International Journal of Innovations & Research Analysis (IJIRA)
ISSN :2583-0295, Impact Factor: 5.449, Volume 02, No. 02 (II), April- June, 2022, pp 94-98

CONSEQUENCES OF URBANIZATION ON INDIAN AVIFAUNA COMMUNITY ORGANIZATION

Mushtaq Ahmed Rather*
Dr. Reetu Bhanot**

ABSTRACT

In order to ascertain the impact of urbanization on the avian community structure in India, elaborative analysis of relevant literature was carried out to extract the impact of urbanization that affect the avian community structure. The negative consequences of urbanization have severely affected the urban avifauna in multifaceted ways, be it availability of unhygienic food, diminished nesting sites, noisy surroundings because of high scale vehicular movement which has direct bearing on their communication channels there by affecting their mating pattern leading to reduced reproductive success. These negative consequences of urbanization on urban avifauna are highlighted by majority of the researchers through their published research work.

Keywords: *Impact, Urbanization, Avian Community, Pollution, Vegetation, Nesting Sites.*

Introduction

Human exploitation of land dates back to our earliest settlements, with massive, yet local, destruction and deforestation **(Diamond, 2005)**. Over half of humanity now live in cities **(UN, 2011)**, which cover less than 3% of the Earth's terrestrial surface **(Schneider et al., 2010)**. Cities are often located in naturally species-rich regions **(Kühn et al., 2004; Luck, 2007)** where native species are threatened by an array of anthropogenic factors, including habitat loss and species introductions **(Williams et al., 2009)** that present serious conservation challenges **(McKinney, 2002)**. Western industrialization started in the 1700s and with that urbanization and urban sprawl became a significant part of the landscape. Today, urbanization is a global phenomenon with implications for birds as well as for all other animals. Birds are found over the entire Earth **(Hawkins & Porter, 2001)**. One of the most intriguing aspects of bird biology is the ability to migrate exceptional distances **(Dingle, 2014)**. Birds possess highly specialized directional senses for orientation, navigation, homing and migration, including the ability to detect the Earth's magnetic field **(Walker et al., 2003)**. These uncanny abilities permit birds to occupy distinctive wintering and nesting grounds, thus expanding their usable habitats. Some migrations, such as that of the Arctic tern, involve a circumatlantic migration from Alaska to the South Pole. There are some 9700 species of birds living today; some 5000 species belong to the order Passeriformes, the perching birds or songbirds **(Kale et al., 2012)**.

The number of avian orders is still controversial and texts show different arrangements. The avifauna of India includes around 1301 species, of which 42 are endemic and 26 are rare or accidental. 82 species are globally threatened **(Ramesh et al., 2014).** Birds are depending on scientific classification over 9000 bird's species and more than 1250 in India, with almost 150 having become extinct after the arrival of Humans **(Shelekar & Jaodho, 2020).** Together with climate change, urbanization is considered

* Research Scholar, Department of Zoology, School of Agricultural and Natural Sciences, CT University Ludhiana, Punjab, India.
** Assistant Professor, Department of Zoology, School of Agricultural and Natural Sciences, CT University Ludhiana, Punjab, India.

one of the largest threats to wildlife, including the persistence of many bird species. The foremost threat is probably habitat loss and fragmentation, which forces rapid decisions about emigrating (if possible) to more suitable habitats or stay and cope with the new conditions **(Marzluff & Ewing 2008; McKinney 2002)**. The new urban conditions are not only through the process of urbanization per se but also the fact that the existing or remaining "green" areas are often changed, through plantation of non-native plant species, managed lawns, and removal of the mid-story canopy **(Luck & Smallbone 2010; Aronson et al. 2014)**.

Results and Discussion

Urban habitats and geographical landscapes are variedly different from non –urban "natural" habitats **(Koh, 2007)**. The major difference is the transformation of land, from natural green areas to anthropogenic structures and impervious surfaces **(Yeo & Neo, 2010)**. To survive in the urban habitat, birds are forced to either accept or avoid the new conditions **(Isaksson, 2018)**. Urban areas have low species richness than non-urban habitats, because the environmental stress factors such as chemical pollution, noise, artificial light at night and anthropogenic presence **(Lowry et al., 2013)** and this has rendered urban habitat as a major threat to avian diversity **(Escobar-Ibáñez et al., 2020)**. In fact mass scale rapid urbanization along with climate change is regarded as one of the catastrophic threat to avifauna and their collective contribution has lead to decline in the avian population in urban area at rampant pace **(Chemutai, 2017)**. Urban habitats and landscapes are markedly different from non –urban "natural" habitats. The major difference is the transformation of land, from natural green areas to anthropogenic structures and impervious surfaces. Besides, urban expansion has led to a highly fragmented landscape, with islets of suitable bird habitat surrounded by highways and buildings that frequently act as barriers **(Khan et al., 2020)**. These adverse conditions have changed the avifauna dramatically, with many species vanishing once an area is urbanized **(Bilal et al., 2021)**.

In exceptional and rare cases, some species seem to thrive in the urbanized area, and these urban – dwelling species often show prominent phenotypic differences e.g., marked change in behavior, physiological and morphological characteristics **(Liker, 2020)**. Thus, it is quite evident and ample clear that due to increased rate of urbanization and the rapid loss of wild habitats, urban areas are now viewed as challenging ecosystems for sustaining biotic communities **(Shochat et al., 2010)**. Some researchers are even of the opinion which is also corroborated by research data reflected in the work of **Beissinger and Osborne (1982), Marzluff (2012), Chace and Walsh (2006)** that urban areas normally have higher bird abundances in comparison with adjacent, more natural ecosystems. Higher bird abundance in urban areas is supported by the research conducted by **Emlen (1974), Bolger (2001), Marzluff (2012),** as they documented in their published work that increased availability of food in urban settings is responsible for increase in bird densities.

Connor and McCoy (1979) too established through their research that urban environment should possess higher species density because urban habitat has the potential tendency to attract more individuals from the regional species pool. In total contrast to this research finding, most of the studies conducted on birds in urban settings have unanimously pointed out that urban areas are comparatively poor in species richness and diversity as compared with areas bestowed with more natural habitats such as rural areas and forest dwelling areas. Data available on avian diversity and richness in urban settings is contradictory and debatable and is truly a grey area in research that further needs to be explored by researchers to arrive at a unanimous conclusion regarding avifauna diversity in an urban habitat. Urban habitats witness increased anthropogenic disturbances **(Gong et al., 2013)**. Anthropogenic disturbance is considered as an important parameter in determining the shape of the bird community which is supported by the research work conducted by **Marzluff (2008)**, who has pointed out through his research that when anthropogenic disturbance is extreme, synanthropic species dominate bird community and when disturbance is rare native forest species dominate but when disturbance is intermediate a rich diversity coexists.

Urbanized areas are a better habitat for those few species which are tolerant / acclimatized themselves to the disturbances **(Winchell et al., 2016)**. Such urban environments favor ground feeding granivorous or omnivores species and cavity –nesting species or need nesting sites resembling to cliffs or ledges, whereas most of the bird species avoid urban habitat because of disturbance factors such as walking, driving, pollution, crowding, transportation, waste solid material etc. **(Akram, 2015).** Another important reason being noise pollution because birds use vocalization to warn danger, defend their territory and also attract their mates, so due to noisy surroundings which is main result of congested traffic, the birds are there by compelled to avoid urban dwellings **(Dutta, 2017)**. In urban habitat though

food is in abundance but not in good quality, which thus severely affects the health and growth of the birds, so most of the birds try to avoid urban settings and is considered one of the prime determining factor in low species diversity in urbanized areas **(Coogan et al., 2018; Seress & Liker, 2015)**. The huge abundance of food in an urban habitat attracts feral animals (predators of birds) such as cats and dogs **(Shochat, 2004; Tryjanowski et al., 2016)**. The piece of research conducted by **Chace and Walsh (2006)** concluded that cats cause unprecedented damage to birds in an urbanized habitat.

Another important factor that has direct bearing on low species density and richness in an urban setting is loss of vegetation in an urban habitat **(Jokimäki & Huhta, 2000; Lowry et al., 2013)**. Vegetation is important factor for bird community, as birds perform majority of functions on it but scant and fragmented vegetation has severely impacted the urban ecosystem **(Guix, 2007; Magle et al., 2012)**. Besides birds are highly sensitive to alterations in habitat structure and function: consequently, they serve as excellent indicators of changes and stresses in urban ecosystems **(Jones et al., 2009)**.

Conclusion

Avian community structure is considered as an inevitable component of vibrant ecosystem and is reflective of the quality of the habitats. Therefore, any sort of fluctuation in avian community dynamics has serious ramifications for the entire ecosystem. Birds are truly considered as one of the best tools and parameters of environmental vitality of any ecosystem because of their sensitivity to various kinds of perturbances. Avian species diversity and richness varies greatly and not all species are uniformly distributed over a large ecological area because of varied nature of topography, vegetation composition and structure and availability of food and other factors influence species occurrence .Avian abundance is also affected by other factors such as migration, natality and mortality or due to changes in habitat structure and distribution pattern of food resources .Research data has pointed out strong patterns of association between bird community structure and the physical configuration of the environment. Analysis of diverse avian literature points towards some starking revelations that have jeopardized the entire avian community structure. The negative consequences of urbanization have severely affected the urban avifauna in multifaceted ways, be it availability of unhygienic food, diminished nesting sites, noisy surroundings because of high scale vehicular movement which has direct bearing on their communication channels there by affecting their mating pattern leading to reduced reproductive success. These negative consequences of urbanization on urban avifauna are highlighted by majority of the researchers through their published research work. The research work in an urbanized setting has also pointed out that most of the birds try to avoid urban habitat and those species of birds who prefer to live there, have marked phenotypic transition especially being aggressive towards other living beings and that seems to be a potential research gap which further needs to be thoroughly analyzed and examined. For thorough understanding of the bird community structure and niche relationships, in depth analysis of avian population in different habitats is akin not only to understand the avian community structure but it will be a catalyzing factor for effective management of avian populations.

References

1. Akram, F. (2015). Impact of Urbanization on Bird C around Aligarh Cit.
2. Aronson, M. F., La Sorte, F. A., Nilon, C. H., Katti, M., Goddard, M. A., Lepczyk, C. A., ... & 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.
3. Beissinger SR, Osborne DR. Effects of urbanization on avian community organization. The Condor. 1982 Feb 1;84(1):75-83.
4. Bilal, A., Noor, E., & Sajjad, A. (2021). Urbanization Causing Habitat Destruction and Loss of Birds Diversity in District Sargodha. *Op Acc J Bio Sci & Res*, *10*(1).
5. Bolger, D. T. (2001). Urban birds: population, community, and landscape approaches. In *Avian ecology and conservation in an urbanizing world* (pp. 155-177). Springer, Boston, MA.
6. Chace JF, Walsh JJ. Urban effects on native avifauna: a review. Landscape and urban planning. 2006 Jan 1; 74(1):46-69.
7. Chemutai, I. (2017). *The Role of Environmental Diplomacy in Addressing Deforestation by the Small Holder Farmers in Mau Forest Complex, Kenya* (Doctoral dissertation, University of Nairobi).

8. Connor, E. F., & McCoy, E. D. (1979). The statistics and biology of the species-area relationship. *The American Naturalist*, *113*(6), 791-833.

9. Coogan, S. C., Raubenheimer, D., Zantis, S. P., & Machovsky-Capuska, G. E. (2018). Multidimensional nutritional ecology and urban birds. *Ecosphere*, *9*(4), e02177.

10. Diamond, J. (2005). Collapse: how societies choose to fail or succeed. Viking Press, New York.

11. Dingle, H. (2014). *Migration: the biology of life on the move*. Oxford University Press, USA.

12. Dutta, H. (2017). Insights into the impacts of four current environmental problems on flying birds. *Energy, Ecology and Environment*, *2*(5), 329-349.

13. Emlen, J. T. (1974). An urban bird community in Tucson, Arizona: derivation, structure, regulation. *The Condor*, *76*(2), 184-197.

14. Escobar-Ibáñez, J. F., Rueda-Hernández, R., & MacGregor-Fors, I. (2020). The greener the better! Avian communities across a neotropical gradient of urbanization density. *Frontiers in Ecology and Evolution*, *8*, 500791.

15. Gong, C., Chen, J., & Yu, S. (2013). Biotic homogenization and differentiation of the flora in artificial and near-natural habitats across urban green spaces. *Landscape and Urban Planning*, *120*, 158-169.

16. Guix, J. C. (2007). The role of alien plants in the composition of fruit-eating bird assemblages in Brazilian urban ecosystems. *Orsis: organismes i sistemes*, 87-104.

17. Hawkins, B. A., & Porter, E. E. (2001). Area and the latitudinal diversity gradient for terrestrial birds. *Ecology letters*, *4*(6), 595-601.

18. Isaksson, C. (2018). Impact of urbanization on birds. *Bird species*, *235*, 257.

19. Jokimäki, J., & Huhta, E. (2000). Artificial nest predation and abundance of birds along an urban gradient. *The Condor*, *102*(4), 838-847.

20. Jones, G., Jacobs, D. S., Kunz, T. H., Willig, M. R., & Racey, P. A. (2009). Carpe noctem: the importance of bats as bioindicators. *Endangered species research*, *8*(1-2), 93-115.

21. Kale, M., Dudhe, N., Kasambe, R., Chakane, S., & Bhattacharya, P. (2012). Impact of urbanization on avian population and its status in Maharashtra state, India. *International Journal of Applied Environmental Sciences*, *7*(1), 59-76.

22. Khan, S. K., Kaur, K., & Dar, A. A. (2020). Impact of urbanization on Avain community structure in India: A review.

23. Koh, L. P. (2007). Impacts of land use change on South-east Asian Forest butterflies: a review. *Journal of applied ecology*, *44*(4), 703-713.

24. Kühn, I., Brandl, R., & Klotz, S. (2004). The flora of German cities is naturally species rich. *Evolutionary ecology research*, *6*(5), 749-764.

25. Liker, A. (2020). Biologia Futura: adaptive changes in urban populations. *Biologia Futura*, *71*(1), 1-8.

26. Lowry, H., Lill, A., & Wong, B. B. (2013). Behavioural responses of wildlife to urban environments. *Biological reviews*, *88*(3), 537-549.

27. Luck, G. W. (2007). A review of the relationships between human population density and biodiversity. *Biological Reviews*, *82*(4), 607-645.

28. Luck, G. W., & Smallbone, L. T. (2010). Species diversity and urbanisation: patterns, drivers and implications. *Urban ecology*, 88-119.

29. Magle, S. B., Salamack, K. A., Crooks, K. R., & Reading, R. P. (2012). Effects of habitat fragmentation and black-tailed prairie dogs on urban avian diversity. *Biodiversity and Conservation*, *21*(11), 2803-2821.

30. Marzluff JM, Bowman R, Donnelly R, editors. Avian ecology and conservation in an urbanizing world. Springer Science & Business Media; 2012 Dec 6.

31. Marzluff, J. M., & Ewing, K. (2008). Restoration of fragmented landscapes for the conservation of birds: a general framework and specific recommendations for urbanizing landscapes. In *Urban Ecology* (pp. 739-755). Springer, Boston, MA.

32. McKinney ML. 2002 Urbanization, biodiversity, and conservation. Bioscience52, 883–890.

33. McKinney, ML. (2002). Urbanization, biodiversity, and conservation. Bioscience 52:883–890.

34. Ramesh, M., Nijagunappa, R., & Manjunath, K. (2014). Urbanization impact on avifauna population and its status in Gulbarga city, Karnataka, India. *International Letters of Natural Sciences*, *21*.

35. Schneider, A., Friedl, M. A., & Potere, D. (2010). Mapping global urban areas using MODIS 500-m data: New methods and datasets based on 'urban ecoregions'. *Remote sensing of environment*, *114*(8), 1733-1746.

36. Seress, G., & Liker, A. (2015). Habitat urbanization and its effects on birds. *Acta Zoologica Academiae Scientiarum Hungaricae*, *61*(4), 373-408.

37. Shelekar, A. L., & Jadhao, R. G. (2020). Study of Avifaunal diversity in and around Mandwa Lake Near Dharni (Melghat) Tahsil, District Amravati (MS), India. *Int. J. of Life Sciences*, *8*(1), 199-204.

38. Shochat, E. (2004). Credit or debit? Resource input changes population dynamics of city-slicker birds. *Oikos*, *106*(3), 622-626.

39. Shochat, E., Lerman, S., & Fernández-Juricic, E. (2010). Birds in urban ecosystems: population dynamics, community structure, biodiversity, and conservation. *Urban ecosystem ecology*, *55*, 75-86.

40. Tryjanowski, P., Møller, A. P., Morelli, F., Biaduń, W., Brauze, T., Ciach, M., ... & Zduniak, P. (2016). Urbanization affects neophilia and risk-taking at bird-feeders. *Scientific Reports*, *6*(1), 1-7.

41. UN. 2011World population prospects: the 2010revision. New York, NY: UN.

42. Walker, M. M., Diebel, C. E., & Kirschvink, J. L. (2003). Detection and use of the earth's magnetic field by aquatic vertebrates. In *Sensory processing in aquatic environments* (pp. 53-74). Springer, New York, NY.

43. Williams, N. S., Schwartz, M. W., Vesk, P. A., McCarthy, M. A., Hahs, A. K., Clemants, S. E., ... & McDonnell, M. J. (2009). A conceptual framework for predicting the effects of urban environments on floras. *Journal of ecology*, *97*(1), 4-9.

44. Winchell, K. M., Reynolds, R. G., Prado-Irwin, S. R., Puente-Rolón, A. R., & Revell, L. J. (2016). Phenotypic shifts in urban areas in the tropical lizard Anolis cristatellus. *Evolution*, *70*(5), 1009-1022.

45. Yeo, J. H., & Neo, H. (2010). Monkey business: Human–animal conflicts in urban Singapore. *Social & Cultural Geography*, *11*(7), 681-699.

❑❍❑