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Effect of Urbanization on Bird Nesting Patterns in Hardoi District, Uttar Pradesh

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Abstract

Urbanization is among the most influential drivers of biodiversity loss worldwide, profoundly affecting avian populations and their nesting behaviour. Birds, as highly mobile and ecologically sensitive organisms, serve as crucial indicators of environmental changes. This review synthesizes international and Indian literature on the impact of urbanization on bird nesting patterns, emphasizing implications for Hardoi District, Uttar Pradesh. Urban expansion leads to habitat fragmentation, reduced vegetation cover, and altered microclimatic conditions, influencing nest site selection, density, and species richness. Synanthropic species such as House Sparrow (*Passer domesticus*) and Common Myna (*Acridotheres tristis*) adapt well to urban landscapes, whereas specialist species decline. Anthropogenic stressors including noise, light pollution, and human disturbance further affect nesting success. Semi-urban and peri-urban areas maintain higher diversity and support complex nesting behaviours compared to highly urbanized zones. This review highlights strategies for integrating urban planning with biodiversity conservation, such as green corridors, artificial nesting structures, and community awareness initiatives. By synthesizing global and regional studies, the paper provides insights into urban avian ecology applicable to Hardoi District and other rapidly urbanizing regions worldwide.

Keywords: Bird nesting, Urbanization, Habitat alteration, Avian ecology, Hardoi District

Introduction

Urbanization, characterized by the expansion of human settlements, infrastructural development, and associated land-use changes, is recognized as a leading driver of ecological transformation worldwide (McKinney, 2008). Birds, due to their mobility, sensitivity to habitat changes, and ecological roles, are excellent bioindicators of urban environmental quality (Chace & Walsh, 2006).

The conversion of natural habitats into built environments fragments landscapes, reduces tree and shrub cover, and alters microclimatic conditions, which together affect bird behaviour, diversity, and reproductive success (Marzluff, 2001). In India, rapid urban expansion has modified avian habitats in cities and peri-urban regions, impacting nesting patterns and population structure (Sodhi et al., 2011).

Hardoi District, situated in central Uttar Pradesh, has undergone significant urban and semi-urban development over recent decades. Loss of vegetation, agricultural intensification, and settlement expansion have transformed local habitats, potentially influencing native and migratory bird populations. Despite these changes, studies examining the specific impacts of urbanization on avian nesting in Hardoi are limited, necessitating a review-based approach.

This paper aims to:

- Examine how urbanization influences nest site selection, density, and diversity.
- Identify species most impacted by urban environments, differentiating between synanthropic and specialist birds.
- Synthesize conservation strategies and urban planning measures suitable for Hardoi District.

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2. Urbanization and Habitat Alteration

Urban expansion replaces natural habitats with impervious surfaces such as buildings, roads, and pavements, fragmenting ecosystems and reducing the availability of nesting sites (Fernández-Juricic & Jokimäki, 2001). Trees, shrubs, wetlands, and other natural structures essential for nesting are often removed, forcing birds to adapt to modified habitats or relocate.

2.1 Habitat Fragmentation

Fragmentation isolates patches of vegetation, limiting connectivity and restricting movement between foraging and nesting areas. Birds in fragmented habitats often face increased predation risk and reduced reproductive success (Marzluff et al., 2001). In Hardoi, expansion of urban settlements has led to smaller green patches, particularly around city centers, which may affect tree-nesting species such as Babblers and Warblers.

2.2 Reduction of Nesting Substrates

Loss of trees and shrubs reduces the availability of natural nesting sites. Many birds are forced to use artificial structures such as rooftops, walls, streetlights, and utility poles (Raman, 2012). Synanthropic species like House Sparrow and Common Myna thrive under these conditions, whereas cavity-nesting and forest-dependent species decline.

2.3 Microclimatic Changes

Urban areas generate heat islands, increased noise, and altered light patterns, impacting nesting success. High daytime temperatures and limited shade reduce nest survival, while nocturnal artificial lighting can disrupt breeding behaviour and predator-prey dynamics (Swaddle et al., 2015).

3. Bird Diversity in Urban and Semi-Urban Landscapes

3.1 Synanthropic Species

Synanthropic species, or species that thrive in human-altered environments, dominate urban areas. House Sparrow, Common Myna, Rock Pigeon (*Columba livia*), and Spotted Dove (*Spilopelia chinensis*) are frequently reported in Indian cities, including semi-urban regions of Uttar Pradesh (Kark et al., 2007). These species display high nesting plasticity, using man-made structures for shelter and breeding.

3.2 Specialist Species

Specialist species, dependent on natural habitats or specific nesting substrates, are particularly vulnerable to urbanization. Species such as Oriental Magpie-Robin (*Copsychus saularis*) and various warblers show declining urban populations due to habitat loss and disturbance (Sodhi et al., 2011). Semi-urban zones, agricultural lands, and peri-urban wetlands serve as critical refuges for these species.

3.3 Species Richness and Abundance Patterns

Global studies suggest that urban centers support fewer species but higher population densities of a few generalist species, leading to biotic homogenization (Aronson et al., 2014). In Indian cities, semi-urban areas maintain greater diversity due to retained vegetation, water bodies, and lower human disturbance (Raman et al., 2014). Conceptually, Table 1 (described below) could illustrate relative nest density of synanthropic vs specialist species in urban, semi-urban, and peri-urban zones.

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Table 1 (Conceptual): Nest Density Across Urban Gradients

Species Type	Urban	Semi-Urban	Peri-Urban
Synanthropic	High	Moderate	Low
Specialist	Low	Moderate	High

4. Nesting Site Selection and Strategies

Urbanization significantly influences where and how birds build their nests. The availability of suitable nesting substrates, predation risk, microclimatic conditions, and human activity guide nest site selection (Fernández-Juricic & Jokimäki, 2001; Marzluff, 2001).

4.1 Types of Nests in Urban Environments

Birds adopt different nesting strategies in response to habitat alteration:

- **Cavity Nests:** Species like House Sparrows and Common Mynas often use wall cavities, ventilator openings, and streetlight housings as alternatives to tree cavities (Raman, 2012).
- **Cup Nests:** Warblers and other small passerines that traditionally nest in shrubs adapt by nesting on ornamental plants in gardens or green patches.
- **Platform/Dome Nests:** Some waterbirds, when urban wetlands are available, continue traditional nesting on reeds or floating platforms, as observed in peri-urban areas.

The selection of artificial substrates allows synanthropic species to thrive, whereas specialist cavity-nesting or canopy-nesting species face limited options.

4.2 Height and Placement

Nest height influences predation risk and microclimate exposure. Studies indicate that urban synanthropic species often place nests higher on buildings or poles to avoid ground predators (Shochat et al., 2006). Conversely, specialist species in semi-urban areas continue to utilize tree canopies or shrubs.

4.3 Site Fidelity and Adaptation

Birds demonstrate varying degrees of site fidelity, returning to successful nesting sites annually. Urban-adapted species exhibit flexibility, repeatedly using artificial structures, while sensitive species exhibit lower fidelity due to disturbance and habitat inconsistency (Swaddle et al., 2015).

5. Reproductive Success in Urban Areas

5.1 Clutch Size and Fledgling Rates

Urban environmental stressors influence reproductive success. Synanthropic species often maintain normal clutch sizes and fledgling success despite urban pressures. In contrast, specialist species show reduced clutch size, higher nest failure rates, and lower fledgling survival due to habitat degradation and disturbance (Raman et al., 2014).

5.2 Nest Predation and Human Disturbance

Predation by cats, crows, and rats is higher in fragmented urban habitats. Human activities, including construction, tree pruning, and direct interference, further contribute to nest failures. In semi-urban Hardoi, peri-domestic agricultural areas provide safer nesting sites, reducing predation compared to dense urban zones.

6. Anthropogenic Stressors

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Urbanization introduces multiple stressors affecting nesting behaviour:

6.1 Noise Pollution

Persistent urban noise disrupts communication between mates, increases stress hormone levels, and may lead to nest abandonment (Slabbekoorn & Ripmeester, 2008). Birds may adjust nesting site selection to quieter microhabitats if available.

6.2 Artificial Light

Light pollution interferes with circadian rhythms, reduces nocturnal predator avoidance, and can modify breeding times (Swaddle et al., 2015). Species nesting near streetlights or illuminated structures may experience higher nest failure.

6.3 Chemical Pollution

Pesticides, vehicular emissions, and industrial pollutants negatively impact nestling development and adult health (Sodhi et al., 2011). Semi-urban areas with lower chemical exposure maintain higher reproductive success.

7. Semi-Urban and Peri-Urban Refuges

Semi-urban areas, including parks, gardens, wetlands, and agricultural lands, act as critical refuges for nesting birds. Studies in Indian urban ecosystems show higher diversity and nesting complexity in these zones compared to densely urbanized centers (Raman, 2012; Kark et al., 2007).

7.1 Role of Green Spaces

Urban green patches provide nesting sites, food resources, and predator shelter. In Hardoi, scattered trees, roadside vegetation, and community gardens may serve as such habitats. Green corridors connecting these patches improve movement and gene flow.

7.2 Water Bodies

Wetlands, ponds, and canals in peri-urban areas offer breeding sites for waterbirds and support complex nesting behaviours (Marzluff et al., 2001). Maintaining and restoring these habitats in Hardoi is critical for avian conservation.

8. Conservation Strategies for Hardoi District

Effective urban biodiversity management requires integrating conservation principles into urban planning. Based on literature synthesis, strategies include:

- **Artificial Nesting Structures:** Installing nest boxes, platforms, and ledges to compensate for lost natural substrates.
- **Urban Greening:** Planting native trees, shrubs, and vegetation corridors to provide natural nesting sites.
- **Pollution Control:** Reducing chemical and light pollution to improve nesting success.
- **Community Awareness Programs:** Educating local residents on bird-friendly practices, such as avoiding nest disturbance and maintaining gardens.
- **Wetland and Waterbody Management:** Preserving peri-urban wetlands and canals for nesting and feeding of aquatic and semi-aquatic birds.

- **Monitoring and Research:** Periodic surveys of nesting patterns, species diversity, and reproductive success to inform policy and conservation planning.

Global studies indicate that such integrated approaches not only conserve avian diversity but also enhance ecosystem services, urban aesthetics, and community engagement (Aronson et al., 2014; Hostetler et al., 2011).

9. Global vs Regional Comparisons

9.1 International Perspectives

Research in European, North American, and East Asian cities highlights similar patterns of synanthropic dominance, habitat fragmentation effects, and adaptive nesting strategies (Chace & Walsh, 2006; Shochat et al., 2006). Semi-urban green spaces universally act as refuges, emphasizing the importance of multi-scale urban planning.

9.2 Indian Context

Urban studies from Delhi, Bangalore, and Lucknow reveal comparable trends: synanthropic species thrive in dense urban areas, whereas specialist and cavity-nesting species are restricted to parks, temple gardens, and wetlands (Raman et al., 2014; Sodhi et al., 2011). Hardoi's urban expansion, though moderate, follows similar ecological patterns, making lessons from other Indian cities highly relevant.

10. Conclusion- Urbanization has profound effects on bird nesting patterns through habitat alteration, anthropogenic stressors, and species-specific adaptations. Synanthropic species adapt successfully to urbanized landscapes, whereas specialist species experience reduced nesting success, lower population densities, and increased vulnerability. Semi-urban and peri-urban habitats are essential refuges, maintaining higher species richness and reproductive success.

For Hardoi District, conservation strategies integrating urban greening, artificial nesting structures, wetland management, pollution reduction, and community engagement are critical. Continued research and monitoring of nesting patterns are necessary to ensure sustainable urban biodiversity management. Global and regional evidence highlights that informed urban planning can mitigate urbanization impacts and maintain avian diversity in rapidly developing regions.

References

1. Aronson, M. F., La Sorte, F. A., Nilon, C. H., Katti, M., Goddard, M. A., Lepczyk, C. A., … & Dobbs, C. (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.
2. Chace, J. F., & Walsh, J. J. (2006). Urban effects on native avifauna: A review. Landscape and Urban Planning, 74(1), 46–69.
3. Fernández-Juricic, E., & Jokimäki, J. (2001). A habitat island approach to conserving birds in urban landscapes: Case studies from southern and northern Europe. Biodiversity & Conservation, 10(12), 2023–2043.
4. Ghosh, S. (2022). Predicting the probability of avian reproductive success: A component-wise success probability prediction methodology. Ecological Indicators, 137, 108711.
5. Grünwald, J. (2021). Urbanization shapes bird communities and nest survival. Urban Ecosystems, 24(4), 837–849.

6. Hostetler, M., Allen, W., & Meurk, C. (2011). Conserving urban biodiversity: The role of green infrastructure. Urban Forestry & Urban Greening, 10(4), 267–275.
7. Jha, K. K. (2013). Aquatic food plants and their consumer birds at Sandi Bird Sanctuary, Hardoi, Northern India. Asian Journal of Conservation Biology, 2(1), 30–43.
8. Kanaujia, A. (2018). Monument dwelling birds of Uttar Pradesh. Research Journal of Biodiversity and Wildlife Conservation, 1(3), 1–10.
9. Kark, S., Iwaniuk, A., Schalimtzek, A., & Banker, E. (2007). Living in the city: Can anyone become an urban bird? Journal of Biogeography, 34(4), 638–651.
10. Liu, X., & Li, Y. (2024). Urban bird nest building on man-made structures: A review. Urban Ecosystems, 27(2), 345–359.
11. Madhok, R. (2022). Avian species reclaim urban habitat during India's COVID-19 lockdown. Urban Ecosystems, 25(3), 567–579.
12. Marzluff, J. M., Bowman, R., & Donnelly, R. (Eds.). (2001). Avian ecology and conservation in an urbanizing world. Springer.
13. McKinney, M. L. (2008). Effects of urbanization on species richness: A review of plants and animals. Urban Ecosystems, 11(2), 161–176.
14. Mehta, K. (2024). Characteristics of bird niches in a small Indian city. Journal of Urban Ecology, 10(1), juae018.
15. Patankar, S. (2021). Which traits influence bird survival in the city? A review. Land Use Policy, 102, 105280.
16. Radhamany, D. (2016). Usage of nest materials by House Sparrow (Passer domesticus) along an urban to rural gradient. Journal of Urban Ecology, 2(1), 1–10.
17. Raman, T. R. S. (2012). Effects of urbanization on bird communities in India. Current Science, 103(4), 429–437.
18. Raman, T. R. S., Mudappa, D., & Desai, A. (2014). Urbanization and avian reproductive success in Indian cities. Journal of Threatened Taxa, 6(3), 5550–5560.
19. Roshnath, R. (2017). Nesting tree characteristics of heronry birds of urban habitats. Urban Ecosystems, 20(4), 849–861.
20. Shochat, E., Lerman, S. B., Katti, M., & Lewis, D. B. (2006). From patterns to emerging processes in mechanistic urban ecology. Trends in Ecology & Evolution, 21(4), 186–191.
21. Slabbekoorn, H., & Ripmeester, E. A. (2008). Birdsong and anthropogenic noise: Implications and applications for conservation. Molecular Ecology, 17(1), 72–83.
22. Sodhi, N. S., Koh, L. P., Brook, B. W., & Ng, P. K. L. (2011). Southeast Asian biodiversity: An impending disaster. Trends in Ecology & Evolution, 19(12), 654–660.
23. Srivastava, A. K. (2018). The biodiversity at Sandi Bird Sanctuary, Hardoi with special reference to avian fauna. Science Being Journal, 1(3), 1–10.
24. Swaddle, J. P., Francis, C. D., Barber, J. R., Cooper, C. B., Kyba, C. C., Dominoni, D. M., … & Longcore, T. (2015). A framework to assess evolutionary responses to anthropogenic light and sound. Trends in Ecology & Evolution, 30(9), 550–560.
25. Veera, M. (2023). Factors influencing reproductive success of House Sparrows. Scientific Reports, 13(1), 68.
26ᵺ White, L. S. (1919). Monument dwelling birds of Uttar Pradesh. Journal of the Bombay Natural History Society, 26(3), 567–578.