THE EFFECT OF GUNNISON'S PRAIRIE DOG COLONIES ON ARTHROPOD DIVERSITY IN THE NEW MEXICAN SHORTGRASS PRAIRIE

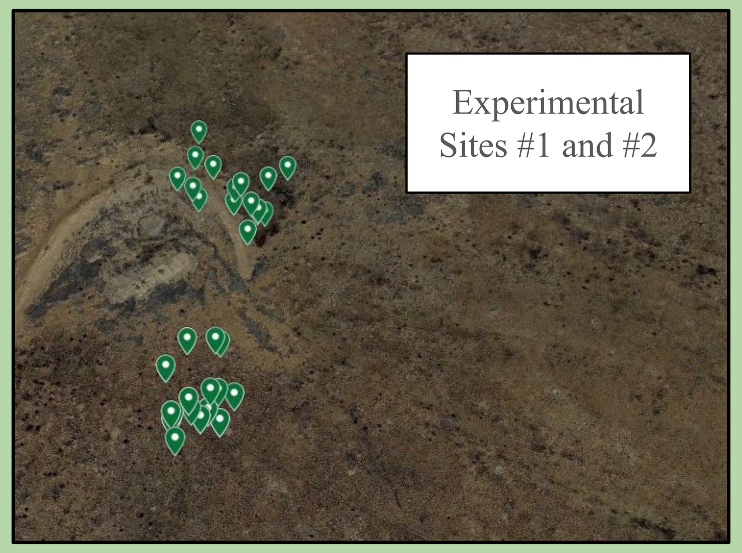
Thaddaeus Blakley, Javier O. Morales, James Loomis, Andrew Hope

Introduction

The black-tailed prairie dog (*Cynomys ludovicianus*) has been extensively studied and is widely recognized as a keystone species for the prairie ecosystem, providing valuable microhabitat for a wide array of other species. The black-tailed prairie dog data, however, has been indiscriminately applied to the four other prairie dog species of North America (Grant-Hoffman & Detling, 2006). This investigation aims to ascertain whether the lesser researched Gunnison's prairie dog (*Cynomys gunnisoni*), indeed, has similar ecological benefits as the black-tailed prairie dog.

This study was conducted on the Sevilleta National Wildlife Refuge, in two adjacent human-built prairie dog towns with moderate to low activity levels. For the past 14 years, conservation organizations have released Gunnison's prairie dogs into these towns. This study aims to shed light on the impact of this type of long-term reintroduction program.

I hypothesized that the Gunnison's prairie dog population supports local biodiversity. To test this, I analyzed arthropod diversity both within and outside of prairie dog towns. Soil-dwelling arthropods are diverse, have wide distributions, and are acutely sensitive to environmental alterations. This renders them ideal indicators of an ecosystem's overall biodiversity and makes them a viable tool for conservation success analyses (Beiroz et al., 2014) & (Menta and Remelli, 2020).



Methods

The methodology for the experimental design was inspired by Hohbein & Conway (2018) and Litavský & Prokop (2023).

Experimental sites #1 and #2 (E1, E2) comprised two tracts of land, each 1.32 acres in area, in two adjacent prairie dog towns. A similarly sized control plot (C) was established over a kilometer away. I randomly generated coordinates for 16 points per site for arthropod pitfall traps. At each point, I set a trap of two 18 oz party cups, one inside the other, placed in the ground and filled with 1-2 inches of slightly soapy water. I propped tiles 1-3 inches above each trap to shield against sun, rain, and larger animals. Each trap was active for one 24-hour period per week. I identified the collected specimens to the family level with only a couple of exceptions: *Diptera* specimens were only identified to order level and were consequently excluded from all family-level analyses. Ants (Family *Formicidae*) were highly abundant (approximately 15,000 were counted from the traps). As *Formicidae* diversity is not accurately determined from pitfall traps, this family was excluded from analyses at all levels.

All analyses and graphing were conducted in R.

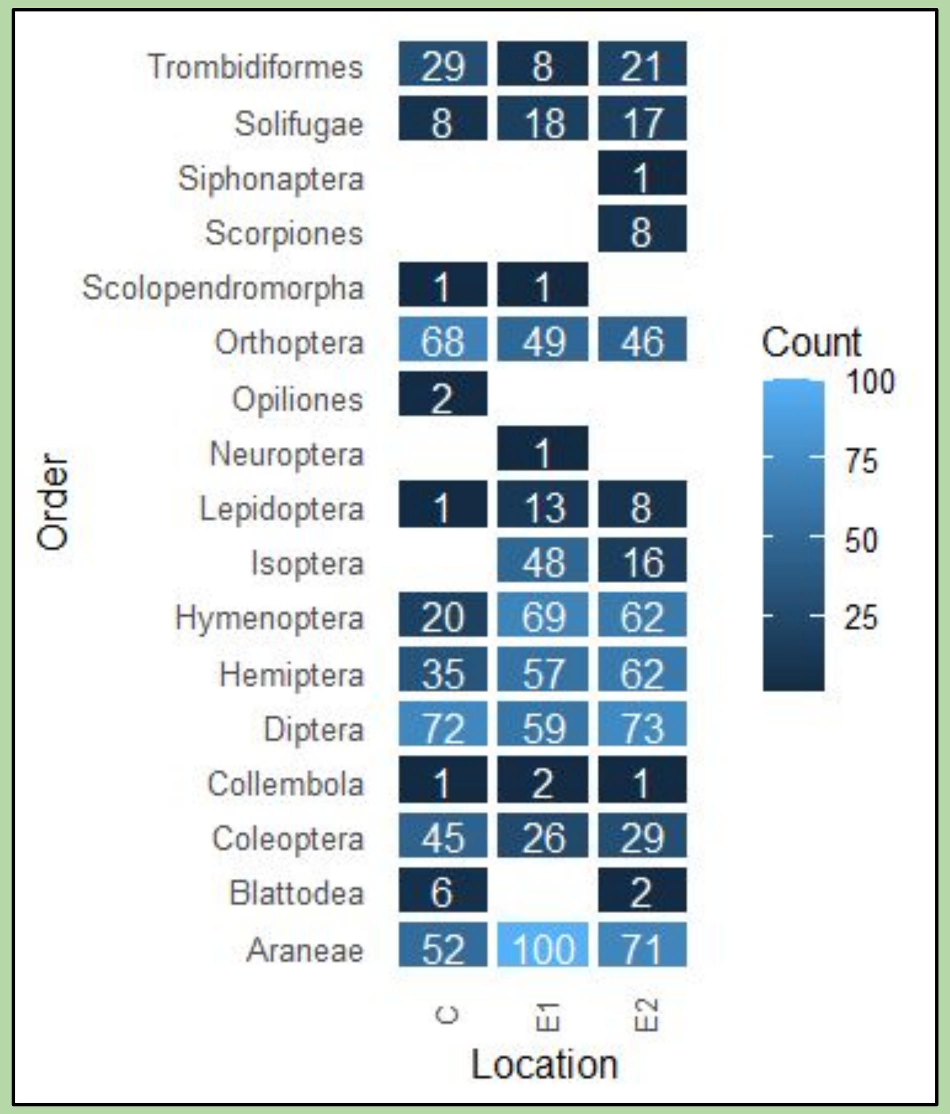
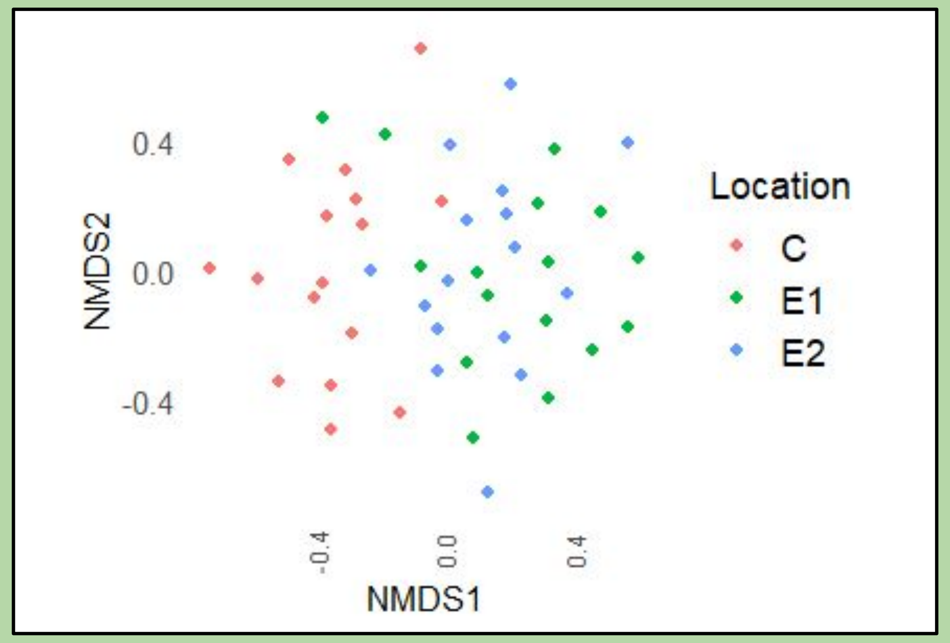


Table 1: Comparison of Order Abundance Across Control (C) and Experimental (E1, E2) Sites

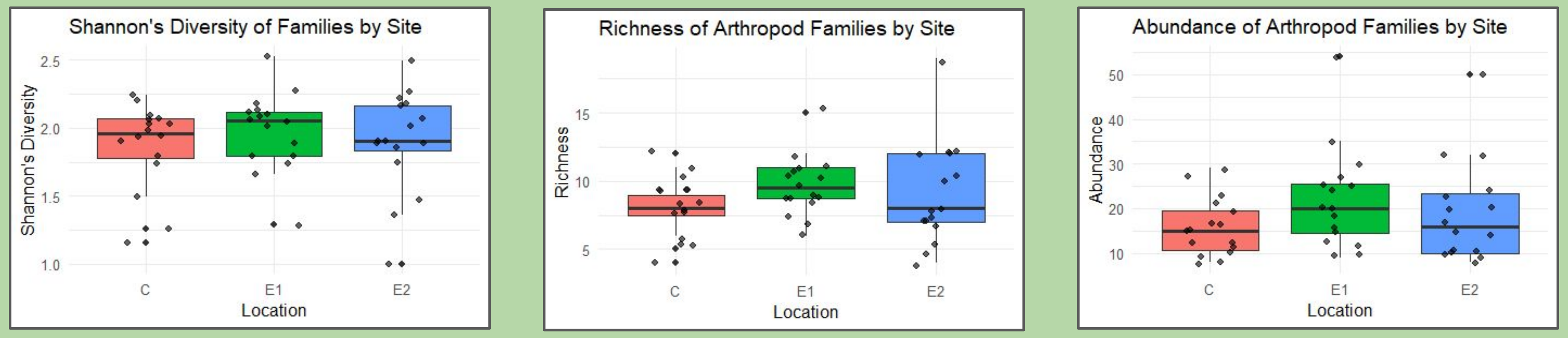


Graph 1: Multidimensional Similarity Plot Analysis of the Family Composition of 48 Pitfall Traps Across Control and Experimental Sites

Results

There was a clear difference in the taxonomic and numeric composition of arthropod communities within and outside of the prairie dog towns. NMDS analysis was conducted on the pitfall traps by site. It showed a clear distinction between family presence and abundance on the control and experimental plots. However, diversity (as calculated by the Shannon Diversity Index), richness, and abundance were not statistically significant between the three sites.

A pairwise PermANOVA test showed significant differences at a p = 0.001 on the family level between Control and Experimental site #1 and between Control and Experimental site #2. However, there was no significant statistical difference between Experimental #1 and #2 (p = 0.663).



Graphs 2, 3, 4: Comparisons of Site Diversity, Richness, and Abundance

Pairs	Df	F Model	R2	P Value
C vs E1	1	4.6973890	0.13538163	0.001
C vs E2	1	4.3216699	0.12591666	0.001
E1 vs E2	1	0.8138504	0.02641184	0.663

Table 2: Pairwise PermANOVA Comparison Between All Sites

Conclusion

The data indicates that, while Gunnison's prairie dogs do not significantly influence diversity, richness, or abundance, they do impact community composition. Biodiversity is not enhanced, but it is altered. The microhabitat created by the prairie dog towns is very distinct from the undisturbed prairie and supports a different variety of families, but not necessarily a different number.

This has exciting implications for future research in this field. The microhabitat associated with prairie dog towns serves as a source of environmental heterogeneity that may benefit a different community of plants and larger animals as well. Future research may focus on the ecological indications of the presence of specific arthropod families. Such studies may find places in conservation efforts that rely on finding microhabitats to restore numbers of specialist-type species.

References and Acknowledgements

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