Exploring the Effects of Urbanization on Small Mammals

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Introduction

- Rapid urbanization is a force that is changing the composition of the NYC mammal community. As urbanization increases in an area, mammal diversity decreases. This is largely because urbanization results in loss of vegetation, fragmentation of habitats, and exposes mammals to a higher degree of human interaction than they are used to.1
- The important ecosystem roles of small mammals include pollinators and seed dispersers, which increases plant diversity; in addition to supporting forest regeneration, and maintaining insect populations. In the long run, small mammals are also indicators of climate, biodiversity, and ecosystem change.2
- Flight initiation distance (FID) is a helpful tool for urbanization research because it indicates an animal’s, in this case a squirrel’s, level of habituation to humans.3
- Population growth, which is intertwined with urbanization, is a major cause of pollution. Water pollution, in particular, increases the nitrate and phosphate content in the water, which disrupt the food and habitat resources of mammals in the environment.4
- Our project, in which we observe these mammals’ environments and their responses to urban factors, is an important indicator of the prominent impacts of urbanization on mammal life.

Research Questions & Hypotheses

Research Question: What are the effects of urbanization on the behavior and species richness of small mammals?

Hypothesis: Urbanization has made urban mammals less sensitive to human presence and decreases species richness.

Does high adjacent population density have negative effects on water quality in NYC parks?

Hypothesis: An area with higher adjacent population density will have higher pollution runoff into water sources, and, therefore, lower water quality.

How is water quality correlated with the mammal species richness of an area?

Hypothesis: As quality of water sources increases, an area will have higher species richness.

How does urbanization affect the flight distance of squirrels?

Hypothesis: Flight distance will be lower in more urban parks and higher in less urban parks.

How does urbanization affect the distance a squirrel flees to a refuge after flushing?

Hypothesis: In less urban parks, squirrels will seek refuge farther away than in more urban parks.

Research Methodology

We placed two track tubes at each site.

Most to least urban: Riverside Park, Central Park, Highbridge Park, Inwood Hill Park, and Pelham Bay Park.

Track tubes

We placed two track tubes at each site.

- We baited with oats and left the track tubes for a maximum of 48 hours before collection and analysis.
- We used a track ID book to identify squirrels.

Camera Traps

We placed motion-sensored camera traps at each site baited with peanut butter and oats.

Flight Distance

We walked steadily toward squirrels with hands behind our backs until squirrels flushed. We then recorded the distance at which the squirrel flushed and the distance to the refuge to which the squirrel ran.

For a subset of squirrels we projected various sounds using a handheld speaker behind the observer’s back.

Water Quality

We used Lamotte kits to measure phosphates, nitrates, and pH.

Results

- Figure 1 shows the flight initiation distance (FID) of squirrels in the different parks.
- Figure 2 shows the relationship of ambient sound to flight distance. FID without sound was observed to have the lowest average flight distance, except for the palatal click. Error bars are standard error.
- Figure 3 shows the relationship of distance to refuge to urbanization gradient.

Conclusion

- The flight distance of squirrels and distance to refuge decreased, which supported our hypothesis (Fig. 1).
- The FID water quality criteria states that phosphates should not exceed 0.7 mg/l to control algal growth.5 The phosphate levels at Riverside, Central, Inwood Hill, and Pelham Bay parks all surpass this level by large amounts. In addition, there is a weak positive correlation between species richness and water quality (Fig. 6), supporting our hypothesis, and showing that an area with better water quality supports a larger variety of mammals, and is therefore beneficial to the ecosystem overall.

Future Research

Future research could observe other aspects of these mammals’ environments, including the surrounding trees and soil. It’s also important to note the size of their habitats, and determine if these parks are a large enough area for these mammals. Research can also look into the predator-prey relationships of various mammal species in these parks. Research like this is the first step in taking measures to help protect mammals in urban parks.

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References