Species Diversity of Urban Birds in Biratchowk, Morang, Nepal

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Abstract

Urban birds are species that thrive in city habitats and serve as indicators of urban environmental change. The present study was conducted to explore the diversity of urban birds in Biratchowk to develop baseline information for future research to understand how ongoing urban growth may be influencing their diversity, which will be helpful for future research. The data were collected during March to May of 2025 by using the point count method. A total of 24 species representing 23 genera, 16 families, and 7 orders were recorded. The order Passeriformes contributed the highest number of species (10), and Bucerotiformes and Charadriiformes each had a single species in the study area. The ecological indices showed moderate species diversity (H = 2.81), high evenness (E = 0.88), and semi-disturbed richness (D = 3.96). This study revealed that dense human settlement, limited vegetation, and scarcity of suitable nesting sites are associated with only moderate species diversity in the Biratchowk area.

Keywords: bird diversity, diversity indices, Morang district, point-count survey, urban area

Introduction

Birds are ecological indicators because they are sensitive to environmental change and respond to various structures of different habitats (Hossain & Baki, 2015). Urban birds are the bird species that adapt to human-dominated urban environments, showing behavioural, physiological, and morphological changes caused by urbanization (Isaksson, 2018). The importance of studying urban birds is that they are key components of urban biodiversity and are sensitive indicators of environmental change, and nearly 20% of the world's bird species occur in cities (Aronson et al., 2014; Bhusal & Ghimire, 2023). Their density, presence, or disappearance shows the

ecosystem's health (Dangaura et al., 2020; Shrestha et al., 2023). In addition, birds play crucial roles in pollination, seed dispersal, pest control, and nutrient cycling (Sekercioglu, 2006).

Nepal, being a world hotspot of avian diversity due to its diversified topography and climate (Lama et al., 2022), supports 892 bird species (DNPWC & BCN, 2025). However, increasing urbanization in city areas is leading to declining avian diversity due to habitat destruction and fragmentation (Desalegn & Abebe, 2024). Public places such as Parks and gardens become important shelters for the bird species (Baral et al., 2022). There are studies on bird diversity in wetlands and forest areas (Bhattarai & Devkota, 2020; Ghimire et al., 2022); however, studies on urban birds are limited in Nepal; most have focused on major cities such as Kathmandu, Pokhara, and Butwal, leaving other rapidly growing cities without baseline data (Bhusal & Ghimire, 2023).

Biratchowk is a rapidly growing urban area located in the Morang district of Koshi Province with no prior baseline data on avian species, which makes it harder to determine the impact of urban growth on birds. It is essential to develop evidence-based baseline data on urban bird species richness and abundance in the Biratchowk area to address this research gap. The present study will be helpful for future scientific research for comparison and analysis.

Methods

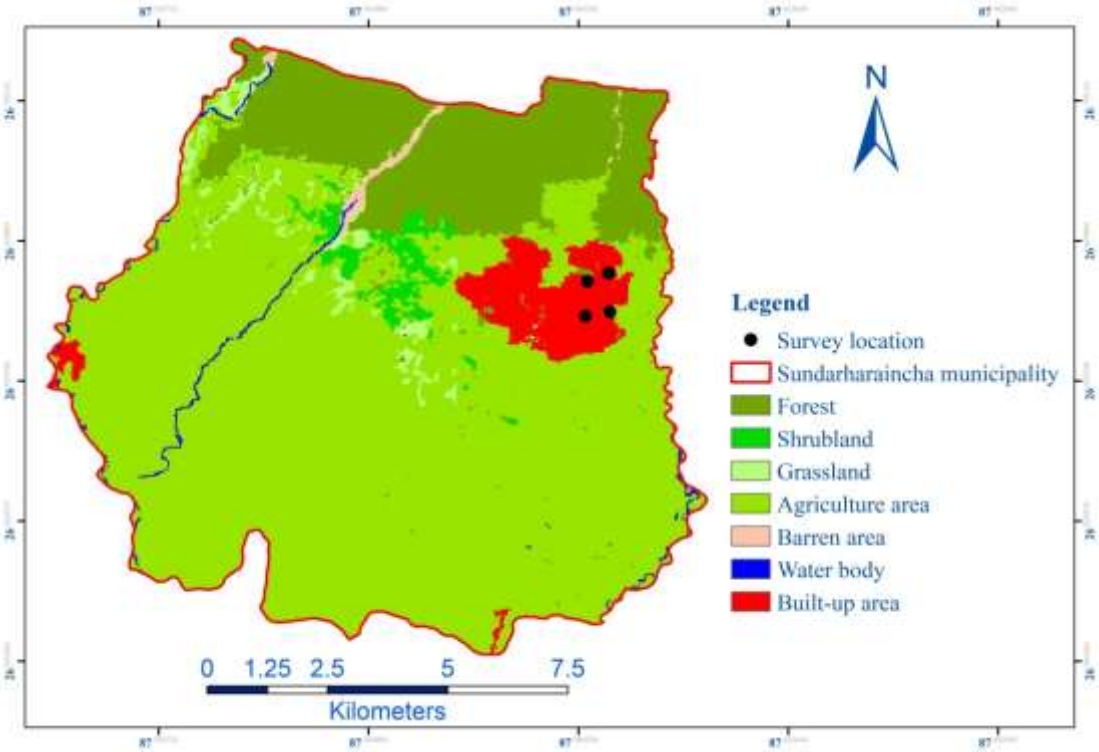
Study area

The present study was conducted in the Biratchowk area, in the Morang district of Koshi Province, at an elevation of 144 m above sea level, at 26°67' N latitude and 87°38' E longitude (Fig. 1). The study area has an average annual temperature range between 14.6°C and 30.6°C, with dominant vegetation of Sal (*Shorea robusta*), Sissoo (*Dalbergia sissoo*), Golden shower tree (*Casia fistula*), and Chir pine (*Pinus roxburghii*) and major crops grown in the study area of rice, maize, and jute (Mandal et al., 2021). Biratchowk is an educational hub, with Sukuna Secondary School, Sukuna Multiple Campus, and several reputed private schools clustered within a small area. As a result, the region supports dense, diversified human settlements, and their activities may influence the local biodiversity. Minimum distance of 1 km between points for data collection, and their coordinates were recorded using a Garmin eTrex10 GPS device and indicated on a study map. Each

point was observed for 20 minutes between 10.00 am and 12.00 pm. Photos of birds were taken using a Nikon D5600 DSLR camera and a 70–300 mm lens for documentation.

Figure 1

Map of Sundarharaincha municipality with black spots indicating survey locations



Data collection

The data were collected for three months from March to May 2025 (a total of 15 survey days) by the point count method with a 50 m radius (Hutto et al., 1986; Bibby et al., 1992). Four fixed observation points were randomly selected, with a. Bird identification was done using the field guidebook *Birds of Nepal* (Grimmett et al., 2016), the documented list of "Birds of Nepal: An Official Checklist" (Department of National Parks and Wildlife Conservation & Bird Conservation Nepal, 2022), and online resources such as iNaturalist and the eBird websites.

Analysis method

The key ecological diversity indices, such as the Shannon–Wiener Diversity Index for overall species diversity (Shannon & Wiener, 1948), Pielou's Evenness for how evenly individuals are distributed among species (Pielou, 1969), and Margalef's Richness Index for species richness relative to sample size (Margalef, 1958), were calculated using Microsoft Excel 2010.

The Shannon-Wiener Index (H) = $-\sum_{i=1}^{n} Pi \times \ln Pi$ where,

Pi represents the proportion of individuals of a specific species n divided by the total number of individuals N in the community,

ln denotes the natural logarithm,

Σ is the sum over all species present in the community.

Pielou's Evenness (E) = $\frac{H}{\ln(S)}$, where,

H denotes Shannon-Wiener Diversity Index,

ln represents the natural logarithm,

S is the number of species present in the community.

Margalef's Richness Index (D) = $\frac{S-1}{\ln(N)}$, where,

S is species richness,

N denotes the total number of individuals in the community.

Results

A total of 24 species belonging to 23 genera, 16 families, and seven orders were recorded during the study period (Table 1).

Table 1

Species of birds in the Biratchowk area

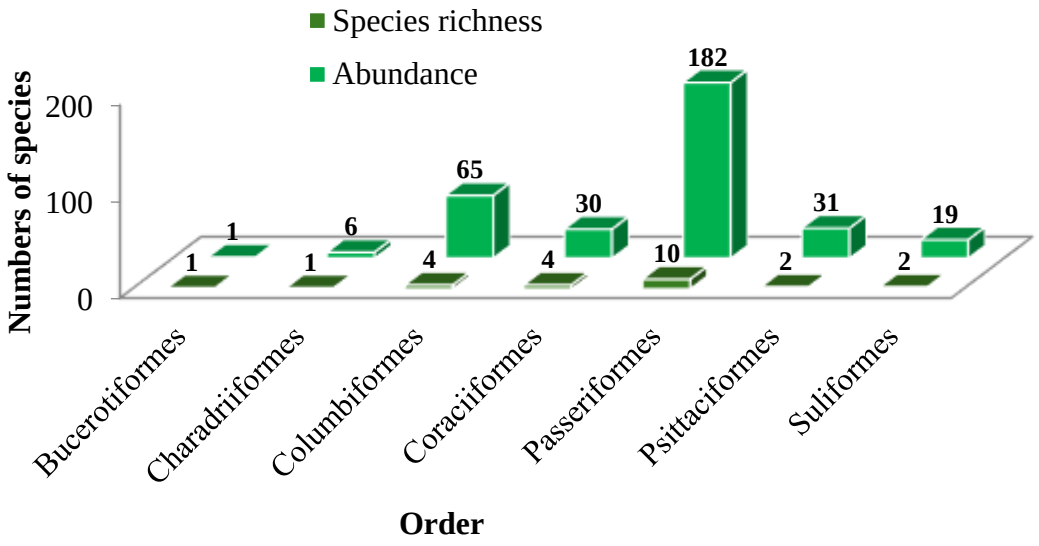
S.N.	Family	Scientific name	Common name	Nepali name	Abundance	CITES
Order: Bucerotiformes						
1	Bucerotidae	*Ocyceros birostris*	Indian Grey Hornbill	सानो धनेश	1	
Order: Charadriiformes						
2	Charadriidae	*Vanellus indicus*	Red-wattled Lapwing	हुटिट्याउँ	6	
Order: Columbiformes						
3	Columbidae	*Columba livia*	Rock Pigeon	मलेवा	26	
4	Columbidae	*Spilopelia suratensis*	Spotted Dove	कुर्ले ढुकुर	17	
5	Columbidae	*Streptopelia decaocto*	Eurasian Collared Dove	कण्ठे ढुकुर	13	
6	Columbidae	*Treron phoenicopterus*	Yellow-footed Green Pigeon	हलेसो	9	
Order: Coraciiformes						
7	Alcedinidae	*Alcedo atthis*	Common Kingfisher	सानो माटीकोरे	5	
8	Alcedinidae	*Halcyon smyrnensis*	White-throated Kingfisher	सेतोकण्ठे माटीकोरे	13	
9	Meropidae	*Merops leschenaultia*	Chestnut-headed Bee-eater	कटुसटाउके मुरलीचरा	7	

10	Meropidae	*Merops orientalis*	Asian Green Bee-eater	मुरलीचरा	5	
Order: Passeriformes						
11	Aegithinidae	*Aegithina tiphia*	Common Iora	सुसेलीचरा	2	
12	Corvidae	*Dendrocitta vagabunda*	Rufous Treepie	कोकले	4	
13	Dicruridae	*Dicrurus macrocercus*	Black Drongo	कालो चिबे	15	
14	Estrildidae	*Lonchura punctulata*	Scaly-breasted Munia	कोटेरो मुनियाँ	29	
15	Oriolidae	*Oriolus xanthornus*	Black-hooded Oriole	कालोटाउके सुनचरी	2	
16	Paridae	*Parus major*	Great Tit	चिचिल्कोटे	2	
17	Passeridae	*Passer domesticus*	House Sparrow	घर भँगेरा	31	
18	Pycnonotidae	*Pycnonotus cafer*	Red-vented Bulbul	जुरेली	39	
19	Sturnidae	*Acridotheres tristis*	Common Myna	डाङ्ग्रे रुपी	52	
20	Sturnidae	*Gracula religiosa*	Common Hill Myna	मदनसारिका मैना	6	
Order: Psittaciformes						
21	Psittacidae	*Himalayapsitta cyanocephala*	Plum-headed Parakeet	टुइँसी सुगा	17	II
22	Psittacidae	*Alexandrinus krameri*	Rose-ringed Parakeet	कण्ठे सुगा	14	
Order: Suliformes						
23	Phalacrocoracidae	*Microcarbo niger*	Little Cormorant	सानो जलेवा	13	
24	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant	जलेवा	6	

The study documented avian diversity across seven orders. Passeriformes exhibited the highest dominance, comprising 9 families, 10 genera, and 10 species. In contrast, Bucerotiformes and Charadriiformes were each represented by only a single family, genus, and species. The order Passeriformes had the maximum species abundance with 182 individuals, followed by the order Columbiformes with 65 individuals and least by the order Bucerotiformes with a single individual (Figure 2). *Himalayapsitta cyanocephala* recorded in this study is listed under CITES Appendix II.

Figure 2

Graphical presentation of species richness and abundance across different orders recorded in the study area



The present study recorded a Shannon–Wiener Diversity Index for birds of H = 2.81, along with Pielou's evenness (E = 0.88) and Margalef's Richness Index (D = 3.96). (Table 2).

Table 2

Calculation of ecological indices

Ecological indices	Calculated value
Pielou's evenness	0.88
Shannon-Wiener Diversity Index	2.81
Margalef's Richness Index	3.96

Discussions

The present study showed the highest species richness and abundance of the order Passeriformes in the study area, consistent with prior research in Nepal (Shah & Sharma, 2022; Chalise et al., 2021; Dangaura et al., 2020; Jha, 2019; Jha, 2020) can be attributed to their strong ecological adaptability, broad habitat tolerance, flexible foraging behavior, diverse diet, and high reproductive capacity (Gill, 2007). Their dominance is further supported by their relatively small body size, which enables them to exploit microhabitats more efficiently and occupy a variety of ecological niches (MacArthur & MacArthur, 1961). In contrast, non-passerine orders such as Bucerotiformes and Charadriiformes were recorded in lower species richness and abundance, due to their more specialized ecological requirements. These birds often depend on specific habitat types: Bucerotiformes, for instance, are typically associated with dense primary forests, while Charadriiformes are commonly linked to wetland ecosystems (Bird Life International, 2022). This difference shows that birds with flexible habits, like those in the order Passeriformes, can live in many different environments, while the bird species of the orders Bucerotiformes and Charadriiformes showed narrow habitat preferences that may limit their distribution and abundance in the human-dominated settlement area.

Acridotheres tristis (Common Myna) showed the highest abundance in the study area mainly because of its well-adaptedness to urban environments, as they like to live in human settlement areas, farmlands, feed on a wide variety of food, and use buildings and tree cavities for nesting (Grarock et al., 2012; Lowther & Craig, 2020). In contrast, *Ocyceros birostris* (Indian Grey Hornbill) was recorded only once, indicating the lowest abundance because it strongly depends on large trees for nesting and prefers wooded habitats. The lack of mature trees in urban areas and high human activities likely limit its presence (Jathar & Rahmani, 2006; Grimmett et al., 2011).

The present study recorded a Shannon–Wiener Diversity Index of H = 2.81, indicating moderate bird diversity, while Pielou's evenness (E = 0.88) showed an evenly distributed bird community. Margalef's richness index (D = 3.96) falls within a semi-disturbed range, which is expected in a growing city area. Bird diversity is often lower in such areas due to human disturbance, limited plant diversity, noise, and pollution, all of which reduce habitat quality and resource availability (Blair, 1996; McKinney, 2008). Urban environments generally have only a few species that can tolerate frequent human disturbance, which leads to reduced species richness (Clergeau et al., 2001). Likewise, the limited green

spaces and low tree density in the urban area restrict nesting and feeding opportunities for many birds, resulting in only moderate levels of diversity (Fernández-Juricic, 2000).

Conclusions

The study revealed a moderately rich bird community within the Biratchowk area, with most species belonging to the highly adaptable order Passeriformes. The diversity indices indicate that the area functions as a semi-disturbed habitat with even species distribution. Human disturbance, limited vegetation, and restricted green space appear to shape the composition of the avifauna. Improving habitat structure and plant diversity could support greater avian diversity in the future. Further future studies should be done throughout the year to cover all seasons to assess seasonal variations with additional methods, such as camera traps or sound recordings, to detect hidden or nocturnal species.

Limitations of the study

The survey period covered only three months, which is probably not enough to capture seasonal variations of certain migratory species. Besides that, having only four observation points may be insufficient to cover all habitat heterogeneity in the area. Since the study was conducted during the day, cryptic or nocturnal species might have been missed.

References

Aronson, M. F. J., La Sorte, F. A., Nilon, C. H., Katti, M., Goddard, M. A., Lepczyk, C. A., Warren, P. S., Williams, N. S. G., Cilliers, S., Clarkson, B., Dobbs, C., Dolan, R., Hedblom, M., Klotz, S., Kooijmans, J. L., Kühn, I., MacGregor-Fors, I., McDonnell, M., Mörtberg, U., & Winter, M. (2014). A global analysis of the impacts of urbanization on bird and plant diversity reveals key anthropogenic drivers. *Proceedings of the Royal Society B: Biological Sciences, 281*(1780), 20133330. https://doi.org/10.1098/rspb.2013.3330

Baral, M., Neupane, A., Ghimire, M., & Bhusal, K. P. (2022). Avian Diversity and Seasonal Abundance in Banpale Forest, Kaski District, Nepal. *Forestry: Journal of Institute of Forestry, Nepal, 19*, 1–15.

Bhattarai, S., & Devkota, D. (2020). Avian diversity in and around the Ghodaghodi Lake Complex, a Ramsar site in western lowlands of Nepal. *Journal of Threatened Taxa, 12*(1), 15152–15165. https://doi.org/10.11609/jott.5312.12.1.15152-15165

Bhusal, D., & Ghimire, P. (2023). Avian urban ecology in Nepal: A call for attention. *Nepalese Journal of Zoology, 7*(2), 49–59. https://doi.org/10.3126/njz.v7i2.60810

Bibby, C. J., Burgess, N. D., & Hill, D. A. (1992). *Bird census techniques*. Academic Press.

BirdLife International (2022). *State of the World's Birds 2022*. BirdLife International.

Blair, R. B. (1996). Land use and avian species diversity along an urban gradient. *Ecological Applications, 6*(2), 506–519.

Chalise, M. K., Pandey, N., Khanal, L. et al. (2021). *Bird community structure as a function of habitat heterogeneity: A case of Mardi Himal, Central Nepal*. Biodiversitas, 22, 262–271.

Clergeau, P., Jokimäki, J., & Savard, J. P. L. (2001). Are urban bird communities influenced by the spatial distribution of trees? *Landscape and Urban Planning, 54*(4), 263–275. https://doi.org/10.1016/S0169-2046(01)00137-5

Dangaura, H. L., Pandey, N., Chand, D. B. & Bhusal, K. P. (2020). *Avian richness of the Basanta Protected Forest, far-western lowland Nepal: Implication for conservation.* Nepalese Journal of Zoology, 4(2), 68–84.

Department of National Parks and Wildlife Conservation & Bird Conservation Nepal. (2022). *Birds of Nepal: An Official Checklist*. Kathmandu, Nepal.

Desalegn, T., & Abebe, B. (2024). Diversity and distribution of avifauna in the northeast of Addis Ababa, Central Ethiopia. *The Scientific World Journal.* https://doi.org/10.1155/2024/5592074

DNPWC & BCN. (2022). *Birds of Nepal: An official checklist*. Department of National Parks and Wildlife Conservation & Bird Conservation Nepal.

Fernández-Juricic, E. (2000). Bird community composition patterns in urban parks of Madrid: The role of age, size, and isolation. *Ecological Research, 15*(4), 373–383.

Ghimire, P., Katuwal, H. B., & Adhikari, B. (2022). Bird diversity and their conservation threats in the Panchase Protected Forest, a part of the Annapurna Conservation Area, Nepal. *Avian Conservation and Ecology, 17*(1), 10.

Gill, F. B. (2007). *Ornithology* (3rd ed.). W. H. Freeman.

Grarock, K., Tidemann, C. R., Wood, J., & Lindenmayer, D. B. (2012). Is it benign or is it a pariah? Empirical evidence for the impact of the common myna (Acridotheres tristis) on Australian birds. PloS ONE, 7(7), e40622. https://doi.org/10.1371/journal.pone.0040622

Grimmett, R., Inskipp, C., & Inskipp, T. (2011). *Birds of the Indian subcontinent* (2nd ed.). Oxford University Press.

Grimmett, R., Inskipp, C., Inskipp, T., & Baral, H. S. (2016). *Birds of Nepal*. Christopher Helm.

Hossain, A., & Baki, M. A. (2015). Avian diversity in the northern part of Bangladesh. *Journal of Threatened Taxa, 7*(1), 6771–6779. https://doi.org/10.11609/JoTT.o3916.6771-9

Hutto, R. L., Pletschet, S. M., & Hendricks, P. (1986). A fixed-radius point count method for nonbreeding and breeding-season use. *The Auk, 103*(3), 593–602.

Isaksson, C. (2018). *Impact of urbanization on birds*. In D. T. Tietze (Ed.), *Bird species: How they arise, modify and vanish* (pp. 235–257). Springer Open. https://doi.org/10.1007/978-3-319-91689-7_13

Jathar, G. A., & Rahmani, A. R. (2006). Indian hornbills: An overview of their status and conservation. Indian Birds, 2(6), 141–147.

Jha, P. K. (2019). *Diversity of Birds in the Foothills of Phulchoki Hill, Lalitpur, Nepal*. Forestry: Journal of Institute of Forestry, Nepal, 16, 62–71.

Jha, P. K. (2020). *Seasonal Diversity of Birds in Nagarjun Forest of Shivapuri Nagarjun National Park, Kathmandu, Nepal*. Tribhuvan University Journal, 35(1), 33–43.

Lama, S., Shrestha, S., Sherpa, A. P., Tamang, M., & Ghale, D. (2022). Avifaunal diversity in Important Bird Areas of Western Nepal. *eco.mont, 14*(2), 70–77. https://doi.org/10.1553/eco.mont-14-2s70

Lowther, P. E., & Craig, A. J. F. K. (2020). Common myna (Acridotheres tristis), version 1.0. In Birds of the World. Cornell Lab of Ornithology. https://doi.org/10.2173/bow.commyn.01

MacArthur, R. H., & MacArthur, J. W. (1961). On bird species diversity. *Ecology, 42*(3), 594–598.

Mandal, H. R., Katel, S., Baidhya, S., Kattel, S., & Katuwal, A. (2021). A case study of medicinal plants and their uses by the Sundar Haraicha Nagarpalika community in Morang District, East Nepal. *Matrix Science Pharma, 5*(1), 84–88. DOI: 10.4103/mtsp.mtsp_1_22

Margalef, R. (1958). Information theory in ecology. *General Systems, 3*, 36–71.

McKinney, M. L. (2008). Effects of urbanization on species richness: A review of plants and animals. *Urban Ecosystems, 11*(2), 161–176.

Pielou, E. C. (1969). *An introduction to mathematical ecology*. Wiley-Interscience.

Sekercioglu, C. H. (2006). Increasing awareness of avian ecological function. *Trends in Ecology & Evolution, 21*(8), 464–471.

Shah, S. B. & Sharma, H. P. (2022). *Bird diversity and factors affecting bird abundance at Dullu Municipality, Dailekh, Nepal*. Biodiversitas, 23, 1535–1545.

Shannon, C. E., & Wiener, W. (1949). *The mathematical theory of communication*. University of Illinois Press.

Shrestha, N., Shrestha, A., & Bhusal, K. P. (2023). Bird Diversity in Bhaludhunga: Exploring Avian Diversity in Eastern Mid-hills of Nepal. *Forestry: Journal of Institute of Forestry, Nepal, 20*(1), 112–125.

Appendix

Photo plate I

Ocyceros birostris	*Vanellus indicus*	*Columba livia*

Spilopelia suratensis	*Streptopelia decaocto*	*Treron phoenicopterus*

Merops orientalis	*Aegithina tiphia*	*Dendrocitta vagabunda*

Photo plate II

Dicrurus macrocercus

Lonchura punctulata

Oriolus xanthornus

Parus major

Passer domesticus

Pycnonotus cafer

Acridotheres tristis

Gracula religiosa

Himalayapsitta cyanocephala

Alexandrinus krameri

Microcarbo niger

Phalacrocorax carbo