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Avian Biodiversity and Urban Development: Assessing the Economic and Ecological Value of Bird Species in Alpha International City, Karnal

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Abstract

Bird survey was conducted in and around Alpha International City (AIC) Karnal, Haryana (India) from January, 2023 to December, 2023. Birds were recognized by keeping eye on them for few minutes. Continuous observations were made regarding their movement, songs, feeding habit and size. Simultaneously specific calls and songs were also identified. General size, shape, distinctive strips and patches of colour including crown strips, eye lines, eye arcs or rings and birds bill size were also noted. Bird Survey revealed a total of 38 bird species belonging to 29 families. All 38 bird species were resident. Based on their frequency of sighting, 15 bird species were categorized as Abundant, 12 species as Common, 8 species as Uncommon and 3 species as Rare. Maximum number of species belonged to order Columbidae and Corvidae least number of species belonged to Picidae and Rallidae. In early Years, no study was conducted in Alpha International city (AIC), Karnal and a great deal of infrastructure, development and urbanization has occurred in this international city. However, scanty information is available on the avian diversity periodic monitoring of Karnal, Haryana. Therefore, present study was planned to monitor and document the avian species in this region as well as to examine the impact of urban development and infrastructure expansion on bird diversity.

Keywords: Abundant, Bird Diversity, Resident, Urban Development, Alpha International City (AIC), Karnal

INTRODUCTION

Indian biodiversity includes large number of species of invertebrates, 2546 species of fishes, 204 species of amphibians, 446 species of reptiles, 1228 species of birds and 372 species of mammals. Haryana is a State in the northern region of India with 22 districts and is the nation's seventeenth most popular state. The State borders with Punjab and Himachal Pradesh to the north and Rajasthan to the west and south. The river Yamuna defines its eastern border with Uttarakhand and Uttar Pradesh. Haryana also surrounds Delhi on three sides, forming the northern, western and southern borders of Delhi. Haryana is primarily an agricultural state with almost 80% of its land under cultivation. The geographical area of the state is 44212 sq. km which is 1.3% of India's geographical area. It is not bestowed with bounty of natural forests and only 3.9% of its geographical area is under notified forests. The Forest and Tree Cover of the Haryana state is 6.49% of its geographical area. Forestry activities in the state are dispersed over rugged Shiwalik Hills in north, Aravalli hills in south, sand dunes in west and wastelands, saline-

alkaline lands and waterlogged sites in the central part of the state. The Aravallis and the Shiwaliks are its two biodiversity hot spots in Haryana.

A visionary development, Alpha International City (AIC), Karnal epitomizes and provides for holistic living at the scale of a small city. Located in Sectors 28 and 29 in Karnal, midway between Delhi and Chandigarh on NH-1, this residential property in Karnal, of 330 acres development, promises and delivers an elevated quality of life. Alpha international city has an excellent landscape for several resident species of birds. Birds are distributed throughout the world in a variety of Habitats**.** Birds have played a unique role in the growth, protection and restoration of natural environment and thus their importance and significance and in the maintenance of clean and healthy environment are of a high order**.** Birds are vertebrate warm-blooded animals i.e. whose temperature remains more or less constant and independent of the surrounding temperature**.** The birds are bio-indicators of ecosystem, as they represent the ecological conditions of the area affected by changes and variation of the environment**.** The Haryana State is endowed with a rich biodiversity of bird species. Out of 1228 bird species found in Indian sub continent, approx. 600 species are found in Haryana.

Birds are among the best indicators of environmental changes. They are being eye-catching and sensitive towards environmental change, seen as most suitable biological indicators for monitoring the ecosystem health. Birds are often common denizens of the ecosystem and they have been considered as an indicator species of inhabited areas**.** Birds recognize potential breeding territories within the utilized landscape. Thus, individual birds select those areas within a landscape which seem suitable for breeding, foraging and provisioning their young. Bird territories are therefore located within those parts of the landscape with the most favorable spatial configurations for the respective species. Studies of avifaunal diversity are an essential ecological tool in the ecosystem. Bird species not only add aesthetic value to our life but also help in control of pest in agricultural crops, dispersal of seeds and also in maintaining a healthy ecological balance, thus they form an important component in natural ecosystem**.**

Richness, abundance and community composition of birds are often used by ecologists to understand the diversity of species in natural occurrence**.** Alpha international city (AIC), Karnal has an excellent landscape for several resident and migratory species of birds. There are well detailed bird documentations since 1940's. Salim Ali in his historical landmark survey of Karnal covered many species from Haryana state characterized by passerines and non passerine avifauna. The present modern field ornithologist and birdwatcher's organization have contributed significantly in adding many bird species in to the checklist. Birds were considered to be common (encountered daily in relatively in large number), uncommon (encountered daily but in few number) occasional (encountered occasionally in less number) or rare (encountered less than 15 times in a year). Recently, 374 species of birds are enlisted as part of bird count by several bird survey groups from Karnal. Alpha International city (AIC), Karnal with its semi-arid climate, several humans planted vegetations provide excellent habitats for several residential and migratory species of birds. Similarly, a total of 302 species have confirmed records from Okhla bird sanctuary (Delhi) and the areas in its immediate vicinity**.** Similarly, the state of Assam has several species of mammals, birds, reptiles and amphibians. Five National Parks and 19 Wildlife Sanctuaries have been declared in various areas of Assam to protect wildlife of conservation concern. These protected areas also sustain large numbers of migratory and residential avifauna**.** Assam is one of the "endemic bird areas" in the world. With 950 bird species the state is home to 53.5% of the bird species found in the Indian Sub-continent and 17 species of birds are endemic to Assam**.** These areas are quite conducive for the bird's population. Most gardens which are a silence zone, hence free form all

kind of disturbance and also have wide range of trees such as- Eucalyptus, Peeple, Ashok, Cycas, Neem etc. These trees provide habitat for different species of birds. Birds are among the best monitors of environmental changes and have been used to evaluate the environment throughout the history as biomonitors and the changes in their population, behavior patterns and reproductive ability have most often been used to examine the long term effects of habitat fragmentation**.** The conservation of wetlands has become a frequent topic among wildlife managers**.** Santiniketan, a university campus located in the lateritic belt is a semiarid region with few wetlands**.** The species diversity and status of each bird species in different habitat were different as the habitat and vegetation cover was also different.

Anthropogenic activities have made greater impact on distribution and abundance of avian fauna in urban settings. Several studies reported that human disturbance could have negative effect on fitness such as reproduction, feeding and even normal social behavior**.** Human disturbance is caused by mere presence of people in environment, visiting bird habitat areas and increased traffic rate and also walking nesting sites, the reaction of birds to the change in their habitat is very rapid due to their high mobility. Birds are even more disrupted by their noise and air pollution made by human activities, they react to humans as they were natural predators and birds combat escape from that area. Research studies were also evident that human made noise pollution has impact on bird habitat and direct influence on their ability to communicate and response its territory. However avifaunal abundance in lesser human interference has not been documented. Interestingly, there is less interference of human beings with reduced noise and air pollution created favorable environment for avifauna. The present study aims to understand bird abundance and its distribution of Alpha International City, Karnal. This study would also be the baseline for further studies on bird species distribution and its abundance in Alpha International city (AIC), Karnal. Salim Ali surveyed a part of the Sultanpur Bird Sanctuary during the bird survey of Haryana. Salim Ali in his historical landmark survey of Karnal covered many species from Haryana state characterized by passerines and non passerine avifauna. Many new species have been added to the Indian Checklist since the publication of Ali and Ripley's (1968-1975) Handbook of birds of India and Pakistan, which is considered the Bible of Indian Ornithology.

Literature Review

Urbanization has been recognized as a major driver of biodiversity loss, with significant implications for avian species. Several studies have explored the relationship between urban expansion and bird diversity, highlighting habitat fragmentation, pollution, and human disturbances as key factors influencing avian populations (McKinney, 2002). Urban environments often lead to a decline in specialist bird species while promoting the dominance of generalist species that can adapt to human-modified landscapes (Shochat et al., 2006).

In the Indian context, studies have shown that rapid urbanization has led to the shrinking of green spaces, adversely affecting native bird populations (Sodhi et al., 2010). Research conducted in similar semi-urban and agricultural landscapes indicates that changes in land use patterns significantly alter avian biodiversity (Chace & Walsh, 2006). Karnal, being a rapidly developing city with agricultural significance, presents a unique case for studying the intersection of urbanization, ecological conservation, and economic implications of biodiversity loss.

Economic evaluations of avian biodiversity suggest that birds contribute to ecosystem services such as pest control, pollination, and seed dispersal, which have direct and indirect economic benefits (Wenny et

al., 2011). The valuation of such ecosystem services has been an emerging area in environmental economics, emphasizing the need to integrate biodiversity conservation into urban planning and policy frameworks (MEA, 2005). This study aims to bridge the gap in literature by examining how urbanization in Karnal is affecting bird diversity and what economic implications arise from these ecological changes.

Research Objectives

The study aims to:

- Assess the abundance and distribution of bird species in Alpha International City (AIC), Karnal.
- Examine the impact of urban development and infrastructure expansion on bird diversity.

Research Methodology

Relative abundance of bird species were recorded in 7 different study areas of Alpha city, keeping in view of occurrence of large avifauna in 7 regions such as Shiv Mandir site and others parks areas. In this study, 5 sites in each region are selected as count points. Thus in each study area 35 count point station at 100 meters interval were established. Line transect method were followed to study the birds count. Data was gathered through transect walks from one count point to another for the opportunistic sightings of birds. Bird survey was done in all 7 regions during period from January 2023 to December 2023. Birds were counted at each site station in early morning hours. The birds were counted by visiting 4 alternative days of intervals for each region in order to obtain reliable estimate and reduce bias. During each count, all bird species and individual bird calls were identified. Identifying a bird can be a challenging process. Birds are active, energetic animals and quickly fly. Quick eye spotting is required in order to get possible detail in short span of time. The following techniques were used during bird watching- Birds were recognized by fixing eye on them and continuous observations were made regarding their movement, songs, feeding habit and size. Simultaneously specific calls and songs were also identified. General size, shape, distinctive strips and patches of colour including crown strips, eye lines, nape colour, eye arcs or rings and birds bill size were noted**.** Wing bars, colour patches, and marking on bird body during stationary stage or flying stage were noted. Leg colour and length were also noted in each observation. The relative abundance (%) of bird species were estimated according to Gutzwiller with following expression of n/ N * 100, where ‘n’ is the number of a particular bird species and ‘N’ is the total observations detected for all bird species.

Table 1 Relative Abundance of Bird Species in the study areas

Sr No.	Scientific name	Common Name	Family	Habitat Area	Total No.	%age
1.	Bubulcus ibis	**Cattle egret**	Ardeidae	Pocket 1,2,5,7	78	6.27
2.	Ocyceros birostris	**Indian grey Hornbill**	Bucerotidae	Pocket 2,5,7	12	0.96
3.	Spilopelia chinensis	**Spotted Dove**	Columbidae	Pocket 1,3,7	43	3.45
4.	Columba livia	**Rock Pigeon**	Columbidae	Pocket 1,2,3,4,5,6,7	152	10.68

5.	Treron phoenicopterus	**Yellow-footed green Pigeon**	Columbidae	Pocket 1,3,7	84	5.90
6.	Dendrocitta vagabunda	**Indian Treepie**	Corvidae	Pocket1, 3,5,6,7,	16	1.12
7.	Corvus splendens	**House Crow**	Corvidae	Pocket 1,2,3,4,5,6,7	64	4.49
8.	Corvus macrorhynchos	**Jungle Crow**	Corvidae	Pocket 1,7	14	0.98
9.	Megalaima viridis	**White-cheeked Barbet**	Megalaimidae	Pocket 4,7	08	0.56
10.	Turdoides striata	**Jungle Babbler**	Leiothrichidae	Pocket 1,2,3,4,5,6,7	49	3.44
11.	Chrysomma sinese	**Yellow eyed Babbler**	Paradoxornithidae	Pocket 2,4,5,6,7	35	2.45
12.	Hirundo rustica	**Barn Swallow**	Hirundinidae	Pocket 5,7	32	2.24
13.	Eudynamys scolopaceus	**Asian Koel**	Cuculidae	Pocket 1,2,3,4,5,6,7	56	3.93
14.	Centropus sinensis	**Greater Coucal**	Cuculidae	Pocket 5,6,7	13	0.91
15.	Icterus nigrogularis	**Yellow Oriole**	Icteridae	Pocket5,6, 7	06	0.42
16.	Saxicoloides fulicatus	**Indian robin**	Muscicapidae	Pocket 1,3,4	08	0.56
17.	Leptocoma zeylonica	**Purple-rumped sunbird**	Nectariniidae	Pocket 1,2,3,4,5,6,7	42	2.95
18.	Vanellus indicus	**Red-Wattled Lapwing**	Charadriidae	Pocket 6,7	12	0.84
19.	Vanellus malabaricus	**Yellow Wattled Lapwing**	Charadriidae	Pocket 1,2,3,4,5,6,7	38	2.67
20.	**Passer domesticus**	**House Sparrow**	Passeridae	Pocket 7	06	0.42
21.	Pycnonotus cafer	**Red-vented bulbul**	Pycnonotidae	Pocket 1,2.3,4,5,6,7	78	5.48
22.	Pavo cristatus	**Indian Peafowl**	Phasianidae	Pocket 2	04	0.28
23.	Psittacula krameri	**Rose Ring-Parakeet**	Psittaculidae	Pocket 1,2,7	20	1.40

24.	Acridotheres tristis	**Common Myna**	Sturnidae	Pocket1,2,3, 4,5,6, 7	48	3.37
25.	Acridotheres ginginianus	**Bank Myna**	Sturnidae	Pocket 2,3,4,5,7	36	2.52
26.	Halcyon smyrnensis	**White Throated Kingfisher**	Alcedinidae	Pocket 5,6,7	12	0.84
27.	Alcedo atthis	**Common Kingfisher**	Alcedinidae	Pocket 7	02	0.14
28.	Tyto alba	**Barn Owl**	Tytonidae	Pocket 6,7	23	1.61
29.	Upupa epops	**Eurasian Hoopoe**	Upupidae	Pocket 1,3,7	42	2.95
30.	Dicrurus macrocercus	**Black Drongo**	Dicruridae	Pocket 3,6,7	37	2.60
31.	Motacilla alba	**White Wagtail**	Motacillidae	Pocket 1,2,3,4,5,6,7	62	4.35
32.	Anthus rufulus	**Paddyfield Pipit**	Motacillidae	Pocket 6,7	04	0.28
33.	Lonchura punctulata	**Scaly Breasted Munia**	Estrildidae	Pocket 5,6,7	09	0.63
34.	Francolinus pondicerianus	**Grey Francolin**	Phasianidae	Pocket 5,6,7	15	1.05
35.	Amaurornis phoenicurus	**White-Breasted Waterhen**	Rallidae	Pocket 5,6,7	23	1.61
36.	Merops orientalis	**Asian Green bee-eater**	Meropidae	Pocket 5,6,7	46	3.23
37.	Gallus gallus	**Red Jungle Fowl**	Phasianidae	Pocket 2,7	06	0.42
38.	Dryocopus pileatus	**Pileated Woodpecker**	Picidae	Pocket 1,5,6,7	08	0.56
TOTAL					**1243**	

All identifications are based on Ali and Ripley (1987) and The Book of Indian Birds by Salim Ali. (1996).

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Discussion

Study revealed heterogeneous distribution of birds in different types of habitats, viz., along roadside and in and around parks, and in fallow lands. A total 1243 birds of 29 families have been recorded from the study areas. All 38 bird species were resident. A systematic detailed account of birds observed in the study area is given in the Table 1. Based on their frequency of sighting, 15 bird species were categorized as Abundant, 12 species as Common, 8 species as Uncommon and 3 species as Rare. The most commonly found birds are: House Sparrow, Cattle Egret, Jungle Babbler, Asian Koel, Common Myna,

Blue Rock Pigeon, Yellow-footed Green Pigeon, White Wagtail, Spotted Dove, Black Drongo, Indian Treepie, and Red Vented Bulbul. Maximum number of species belonged to order Columbidae and Corvidae and least number of species belonged to Picidae and Rallidae. Among 7 study areas, Pocket 7 area is observed with more bird species, while pocket 1 area was least. Out of the recorded birds, fifteen bird species are maximum in all the seven study areas. The Blue Rock pigeon -**Columba livia** (10.68%), Cattle egret- **Bubulcus ibis** (6.27%) Yellow-footed Green Pigeon-**Treron phoenicopterus** (5.90%), Red-vented bulbul **Pycnonotus cafer** (5.48%) shows the highest relative abundance. On contrary 3 bird species Common Kingfisher- **Alcedo atthis** (0.14%) and Indian Peafowl- **Pavo cristatus** (0.28%) Paddyfield Pipit -**Anthus rufulus** (0.28%) were least abundant from one study area to other. Furthermore, Grey Francolin-**Francolinus pondicerianus** bird species was least concerned in IUCN red list 2018 **(14).** Many of the birds were seen in the pocket 7 but Indian Pea-fowls were found only in the pocket 2 only. Earlier studies of Pawar (2011), in mangroves of Uran (Raigad), Navi Mumbai, Maharashtra, West coast of India and Chilke (2012) **(6)** in and around Bamanwada lake of Rajura, district - Chandrapur (Maharashtra) have also reported that Passeridae was the most dominant family representing maximum number of species which are in contrast with the present studies. There are also some birds which were rarely sighted during the study period such as- Waterhen, and Shikra which are not mentioned in the above list of birds. All these studied areas comprise of only few habitats and possess such a great variety of birds; therefore, we can assume that AIC being home to a variety of habitats may contain a great deal of avian diversity much more what we have documented. Also some bird species might have shifted their habitat due to much construction work going on in various pockets of the AIC, Karnal.

References

1. Abbas, S., Tabassum, R., Khan, M. Z., Khan, B., Hussain, S., Khan, G., & Awan, S. (2014). Avian diversity in Central Karakoram National Park, Gilgit-Balistan. International Journal of Agriculture and Biology, 16(2), 377-382.
2. Ali, S. (1996). The birds of Indian subcontinent. Bombay Natural History Society, Oxford University Press.
3. Ali, S., & Ripley, S. D. (1987). Handbook of birds of India and Pakistan (Compact ed.). Oxford University Press.
4. Bibi, F., & Ali, Z. (2013). Measurement of diversity indices of avian communities at Taunsa Barrage Wildlife Sanctuary, Pakistan. The Journal of Animal & Plant Sciences, 23(2), 469-474.
5. BirdLife International. (2016). Country profile: India. Retrieved from http://www.birdlife.org/datazone/country/india
6. Chace, J.F., and John J. Walsh (2006) Urban effects on native avifauna: a review. Landscape and Urban Planning. Vol. 74, Issue 1, Jan 2006, Pages 46-69.
7. Chilke, A. M. (2012). Avian diversity in and around Bamanwada Lake of Rajpura, District Chandrapur (Maharashtra). Annals of Biological Research, 3(4), 2014-2018.
8. Chopra, G., & Sharma, S. K. (2014). Avian diversity of lower Shivalik foothills, India. International Journal of Research Studies in Biosciences, 2(7), 1-12.
9. Deka, C., & Nath, B. (2013). A study on avifaunal diversity and their conservation status of Chandubi Tectonic Lake, Assam, India. International Journal of Pure & Applied Bioscience, 1(6), 67-71.

10. Gaston, A. J. (1975). Methods for estimating bird population. The Journal of the Bombay Natural History Society, 69(3), 591-615.
11. Ghorade, I. B., Thakur, V. R., & Patil, S. S. (2014). Diversity of avian fauna from Jaikwadi Reservoir at Paithan. European Academic Research, 2(2), 1967-1978.
12. Grimmett, R., Inskipp, C., & Inskipp, T. (1999). Pocket guide to the birds of the Indian subcontinent. Oxford University Press.
13. Gutzwiller, J. (1991). Estimating winter species richness with unlimited-distance point counts. The Auk, 108, 853-862.
14. Harisha, M. N., & Hosetti, B. B. (2009). Diversity and distribution of avifauna of Lakkavalli Range Forest, Bhadra Wildlife Sanctuary, Western Ghats, India. Ecoprint, 16, 21-27.
15. International Union for Conservation of Nature (IUCN). (2018). BirdLife International: The IUCN Red List of Threatened Species. Retrieved from www.iucnredlist.org.
16. Joshi, P. P. (2001). Assessment of avian population in different habitats around Amolakchand Mahavidyalaya Campus, Yavatmal, Maharashtra, India. Journal of Biosciences, 4, 11.3.
17. Kumar, J. I. N. (2007). Pattern of seasonal abundance and diversity in the waterbird community of Nal Lake Bird Sanctuary, Gujarat, India. Bird Populations, 8, 1-20.
18. Maity, S., Balachandran, S., & Chaudhury, S. (2010). Interdependency of macrophytes and avian diversity in the wetlands of Ballavpur Wildlife Sanctuary, Santiniketan. Science and Culture, 76(5-6), 180-184.
19. Manakandan, R., & Pittie, A. (2001). Standardized common and scientific names of the birds of the Indian subcontinent. Buceros, 6(1), i-ix, 1-37.
20. Michael L. McKinney (2002). Urbanization, Biodiversity and Conservation: The impacts of Urbanization on Native Species are poorly studied, but educating a highly urbanized human population about these impacts can greatly improve species conservation in all ecosystems. BioScience Volume 52, Issue 10, October 2002, Pages 883-890.
21. Pawar, P. R. (2011). Species diversity of birds in mangroves of urban (Raigad), Navi Mumbai, Maharashtra, West Coast of India. Journal of Experimental Sciences, 2(10), 73-77.
22. Saikia, P. K., & Saikia, M. K. (2011). Present distribution, status, and ecology of White-winged Duck and Hornbills in Nameri National Park, considering the tropical forest distribution of Assam. Zoo's Print, 24, 1-11.
23. Sale, J. B., & Berkmuller, K. (1988). Manual of wildlife techniques for India. Field Document No. 11. FAO, United Nations.
24. Shochat et al., (2006). Birds in Urban Ecosystems: Population Dynamics, Community Structure, Biodiversity, and Conservation. **https://doi.org/10.2134/agronmonogr55.c4**
25. Sodhi et al., (2010) Conserving Southeast Asian forest biodiversity in human-modified landscapes. Biological Conservation Vol.143, Issue10, Oct 2010 Pages 2375-2384.
26. Srinivasulu, C., & Nagulu, V. (2001). Mammalian and avian diversity of the Nallamala Hills, Andhra Pradesh. Zoo's Print Journal, 17(1), 675-684.
27. Urfi, A. J. (2003). The birds of Okhla Barrage Bird Sanctuary, Delhi, India. Forktail, 19, 39-50.
28. Wenny et al., (2011) The Need to Quantify Ecosystem Services Provided By Birds. The Auk, Vol.128, Issue 1, Pages 1-14.