Species Diversity and Community Similarity of Carrion Beetles Along an Urban-Rural Gradient

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BACKGROUND

Carrion beetles (Coleoptera: Silphidae) play an important ecological role by facilitating the decomposition of vertebrate carcasses, and are some of the few insects to provide parental care. In the Northeastern United States, several species are found in temperate forests and field habitats. It is currently unknown as to what extent the carrion beetle communities in the New York City metropolitan area are able to withstand increasing urbanization and subsequent forest fragmentation, as well as the local diversity of carrion beetles. A previous study on how forest fragmentation affected the species richness and abundance of carrion beetle communities in central New York State, USA, found that species richness was reduced by one-third and species abundance by two-thirds in heavily fragmented forests (Gibbs & Stanton, 2001). This study will survey carrion beetle species richness and diversity with a similar experimental design and determine community similarity along an urban-rural gradient from New York City to southern New York State and western Connecticut.

OBJECTIVES

• Examine the effects of urbanization and forest fragmentation on the species richness and diversity of carrion beetle communities around the New York City metropolitan area across an urban-rural gradient

• Measure and compare community similarity between different sites across the gradient

HYPOTHESES

• As urbanization and forest fragmentation increase, carrion beetle species richness and diversity will decrease

• Sites with similar levels of fragmentation will have more similar communities

METHODS

• Carrion beetles were trapped and collected from forests throughout late June and July 2015 at 12 field sites along the urban-rural gradient

• Species diversity was calculated using Simpson’s reciprocal index (1/D), and community similarity was calculated using the Jaccard coefficient of community similarity (CC = c / S)

• Linear regression analysis of mean % impervious cover (representing degree of urbanization) versus species richness and of mean % impervious cover versus species diversity was performed

In addition, the carrion beetle community at the Louis Calder Center in Armonk, NY was compared with the community observed in 1970 by Pirone (1974)

METHODS CONTINUED

Figure 1. Map of study sites across southern New York and western Connecticut. Urban sites are pinned in red, suburban sites in yellow, and rural sites in light green.

RESULTS

Figure 4. Total carrion beetle species abundance values separated by urban, suburban, and rural habitat classes.

Figure 5. Relationship between mean % impervious surface cover and carrion beetle species richness (A) and with species diversity (B). The line of best fit, the equation of the line, and the $R^2$ and $P$-values are displayed on each plot. Highbridge Park, The Convent of the Sacred Heart, and Rockefeller State Park Preserve are not included in these plots due to lack of impervious surface data. Points representing the New York Botanical Garden and Central Park are labeled to illustrate the similar mean % impervious cover values but widely differing species richness and diversity values between the two sites.

REFERENCES


ACKNOWLEDGEMENTS

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Table 1. Carrion beetle community similarity values between individual field sites, with sites listed in order from south to north along the urban-rural gradient. Urban sites are in red, suburb in yellow, and rural in blue. Possible values range from 0 to 1; higher values indicate higher similarity between the two sites.

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<th>NYBG</th>
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<th>MRG</th>
<th>CFP</th>
<th>MH</th>
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<td>0.333</td>
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</tbody>
</table>

Figure 3. Eight species of carrion beetle were captured in total across all sites, including five in the genus Nicrophorus (burying beetles – top row and far left on bottom row).

Figure 2. Map of impervious surface cover throughout the urban-rural gradient. Impervious values from 2000 m boundary buffers were used in this study.

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RESULTS CONTINUED