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Impact of Urbanization on Mammalian Diversity in and Around Jaipur City: An Ecological and Behavioral Study

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Abstract: ***Urbanization is one of the most powerful anthropogenic forces reshaping biodiversity in rapidly expanding cities of India. Jaipur, the capital of Rajasthan, has undergone unprecedented urban growth over the last five decades, resulting in large-scale land-use transformation. This study assesses the impact of urbanization on mammalian diversity in and around Jaipur city. Surveys were conducted in peri-urban, semi-urban, and core urban zones using direct sighting, camera trapping, pellet count, and interviews with local residents. A total of 23 mammalian species were recorded, including species such as Canis aureus, Herpestes edwardsii, Nilgai, Pipistrellus coromandra, and Felis chaus. Data show a clear decline in species richness in high-density urban areas, coupled with behavioral modifications, changes in feeding patterns, nocturnal shifts, and increased human–animal conflict. The study reveals that habitat fragmentation, pollution, vehicular traffic, roadkills, and loss of vegetation are critical factors influencing the decline. Peri-urban areas retain the highest diversity, whereas the walled city and high-rise colonies show the lowest. The paper recommends enhancing green corridors, conserving microhabitats, and implementing urban biodiversity management strategies to protect mammalian fauna in Jaipur.***

Keywords: Urbanization, mammalian diversity, Jaipur, habitat fragmentation, ecological impacts, wildlife behavior, urban ecology, biodiversity loss..

1.1 Introduction

Urban ecosystems are among the most rapidly changing landscapes in the world. The expansion of human settlements, infrastructure development, and increased mobility exert immense pressure on wildlife populations. Mammals, being highly sensitive to habitat changes, serve as important ecological indicators of urban environmental health.

Jaipur—popularly known as the "Pink City"—is one of India's fastest-growing metropolitan regions. Founded in 1727, the city has expanded far beyond its original walled boundaries, converting forests, agricultural fields, wetlands, and grasslands into built-up areas. These transformations have altered the structure, composition, and distribution of mammalian fauna.

Historically, Jaipur and its surroundings supported a diverse mammal community including antelopes, deer, carnivores, rodents, bats, and lagomorphs. However, with increasing human population, industrialization, deforestation, and infrastructure development, local species are experiencing severe pressure.

This research seeks to:

1. document mammalian diversity in different urban zones
2. assess how urbanization affects their ecology and behavior
3. identify vulnerable species and habitats
4. provide recommendations for conservation

The study contributes significantly to the knowledge of urban wildlife patterns in Rajasthan, where ecological research remains limited.

1.2 Objectives

1. To document mammalian diversity across urban, semi-urban, and peri-urban zones of Jaipur.
2. To analyze how urbanization affects mammalian ecology, behavior, and distribution.
3. To identify major threats faced by mammals in the urban landscape.
4. To examine patterns of human–animal conflict.
5. To propose conservation strategies suitable for an expanding metropolitan region.

1.3 Methodology

I. Study Design

A mixed-method ecological survey was conducted over 14 months (January–February 2023–24). Data were collected using field observation, camera trapping, nocturnal surveys, and socio-cultural interviews.

II. Study Zones

Three zones were identified:

1. Urban Core – Walled city, C-Scheme, Raja Park, Mansarovar

2. Semi-Urban – Jagatpura, Sanganer, Kalwar Road, Ajmer Road

3. Peri-Urban – Nahargarh foothills, Jhalana, Goner, Chokhi Dhani, Kukas

III. Data Collection Techniques

1. Direct Sightings during dawn and dusk
2. Camera Trap Stations (41 stations deployed)
3. Pellet Count Method for herbivores
4. Roadkill Surveys on Tonk Road, Ajmer Road, Jaipur-Delhi Highway
5. Interviews with forest officials, villagers, urban residents, and local naturalists

IV. Identification

Species were identified using:

1. Zoological Survey of India field manuals
2. Tracks and signs
3. Expert verification

V. Data Analysis

1. Species richness and abundance calculations
2. Urban Intensity Index (UII) analysis
3. Behavioural shift analysis
4. Habitat fragmentation mapping (manual adaptation)
5. Human–animal conflict classification

1.4 Study Area

Jaipur district lies in the north-eastern part of Rajasthan.

Features :

1. Altitude: 431 meters

2. Climate: Semi-arid with extreme summer and mild winter

3. Land Use: Urban settlements, forests (Nahargarh–Jhalana), agricultural fields, lakes (Mansagar), and industrial zones

4. Vegetation: Prosopis juliflora, Acacia nilotica, Zizyphus nummularia, Euphorbia species

Important Wildlife Habitats

1. Nahargarh Wildlife Sanctuary
2. Jhalana Leopard Reserve
3. Amer–Kukas Forest Belt
4. Goner–Chandlai Lake Region

These areas act as critical ecological buffers for mammal populations.

1.5 Observations

I. Species Richness

A total of 23 mammalian species were recorded:

1. Herbivores
2. Nilgai (Boselaphus tragocamelus)
3. Blackbuck (rare, historical sightings)
4. Hare (Lepus nigricollis)
5. Porcupine

Carnivores

1. Leopard (Panthera pardus) — Jhalana region
2. Jungle cat
3. Indian fox
4. Jackal
5. Striped hyena (rare)
6. Palm civet
7. Small Indian mongoose
8. Bats
9. Pipistrelle bat
10. Fruit bat (Pteropus giganteus)
11. Insectivorous microbats (multiple species)
12. Rodents
13. Five-striped squirrel
14. Indian gerbil
15. Bandicoot rat
16. House mouse

II. Patterns of Distribution

1. Urban Core: dominated by rodents, bats, squirrels
2. Semi-Urban: mongoose, jackal, hare, civet
3. Peri-Urban: leopard, hyena, nilgai, fox

III. Habitat Fragmentation

Rapid urban sprawl has:

1. reduced green patches
2. disconnected forest corridors
3. increased movement of mammals toward garbage dumps
4. created isolated populations (especially jackals and mongoose)

IV. Behavioural Modifications

1. Jackals showing increased nocturnality
2. Nilgai entering farms during late night
3. Leopards adapting to highly urban Jhalana
4. Bats shifting roost sites due to light pollution
5. Rodents increasing breeding cycles due to food abundance

V. Human–Animal Conflict

1. Leopard sightings near colonies (Malviya Nagar, Jagatpura)
2. Nilgai crop damage
3. Roadkills on highways
4. Rodent infestations

1.6 Discussion

I. Urbanization and Species Decline

The study shows that mammalian species richness declines sharply as urban intensity increases. Core urban areas support mostly generalist species, whereas specialists decline.

II. Survival of Generalist Species

Rodents, squirrels, bats, and jackals thrive due to:

1. abundant food waste
2. lack of predators
3. high adaptability

III. Decline of Specialist Species

Species requiring large territories—leopard, hyena, fox—are now confined to peri-urban zones.

IV. Behavioral Shifts

Urban conditions force mammals to:

1. alter feeding habits
2. adjust activity times
3. rely on human-derived resources

These shifts reflect stress and adaptation to fragmented habitats.

V. Ecological Concerns

1. Loss of ecological balance
2. Increased disease transmission from rodents and bats
3. Roadkill mortality reducing populations
4. Illegal feeding of wildlife altering natural behaviors

VI. Conservation Challenges

1. Unregulated construction
2. Lack of green belts
3. Pressure on Nahargarh & Jhalana
4. Poor awareness of urban biodiversity

1.7 Results

1. 23 mammalian species documented.
2. Peri-urban zones showed highest species richness.
3. Urban core areas showed species homogenization.
4. Significant behavioral changes in jackals, bats, and nilgai.
5. Increasing human–animal conflict in expanding colonies.
6. Roadkills were highest on major highways.
7. Habitat patches are shrinking and becoming isolated.

1.8 Conclusion

Urbanization in Jaipur has significantly altered mammalian diversity. Species that once thrived across the region are now restricted to fragmented patches. Only adaptable species continue to survive in the highly urbanized core areas. Behavioral changes indicate ecological stress, while increasing human–animal conflict reflects shrinking natural habitats.

There is an urgent need for planned urban development strategies that incorporate biodiversity conservation. Preserving wildlife corridors, protecting peri-urban forests, and raising public awareness are essential for safeguarding the ecological identity of Jaipur.

1.9 Recommendations

1. Establish Urban Wildlife Corridors connecting Jhalana–Nahargarh–Amer hills.
2. Strengthen Green Spaces in colonies and industrial areas.
3. Construct Wildlife Underpasses on major highways.
4. Ban Encroachment in buffer zones of wildlife habitats.
5. Promote Native Vegetation in parks and road medians.
6. Awareness Campaigns for urban residents.
7. Strict Waste Management to reduce rodent proliferation.
8. Conduct Regular Biodiversity Surveys by universities and NGOs.
9. Encourage Citizen Science Programs for monitoring mammals.
10. Protect Jhalana & Nahargarh as critical biodiversity hubs.

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