sites in the selected urban areas were also located for different bird species.

### Results

The structure of bird communities recorded at the studied urban areas was different from each other. A total of 25 bird species were observed in the six urban areas from six districts of Punjab. The number of bird species seen in Rayya, Sirhind, Kartarpur, Begowal, Muktsar and Balachaur were 8, 8, 9, 17, 12 and 15 respectively (Table 1). In Rayya, Kartarpur and Muktsar urban areas, Blue Rock Pigeon (*Columba livia*) was the most abundant species with relative abundance of 41.79, 38.30 and 28.00% respectively. In Balachaur, House Crow (*Corvus splendens*) was observed as the most abundant (26.80%) bird species whereas Blue Rock Pigeon and House Crow were equally abundant (29.30%) species in Sirhind city. Blue Rock Pigeon and Common Myna (*Acridotheres tristis*) were the species observed at all the urban areas under study. Bank Myna (*Acridotheres ginginianus*), House Crow and Ring Dove (*Streptopelia decaocto*) were observed in all other five cities except Muktsar. House Sparrow (*Passer domesticus*) was also observed in Begowal, Muktsar and Balachaur towns with relative abundance of 2.47, 18.00 and 4.57% respectively. Five bird species namely Brown Rock Chat (*Cercomela fusca*), Indian Tree Pie (*Dendrocitta vagabunda*), Little Brown Dove (*Streptopelia senegalensis*), Little Cormorant (*Microcarbo niger*) and White Wagtail (*Motacilla alba*) were observed in urban area of Muktsar only with relative abundance of 10.00, 1.00, 9.00, 3.00 and 1.00% respectively, during the study period.

During the study period, active nesting sites of seven bird species were observed at different sites (Table 2). The active nests of Blue Rock Pigeon were observed in all the areas under study. Establishment of nests by this species was observed to be 80% in ventilators, 10% on high window ledges and 10% under water tanks. Their nests consisted of sticks, twigs and grasses. Two Cattle Egret (*Bubulcus ibis*) heronries were located within and in the outskirts of towns of Begowal and Balachaur urban areas respectively. In town of Begowal, 46 Cattle Egret nests were located on Beri (*Zizyphus mauritiana*) tree whereas in Balachaur 11 nests were located on Kikar (*Acacia sp*) tree. The active nests of House Crow were seen in all the study areas except Muktsar city. Over all 81.25% nests were placed at least 10 m above the ground in tall trees whereas 18.75% nesting of this species was observed on electric power transmission line. The cup shaped nests were lined with soft materials such as grass, roots and soft plant material. Nests of Pied Myna (*Sturnus contra*) were observed in Begowal and Balachaur towns only and establishment was 100% on electric poles. The active nests of Pariah Kite (*Milvus migrans*) were observed in four towns with establishment on large traditional trees (87.5%) and on mobile towers (12.5%). The nest was a rough platform of twigs and rags. Nests of Red Vented Bulbul (*Pycnonotus cafer*) were observed in two towns only with 100% establishment on bushes and shrubs at a height of around 2–3 m whereas nesting sites of Ring Dove were located in three towns with 100% establishment on medium sized trees.

**Table 1: Community structure (Percentage abundance) of birds observed in urban areas of different districts of Punjab**

S. No.	Bird species	Amritsar	Fatehgarh Sahib	Jalandhar	Kapurthala	Muktsar	SBS Nagar
		Rayya	Sirhind	Kartarpur	Begowal	Muktsar	Balachaur
1	Bank Myna ( <i>Acridotheres ginginianus</i> )	2.98	24.1	10.64	3.70	-	23.53
2	Black Drongo ( <i>Dicrurus macrocercus</i> )	-	-	-	0.62	1.00	-
3	Black Winged Stilt ( <i>Himantopus himantopus</i> )	-	-	4.25	-	-	0.65
4	Blue Rock Pigeon ( <i>Columba livia</i> )	41.79	29.3	38.30	15.43	28.00	5.23
5	Brain Fever Bird ( <i>Hierococcyx varius</i> )	-	-	-	0.62	-	-
6	Brown Rock Chat ( <i>Cercomela fusca</i> )	-	-	-	-	10.00	-
7	Cattle Egret ( <i>Bubulcus ibis</i> )	-	-	-	13.58	-	1.96
8	Common Myna ( <i>Acridotheres tristis</i> )	10.45	6.8	12.76	14.81	15.00	9.80
9	Common Swallow ( <i>Hirundo rustica</i> )	25.37	-	-	-	6.00	5.26
10	House Crow ( <i>Corvus splendens</i> )	11.19	29.3	17.02	25.92	-	26.80
11	House Sparrow ( <i>Passer domesticus</i> )	-	-	-	2.47	18.00	4.57
12	Indian Robin ( <i>Saxicoloides fulicatus</i> )	-	-	-	0.62	-	-
13	Indian Tree Pie ( <i>Dendrocitta vagabunda</i> )	-	-	-	-	1.00	-
14	Little Brown Dove ( <i>Streptopelia senegalensis</i> )	-	-	-	-	9.00	-
15	Little Cormorant ( <i>Microcarbo niger</i> )	-	-	-	-	3.00	-
16	Pariah Kite ( <i>Milvus migrans</i> )	-	3.4	2.13	1.85	-	8.50
17	Pied Myna ( <i>Sturnus contra</i> )	-	-	-	1.23	-	1.31
18	Purple Sunbird ( <i>Cinnyris asiaticus</i> )	-	-	-	3.09	-	0.65
19	Red Vented Bulbul ( <i>Pycnonotus cafer</i> )	-	-	2.13	0.62	7.00	1.31
20	Red Wattled Lapwing ( <i>Vanellus indicus</i> )	-	1.7	-	1.23	-	1.96
21	Ring Dove ( <i>Streptopelia decaocto</i> )	1.49	1.7	10.64	9.26	-	7.84
22	Rose-Ringed Parakeet ( <i>Psittacula krameri</i> )	5.97	3.4	-	-	1.00	-

23	Shikra ( <i>Accipiter badius</i> )	0.75	-	2.13	1.23	-	-
24	White Throated Munia ( <i>Lonchura maja</i> )	-	-	-	3.70	-	0.65
25	White Wagtail ( <i>Motacilla alba</i> )	-	-	-	-	1.00	-

**Table 2: Nesting of bird species observed in urban areas of different districts of Punjab**

S. No.	Bird species	Amritsar	Fatehgarh Sahib	Jalandhar	Kapurthala	Muktsar	SBS Nagar
		Rayya	Sirhind	Kartarpur	Begowal	Muktsar	Balachaur
1	Blue Rock Pigeon	☐	☐	☐	☐	☐	☐
2	Cattle Egret	-	-	-	☐	-	☐
3	House Crow	☐	☐	☐	☐	-	☐
5	Pariah Kite	-	☐	☐	☐	-	☐
4	Pied Myna	-	-	-	☐	-	☐
6	Red Vented Bulbul	-	-	-	☐	☐	-
7	Ring Dove	☐	☐	☐	-	-	-

## Discussion

Birds adapt to the urban ecosystem both physiologically (changes in stress hormones) and in behavior (e.g., changes in foraging behavior, extending the breeding season). In general, urban bird communities include less species and higher abundances than those from natural habitats (Suhonen et al., 2009). Urbanization selects for omnivorous, granivorous, and cavity nesting species. In present studies, two species of omnivorous birds (House Crow and Common Myna) and two species of granivorous birds (Blue Rock Pigeon and Ring Dove) were relatively abundant in urban areas. Some bird species like *Columba livia*, *Corvus splendens*, *Acridotheres tristis*, *Strunus contra*, *A. ginginianus* and *Streptopelia decaocto* were noted to dominate the avian landscape and were on the top level of urbanization (Kler, 2006). Several ecological factors like roosting sites, nesting sites, food and water points have definite relationship with population of feral pigeon in urban areas (Ali et al., 2013). Invasive urban bird species that colonized urban environments over a long period achieved the largest increase in population density compared to their ancestral rural habitats. Urban and suburban habitats are normally characterized by extremely high food resource abundance. In present studies, House Crow and Bank Myna were commonly observed foraging near garbage dumps. Food such as refuse is likely to provide important resources for some species (Chamberlain et al., 2009). The increase in population density is related to the increase in food abundance and probably to the reduction in predation pressure. The towns like Balachaur and Begowal with moderate vegetation (road-side trees and unused land with bushes) have shown the presence of more number of species than others. There is often a strong positive correlation between the volume and structure of native vegetation and native bird diversity (Chace and Walsh, 2006). In study area, Red Vented Bulbul, Indian Robin and Purple Sunbird were the birds commonly observed in urban parks. Studies of bird communities in urban parks have shown that parks are considerably richer in bird species diversity and richness than other urban habitats (Jokimaki 1999). House Sparrow was observed in three towns under study and was observed to be associated with gardens. According to Shaw et al., (2008) the garden areas are likely to contain a high proportion of native shrubs which can provide cover and insects for foraging birds. The presence of Pariah Kite and Shikra in areas under study was for the purpose of food hunt/search. Urban habitats are often of superior quality to raptors because there they are often free from persecution and have an adequate food supply allowing use of otherwise unsuitable or unproductive nesting sites (Chace and Walsh, 2006; Gatesire et al., 2014). Avian fecundity in urban areas is a reflection of species-specific adaptability to urban resources, and to levels of nest predation and nest parasitism.

In study areas, birds were usually observed to breed in the spring and summer months. Different species show different preferences as to where they nest. The space under the roof and crevices were the most commonly reported nest-site locations of Blue Rock Pigeon. Bird-friendly buildings and gardens providing appropriate food, water, nesting material and preferred nesting sites can, therefore, be important for such birds. Unfortunately, modern houses provide fewer nesting sites and are, therefore, used relatively infrequently by nesting birds particularly in urban areas. The negative relationship between buildings and nest-site selection may be due to an increasing human disturbance associated with buildings. Nest construction and placement are correlated with the breeding season, suitable nest sites, nesting materials availability, food availability and predator's interaction (Dial, 2003; Murray, 2015). Birds in urban areas tend to place their nests higher than in areas with lower disturbance (Dhindsa et al., 1989) because nests situated in the lower parts of trees may suffer from higher levels of predation or disturbance by humans than nests situated in the higher parts of trees. In another study conducted by Reale and Blair (2005) nest height significantly influenced nesting outcome for tree nester species like House Crow and Pariah Kite. However, some of the species like Ring Dove, Cattle Egret and Red Vented Bulbul were relatively tolerant to high levels of human disturbance and were often found nesting on medium-sized trees in areas of high foot and vehicular traffic. Therefore, the present study suggests that urban features were more important in predicting nest-site selection and nest success within our study area than tree characteristics.

In conclusion, our results revealed that abundant bird species were only related to urban infrastructure features (i.e., cables, lightning rods, building height), while moderately abundant and rare species were related to habitat structure and urban-related hazards, showing that life-history traits affect how species respond to urbanization. Moreover, the dominance of omnivorous and granivorous species in residential, residential-commercial, and commercial land-uses, demonstrates that these urban land-uses tend to select for generalist species.

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