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Urban Bird Counting From Lothar to Tikauli Bufferzone Forest, Chitwan, Nepal

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Abstract

Urbanization results in habitat modification causing alteration in the assemblage of biological diversity. Bird diversity serves as a good ecological indicator; hence, this study examined the effects of urbanization on bird species counting and diversity in East-west highway from Lothar Khola to Tikauli Bufferzone Forest, Chitwan. Bird surveys were conducted during the spring season and pre-monsoon seasons of 2022 along fifteen transects each of 2 km length by positioning the point count stations at every 2 km interval on vehicle survey. A total of 3,147 birds of 63 species were observed from 28 families. Among the 63 species, 58 were residents and 5 were migratory. The associations of bird richness and abundance were found higher in forest area that covers almost 20% of the total surveyed transects. Number of nest were also recorded throughout the entire survey and majority of nest were of Baya weaber. Conversely, road under construction showed negative effects. In an urban setting, 100 nesting sites were recorded on electric pole, tree species and some on the residential houses. Thus, cities should focus on developing green city concept simultaneously with other developmental projects.

Keywords: *Urbanization, abundance, fragmentation, variation, distribution*

Introduction

Due to the rapid increasing urbanization in developing countries and increase in settlements, disturbances, construction works etc. that makes the urban area more complex (McKinney 2002 and Thapa *et al*., 2010). The most common factor causing species endangerment and extinction second to interactions with invasive species appears to be top-ranked urbanization (Czech *et al*., 2000). Though, the effect of urbanization varies to all the taxa as it carves abundance of some urban exploiter species but reduction in the species richness and their diversity. Avifauna serve as good ecological indicators showing sensitiveness to environmental degradation (Clergeau *et al*., 2001). Habitat degradation is the major challenges that cohord the bird communities in the urban area (McKinney, 2006).

The complexity in bird community and their composition alter with urbanization gradients as species richness decreases with urbanization, while Urbanization creates habitat fragmentation, alters or destroys the natural habitats, threaten the biodiversity and produces great challenges to conservation (McKinney 2006). The species which are not able to cope with such habitat modification disappear locally (Strohbach *et al*., 2009 and Yu and Guo 2013). However, some bird species are also benefited by such heterogeneous habitat of urban landscapes (Chace and Walsh 2006; Caula *et al*., 2008). So, our understanding of urbanization complexity and its impacts on biodiversity are still unknown.

Urbanization is rapidly increasing in Nepal since late 90s and also Chitwan district on of the most developing and populated city that consist of some unplanned place like Tandi, Parsa etc. The unplanned urbanization in such city has triggered the increased habitat fragmentation, changing land use system and loss of forests. Until now, the total number of urban bird species and threats by urbanization in Chitwan district especially the highway trail has not been analysed thoroughly, though a large number of birds are to be believed to be threatened by urbanization due to the lack of breeding and foraging grounds.

Objectives

The objectives of this study were as follows:

- To list the bird's species and their abundance.
- To observe the possible threats.
- To record the nest.

Area of Research

The Chitwan district is situated in South Central Nepal, Bagmati Province in the subtropical lowlands of the inner Terai (DNPWC, 2017) located between 27°.11'and 27.45'N and 83.47' and 84.52'E ranging from 140-900masl (Fig.1). The Chitwan possesses a diversity of ecosystems, including Rapti, Reu, Narayani river, Khair Khola, Lothar Khola, Khageri Khola etc. The Churia hills rise slowly towards the east from 150m to more than 800m. On the north part, The Mahabharat range stood through the border line.

The climate of this region is tropical type. The summer is hotter and dry with temperature rising up to 40°C whereas the winter is cold with temperature declining below to 8°C. Major precipitation takes place during the monsoon that usually begins in June. About 65% of the surface area of Chitwan district is covered by the forest (Thapa and Poudel, 2018). Dominant vegetation in urban and suburban areas of East-West highway from Lothar Khola to Tikauli Bufferzone Forest include *Shorea robusta, Acacia catechu, Ficus religiosa, Ficus benghalensis, Azadirachta indica, Bombax ceiba, Aegle marmelos, Dalbergia sissoo, Garuga pinnata, Saraca asoca,* etc.

Despite unplanned urbanization, Chitwan district still harbors a beautiful landscape and rich biodiversity. Remnant forest patches can be found inside the cities and villages. Altogether six types of vegetation, Tropical mixed forest, Subtropical Broadleaved forest, Riverine Mixed forest, Churia Arid forest, Grassland are found in the district and more than 850 birds, 60 mammals and 70 butterfly's species have been reported (Grimitt *et al.*, 2007; BES 2019).

Figure 1: Map showing the study area; Chitwan District and East-West Highway.

Materials and Methods

The various materials used throughout the survey were binocular, camera (Nikon Cool-pix P-900), GPS, Altimeter, Sound recorder etc. The field design was prepared using topographic map and local bird watchers. The intensive study area was divided into three parts via. Urban, Sub-urban and forest covered area respectively. Line transects (Bibby *et al*., 1992) were drawn according the length of the highway.

Urban bird counting were surveyed through slow drive vehicle survey. Direct observations (Bibby *et al*., 1992) were made through binoculars and visual scanning on walking in transect, two times each during the study period between May 2022 to June 2022. Transect were monitored in the morning (7 am-11 am) and evening (4 pm -6:30 pm). A slow vehicle rides surveyed the entire areas with one bird expert and two observers. For the bird identification, a 'Birds of Nepal' book was carefully investigated (Grimmett and Baral *et al*., 2018). Nearly 30 km stretch was covered in each day and presence of bird species was recorded. A total of 7 days was spent in the field for locating urban bird. Calls were also recorded only for the confirmation of species presence by the help of Call back play method. Possible nest sites were also recorded during the survey time. When the birds were observed, the latitude and longitude at the beginning point and the end point of transect were also noted down immediately with the help of GPS.

Results and Findings

Typically, urban birds in the east-west highway included majority of local resident but few of them visit as a summer and winter migratory. The suitable time for the urban birds was during the morning and evening time while get roosted during mid-day

time. Based on present samplings and observation to the urban birds, habitat preferences of vagrant species, the species richness and abundance were remarkably significant.

A total of 3,147 birds of 63 species were observed from 28 families. Among the 63 species, 58 were residents and 5 were migratory (Table 1). Habitat status refer as Resident (R), Winter migratory (WM) and Summer migratory (SM).

Table 1: Checklist of birds recorded in East-west highway from Lothar to Tikauli Bufferzone Forest, Nepal.

S.N.	English name	Scientific name	Family	Status
1	House Swift	*Apus affinis*	Apodidae	R
2	Common Hoopoe	*Upupa epops*	Upupidae	R
3	Indian Grey Hornbill	*Ocyceros birostris*	Buceroidae	R
4	Asian Openbill	*Anastomus oscitans*	Ciconiidae	R
5	Common Pigeon	*Columba livia*	Columbidae	R
6	Spotted Dove	*Stigmatopelia chinesis*	Columbidae	R
7	White throated Kingfisher	*Halcyon smyrnensis*	Alcedinidae	R
8	Green Bee Eater	*Merops orientalis*	Meropidae	R
9	Greater Coucal	*Centropus sinensis*	Cuculidae	R
10	Asian Koel	*Eudynamys scolopaceus*	Cuculidae	SM
11	Ashy Prinia	*Prinia socialis*	Cisticolidae	R
12	Black Drongo	*Dicrurus macrocercus*	Dicruridae	R
13	Black hooded Oriole	*Oriolus xanthornus*	Oriolidae	R
14	Oriental magpie robin	*Copsychus saularis*	Muscicapidae	R
15	Common Stonechat	*Saxicola torquatus*	Muscicapidae	R
16	Jungle Myna	*Acridotheres fuscus*	Sturnidae	R
17	Asian Pied Sterling	*Gracupica contra*	Sturnidae	R
18	Brahminy Sterling	*Sturnia pagodarum*	Sturnidae	R
19	Common Tailorbird	*Orthotomus sutorius*	Cisticolidae	R
20	Grey Wagtail	*Motacilla cinerea*	Motacillidae	WM

21	Indian Jungle Crow	*Corvus culminatus*	Corvidae	R
22	House Crow	*Corvus splendens*	Corvidae	R
23	House Sparrow	*Passer domesticus*	Passeridae	R
24	Jungle Babbler	*Turdoides striata*	Leiothrichidae	R
25	Paddy-field Pipit	*Anthus rufulus*	Motacillidae	R
26	Purple Sunbird	*Cinnyris asiaticus*	Nectariniidae	R
27	Red-vented Bulbul	*Pycnonotus cafer*	Pycnonotidae	R
28	Red-whiskered bulbul	*Pycnonotus jocosus*	Pycnonotidae	R
29	Scarlet Minivet	*Pericrocotus flammeus*	Campephagidae	R
30	White Wagtail	*Motacilla alba*	Motacillidae	WM
31	Indian Pond Heron	*Ardeola grayii*	Ardeidae	R
32	Cattle Egret	*Bubulcus ibis*	Ardeidae	R
33	Little Egret	*Egretta garzetta*	Ardeidae	R
34	Red-napped Ibis	*Pseudibis papillosa*	Threskiornithidae	R
35	Coppersmith Barbet	*Megalaima haemacephala*	Megalaimidae	R
36	Plum-headed Parakeet	*Psittacula cyanocephala*	Psittaculidae	R
37	Alexandrine Parakeet	*Psittacula eupatria*	Psittaculidae	R
38	Rose-ringed Parakeet	*Psittacula krameri*	Psittaculidae	R
39	Spotted Owlet	*Athene brama*	Strigidae	R
40	Golden Oriole	*Oriolus kundoo*	Oriolidae	R
41	Indian Roller	*Coracias benghalensis*	Corvidae	R
42	Stork-billed Kingfisher	*Halcyon capensis*	Alcedinidae	R
43	Common Swift	*Apus apus*	Apodidae	R
44	Common Moorhen	*Gallinula chloropus*	Ardeidae	R
45	Bay backed Shrike	*Lanius vittatus*	Campephagidae	R
46	Ashy Drongo	*Dicrurus leucophaeus*	Dicruridae	R

47	Plain Martin	*Riparia paludicola*	Apodidae	R
48	Barn Swallow	*Hirundo rustica*	Apodidae	R
49	Baya Weaver	*Ploceus manyar*	Passeridae	R
50	Scaly Breasted Munia	*Lonchura punctulata*	Campephagidae	R
51	Oriental White-eye	*Zosterops palpebrosus*	Muscicapidae	R
52	Plumbeous Water Redstart	*Rhyacornis fuliginosus*	Apodidae	R
53	Oriental Turtle Dove	*Streptopelia orientalis*	Columbidae	R
54	Scarlet Minivet	*Pericrocotus flammeus*	Campephagidae	R
55	Shikra	*Accipiter badius*	Strigidae	R
56	Steppe Eagle	*Aquila nipalensis*	Strigidae	WM
57	Velvet-fronted Nuthatch	*Sitta frontalis*	Sittidae	R
58	White-browed Wagtail	*Motacilla maderaspatensis*	Motacillidae	R
59	Yellow Wagtail	*Motacilla flava*	Motacillidae	R
60	Ruddy-breasted Crake	*Porzana bicolor*	Rallidae	SM
61	Red-wattled lapwing	*Vanellus indicus*	Charadriidae	R
62	White breasted Waterhen	*Amauromis phoenicurus*	Ardeidae	R
63	Common Myna	*Acridotheres tristis*	Sturnidae	R

A total number of 100 nests were recorded in the 15 transects (Table 2). Majority nest were of Baya weaver whereas some of the nest were of House Crow, House Swift, Cattle Egret, Common Myna and Indian Pond Heron. Some of the nest were active where individuals are roasting while some were passive nest.

Table 2: Number of sited nest of different bird species with their nesting habitat.

S.N.	Bird species	No. of nest	Tree species/Habitat
1	Baya Weaver	40	Bettle nut
2	Cattle Egret	25	Peepal
3	House Crow	10	Khair and Electric pole

4	Indian pond Heron	7	Bamboo
5	House Swift	10	Old Muddy house
6	Common Myna	8	Telecommunication tower and electric pole

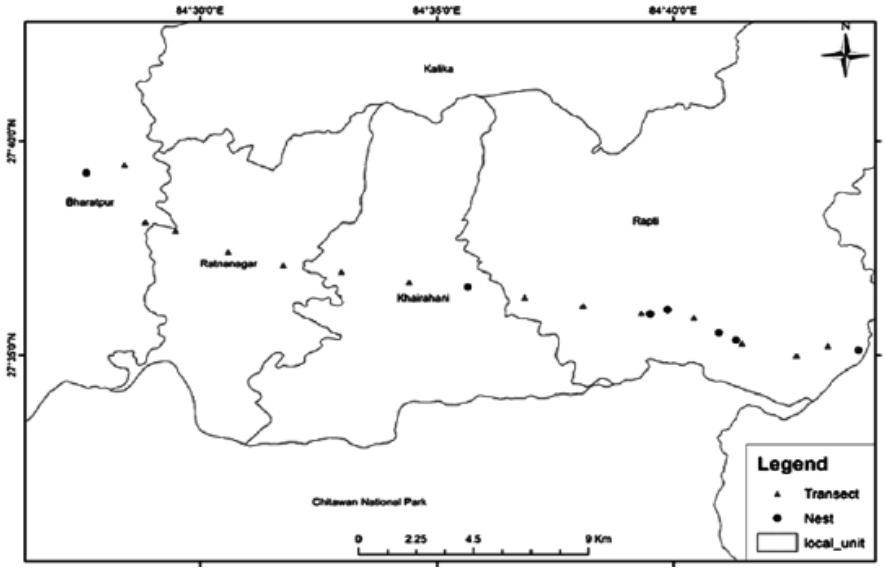

Figure 2: Map showing urban bird diversity and nest location in the east-west highway from Lothar khola to Tikauli Bufferzone Forest by the *ArcGIS* software (Version 10.4.1).

Urban bird was affected by the deforestation in the edges. Many trees species were likely to be cut down as the purpose for road expansion. Due to the purpose of road expansion, the number of bird counting are not maximum as expected. The possible threats to urban birds in the study area were vulnerable (Figure 3).

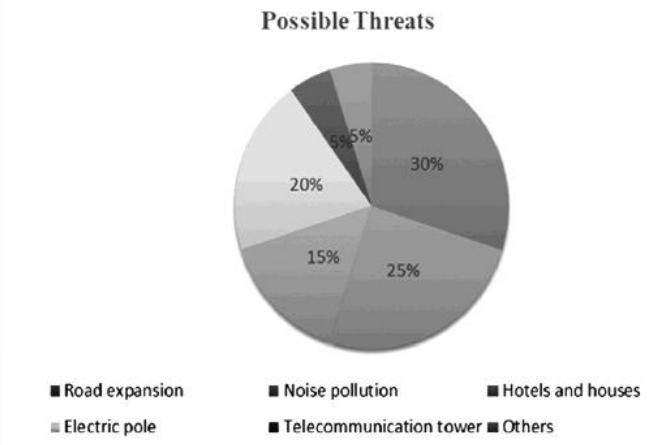

Figure 3: Perceived threats to urban birds in the east-west highway, Chitwan.

Discussion

This results from a mostly busy highway and developing and rapidly urbanizing city is consistent with previous studies from developed cities and countries that have shown decline in species richness and diversity of birds from rural to urban area (e.g. Tratalos *et al*., 2007; Grimmtt *et al*., 2008; Evans *et al*., 2009; Rija *et al*., 2014). This is because of the disturbances, differences in food availability, deforestation along in the highway edges and habitat features along the urban–rural gradients.

The record of fewer species in urban areas may be due to the lack of greenery, foraging area, fruiting trees, high human population density impact, less roasting success, environmental pollution and predation risk (Chandler *et al*., 2004; Crooks *et al*., 2004; Ditchkoff *et al*., 2006; Anderies *et al*., 2007) showing similarity in this survey findings along with urban areas suitable for fewer species (Plass and Wunderle 2013; Tryjanowski *et al*., 2015).

For shaping bird species composition in Nepal, seasonality plays a significant role. Both summer and winter migratory birds constitute almost one-third of the total bird species recorded in Nepal (Grimmett *et al*., 2003; Inskipp *et al*., 2016). In our study, a small number of summer migrants was recorded compared to winter migrants. This is at least partly because there are fewer summer migrants than winter migrants in Nepal (Grimmett *et al*., 2003; Inskipp *et al*., 2016). Also due to migration timing, as well as the availability of thick leaves on trees and bird being less vocal during the breeding period could have influenced in counting summer migratory birds.

The abundance of this species tends to be correlated with the density of large and old trees for nesting. Indeed, recent work has shown a significant nesting preference for larger trees, usually in old growth forest. The Herons are more likely to build nests in tall, evergreen trees. Old growth trees that extend the height of the canopy are preferred for nesting and the height of the tree and availability of natural cavities large enough to hold the male and female individual and also the eggs are more important than the type of tree species (James and Kannan, 2009).

This finding favours the bird abundance in the urban house sparrows with Chandler, R.B., A.M. Strong, and C.C. Kaufman., 2004. In urban house sparrows which was the maximum number of individuals as recorded but the survey was conducted regular time interval of five years' project plan. A threat to sharp-shinned hawks and merlin was also found to co-related with the house sparrows as the massive building and food unavailability adversely affect these passerine urban small creatures.

Conclusion

This finding provides that species richness, possible nest and threats of birds are differently affected by the urbanization and there exists distinct seasonal variations in these communities. More number of urban bird species was found in sub-urban areas as compare to the urban areas. Out of 63 bird species five was found to be migratory bird species. From the intensive study area, a total of 63 urban bird species were recorded in 15 different transects that covers 30km. More bird abundance was observed in the forest covered highway. A total number of 100 active and passive nest were recorded in the survey area. Among them, 60 were active nest whereas 40 were passive nests. The nest of Baya Weaver has been found to be more abundance. Road construction and cutting down the highway edges trees was the major threats for the urban birds. And also the intense noise pollution and deforestation nearby by highway edges in the urban area was major threats for nesting bird species.

We conclude that urbanization and seasonality differently affect the distribution of each bird community in East way highway. Except for urban areas, sub-urban areas contain higher species of birds. Sub-urban areas might help to facilitate in bird migration from rural to urban areas. But the bird diversity, abundance and the number of nests is more likely to deteriorates in near few more days. Rapid urbanization and road construction due to highway expansion project are major threats for urban bird.

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