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Editorial: Spatial aspects of urban animal ecology and conservation biology

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Editorial on the Research Topic
Spatial aspects of urban animal ecology and conservation biology

Introduction

Fragmented landscapes have often been thought of as barriers to the overall health of animal populations and animal species richness. Traditionally, scientists have examined the role of fragmented landscapes and land classification as a predictor of habitat quality and animal diversity. Urban landscapes by definition are fragmented, and how animals respond to fragmentation in urban areas will help inform urban environment planning and policy. With the push to create more urban green spaces and green corridors, urban landscapes have become more ecologically diverse and serve as reservoirs for some animal species.

Humans are the ultimate habitat engineers, and urban areas have already become humanity's principal habitat. Indeed, the United Nations estimated that over 55% of the human population lived in urban areas in 2018—approximately 4.2 billion, a significant increase when compared to 1950 when only 751 million people lived in urban areas. Furthermore, the number of people living in urban areas is expected to increase to 6.7 billion people in 2050 (United Nations 2018). As urban and suburban areas increase in size and importance, the presence and role of animals in these fragmented landscapes need to be better understood to provide adequate habitat space and characteristics. There remains a lot to understand about how organismal communities acclimate to urban habitats. For example, how do animals in a "natural" environment differ from those in urban environments?; how do animals differ with resource, space usage, and home range area in urban, rural, or natural landscapes?; how do landscape ecology metrics differ in the two spaces (natural vs. urban)?; can we make urban environments better suitable to species and do their behaviors differ in one place and another?; how do urban greenspaces change the way that animals act?; and finally, how does this information influence or help create policies allowing for the conservation of native species?

To this end, this Research Topic was initiated to investigate how spatial ecology can be applied in urban landscapes for the betterment of both human and animal habitats. The articles in this collection range from proposing strategies for urban landscapes to benefit both humans and animals, predicting pest outbreaks and microflora influence on species, predicting the influence and use of habitat, and to utilizing citizen science to answer questions about organismal communities in urban habitats.

Habitat quality

Habitat quality is typically defined as the contribution of resources to the survival and reproductive success of individuals and the persistence of populations. Habitats can vary in their abiotic, biotic, and social resources. Human-engineered environments can increase the heterogeneity of resources available to organisms. Investigating the degradation of habitat quality by human activities such as forestry, agriculture, and urbanization has become a research focus. The degradation of aquatic environments can be used as an indicator of overall quality. All organisms use water; however, those organisms that depend on aquatic environments are often sensitive to degradation in water quality. For example, Fisher et al. (2012) pointed out that human activity has increased the spread of fungal disease. Amphibians are susceptible to fungal infections, especially chytrid species. Presumably, they are susceptible to bacterial infections as well. Species whose tadpoles show strong schooling tendencies could be used as models to demonstrate the risk of microflora exposure (Hase). Hase found that Japanese common toad larvae from urban ponds exhibited differences in development and survivorship based on water quality.

Terrestrial habitats are not immune to the risks that come with urbanization and are just as vulnerable to the threats of disease and pests. MacDonald et al. developed models to help predict outbreaks of the emerald ash borer. Models are used to predict outbreak dates that can be used in developing mitigation plans. Without a plan in place, urban forests could be decimated by this insect pest.

Additionally, urban terrestrial environments can provide alternative food sources that might be more diverse than natural environments. Yabsley et al. tracked flying foxes in Adelaide, South Australia to observe how they utilize the various land-use categories in the urban mosaic. Their models revealed that the anthropogenic mixture of food in an urban environment demonstrates their importance in sustaining flying foxes year-round and indicates the need for conserving natural habitats in an urban landscape.

Coexistence and behavior

Ritzel and Gallo (2020) note that while urban mammals acclimated to urban habitats and exhibited behavioral responses to urban pressures, more studies are needed. An empirical investigation by Moura et al. evaluated the spatiotemporal activities of four non-canid mesopredators compared with intraguild predators and the "super predator" humans. They found that these species did not change their spatiotemporal activity in response to coyotes, while humans did influence the mesopredator activity.

Citizen scientists aid in collecting data on animal activities in urban landscapes. Bennett and Agpalo utilized citizen science to better understand how bats use residential swimming pools for water in a suburban neighborhood. They found that specific swimming features, such as reducing clutter around pools, encouraged bat activity, and other features discouraged bats.

Policy

Urban growth is closely aligned with social, economic, and environmental considerations (United Nations, 2018). The more we learn about how animals behave and respond to human engineering, the more we can develop effective policies and conservation plans. Perry et al. described the importance of urban ecology, social justice, and equity to create more livable urban environments for both humans and animals. Urban forests are one urban amenity that can be a better habitat for both humans and animals, resulting in better human health, livability, and higher real-estate values.

Future directions

As human-engineered habitats continue to expand, we need to learn more about how members of the urban landscape interact. We hope this collection inspires more research focusing on the following questions: How do animals in a "natural" environment differ from those in urban environments? How do animals differ with resource, space usage, and home range area in urban, rural, or natural landscapes? How do landscape ecology metrics differ in the two spaces (natural vs. urban)? In order to answer these questions, researchers should consider engaging citizens to help collect scientific data. Questions remain for how to utilize citizen scientists and the type of data that they can collect: Is it possible for them to collect data beyond surveys' of presence or absence? Can citizens be trained to collect data on behavior and species interactions? Lastly, how can the data they collect be validated?

Finally, we encourage researchers, policymakers, and others to continue to study the urban landscape. Ultimately, urban planners and conservation scientists work collaboratively to define policies and construct urban landscape plans that promote species health and richness.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Fisher, M. C., Henk, D. A., Briggs, C. J., Brownstein, J. S., Madoff, L. C., McCraw, S. L., et al. (2012). Emerging ungal threats to animal, plan and ecosystem health. *Nature* 484, 186–194. doi: 10.1038/nature10947

Ritzel, K., and Gallo, T. (2020). Behavior change in urban mammals: a systematic review. *Front. Ecol. Evol.* 8, 576665. doi: 10.3389/fevo.2020.576665

United Nations (2018). *World Urbanization Prospects 2018*. United Nations Department of Economic and Social Affairs. Available online at: https://population.un.org/wup/publications/Files/WUP2018-Highlights.pdf (accessed March 6, 2023).