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Seed Preferences of Native Seed Predators in Southwestern Arizona



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Introduction

- The encroachment of shrubs and woody plants into desert grasslands is a phenomenon contributing to the erasure of desert grasslands in southwestern USA. [1]
- Ants and rodents are studied to disperse both grass and shrub seeds in Arizona and are found at the Santa Rita Experimental Range where there is an invasion of shrubs. [2]
- In a cafeteria experiment, the seed dispersing behavior of ants and rodents were quantified to model the seed preference of native seed dispersers to understand their role in ecosystem shift. [1]

Questions

- Who disperses seeds more throughout a 24 hour cycle, ants or rodents?
- Do ants and rodents prefer wood seeds over grass seeds despite treatment differences?
- Do ants or rodents have a preference for seed species?

Methods



Seed Name	Seed Abbreviation	Seed Name	Seed Abbreviation
<i>Pectis pectis</i>	PAPE	<i>Quercus californica</i>	QCAL
<i>Prosopis juliflora</i>	PRVE	<i>Artemisia tridentata</i>	ARTD
<i>Acacia greggii</i>	ACGR	<i>Muhlenbergia porteri</i>	MUPR
<i>Cercilia collada</i>	CEPA	<i>Bouteloua rostrata</i>	BORO
<i>Crotalaria retusa</i>	CRAR	<i>Ipomoea</i>	IPOM
		<i>Setaria</i>	SETE

- Our collaborators placed a petri dish containing ten seed species on a wood platform.
- Our collaborators left the dishes in the field for 24 hours for each of the three treatments.
- The treatments consisted of All Access, Ant Only, and Rodent Only

Video Recordings

- Our collaborators set up a camera directly above the dish
- We looked at amount of ants and rodents that interacted with the seeds, what seeds they interacted with, and how many times they interacted with a seed

- We watched one minute videos for every five minutes for every hour for 24 hours for ten trials for each treatment
- We performed T-test, ANOVA, and Linear Mixed Effect Models in R.

Cafeteria Experiment

Data Analysis

Dates: June through August 2017
Site: Santa Rita Experimental Range

1. Who disperses seeds more throughout a 24 hour cycle, ants or rodents?

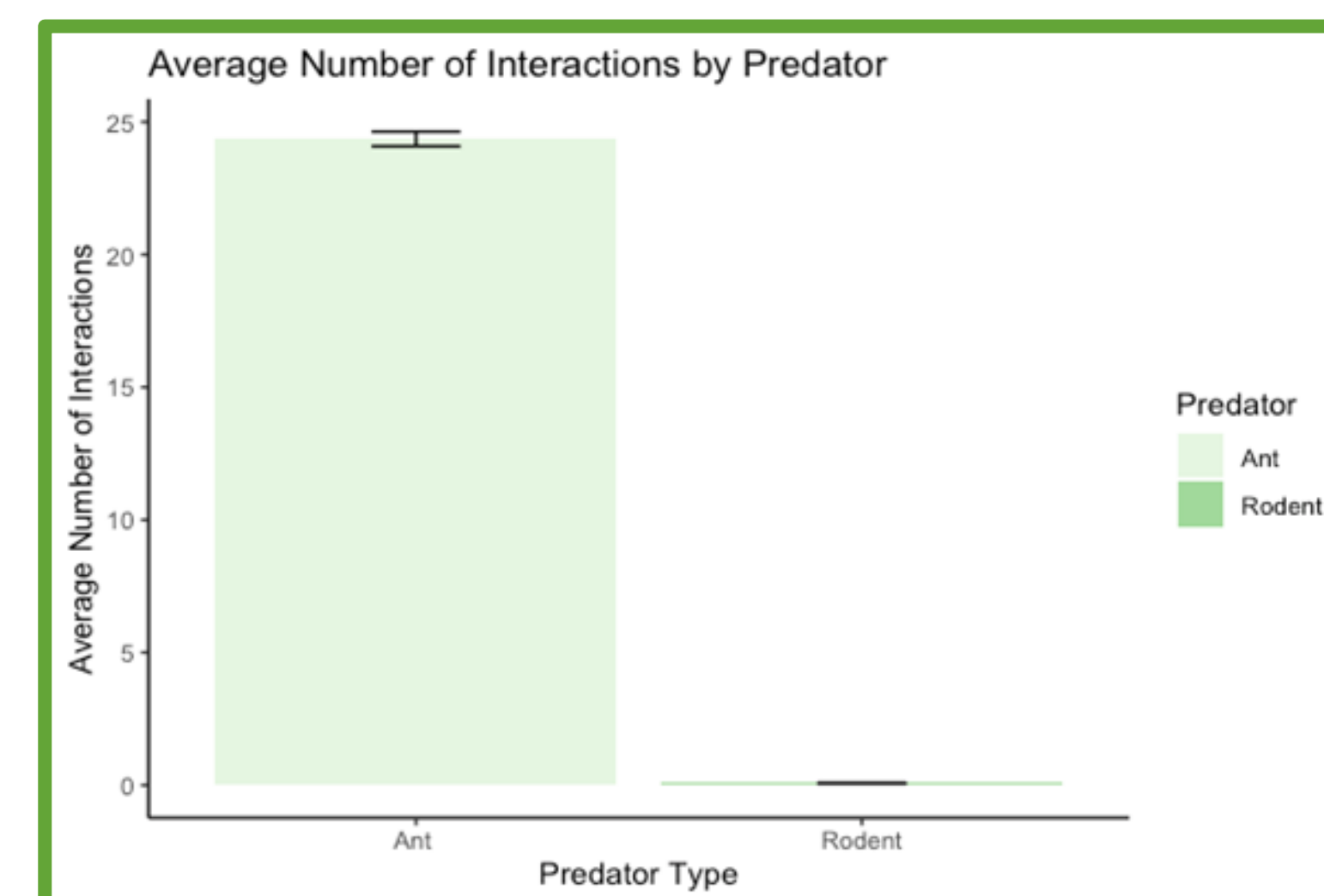


Figure 1: Average amount of interactions for ants and rodents touching or taking seeds. We found ants interact with seeds significantly more than rodents (Welch's two-sample t-test, t-value = 5.6999, p-value < 0.001).

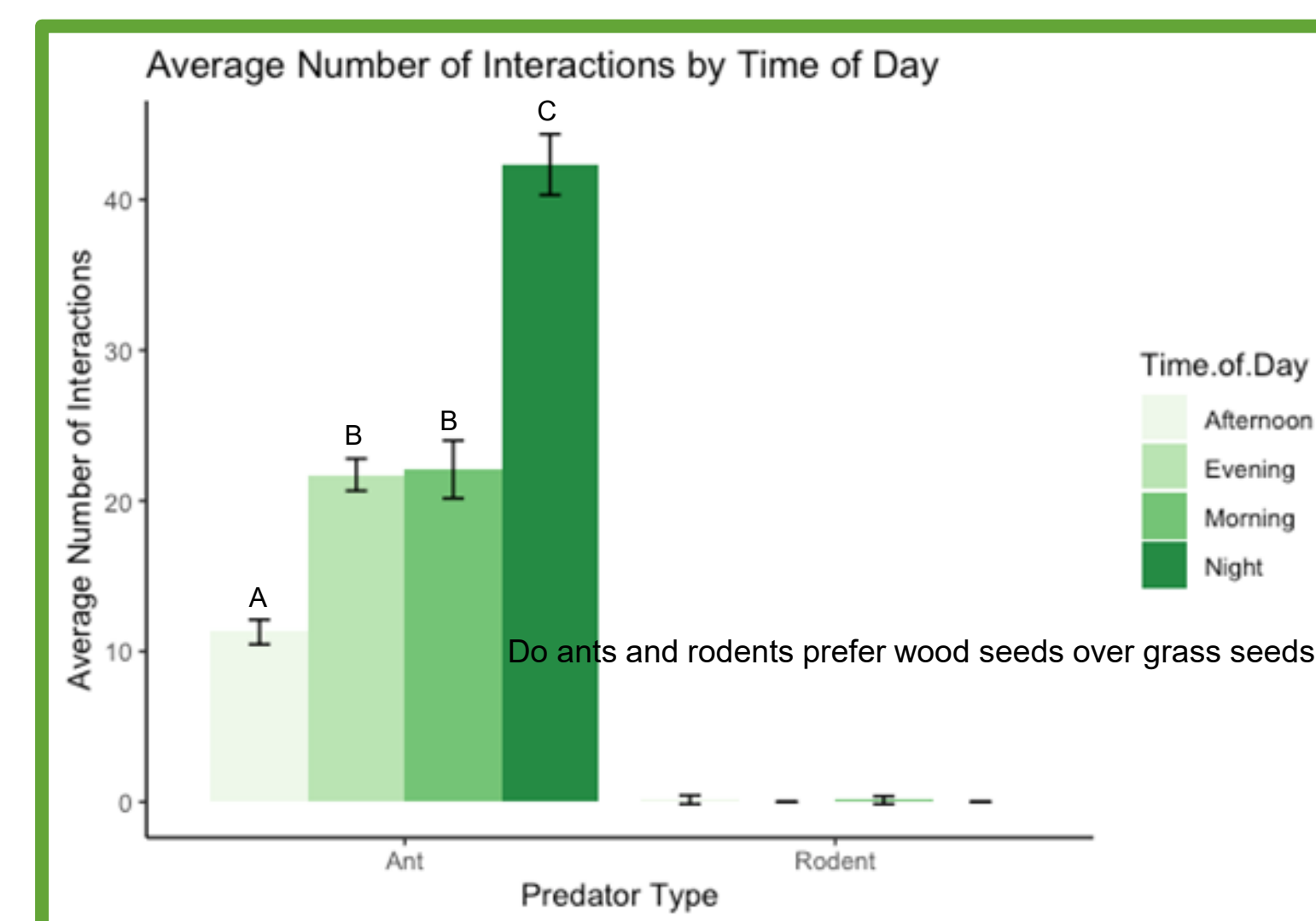


Figure 2: Average amount of interactions for ants and rodents touching or taking seeds by time of day throughout a 24-hour cycle. We found no significant differences in Rodent interactions with seeds by time of day (GLMM, p-value > 0.05). Ants interacted with seeds significantly more at night than any other time of day (GLMM, p-value < 0.001), and significantly less during the afternoon than any other time of day (p-value < 0.001). Activity was significantly different in the Evening and Morning than Afternoon and night (p-value < 0.001), but Morning and Evening were not statistically different than one another (p-value > 0.005).

2. Do ants and rodents prefer wood seeds over grass seeds despite treatment differences?

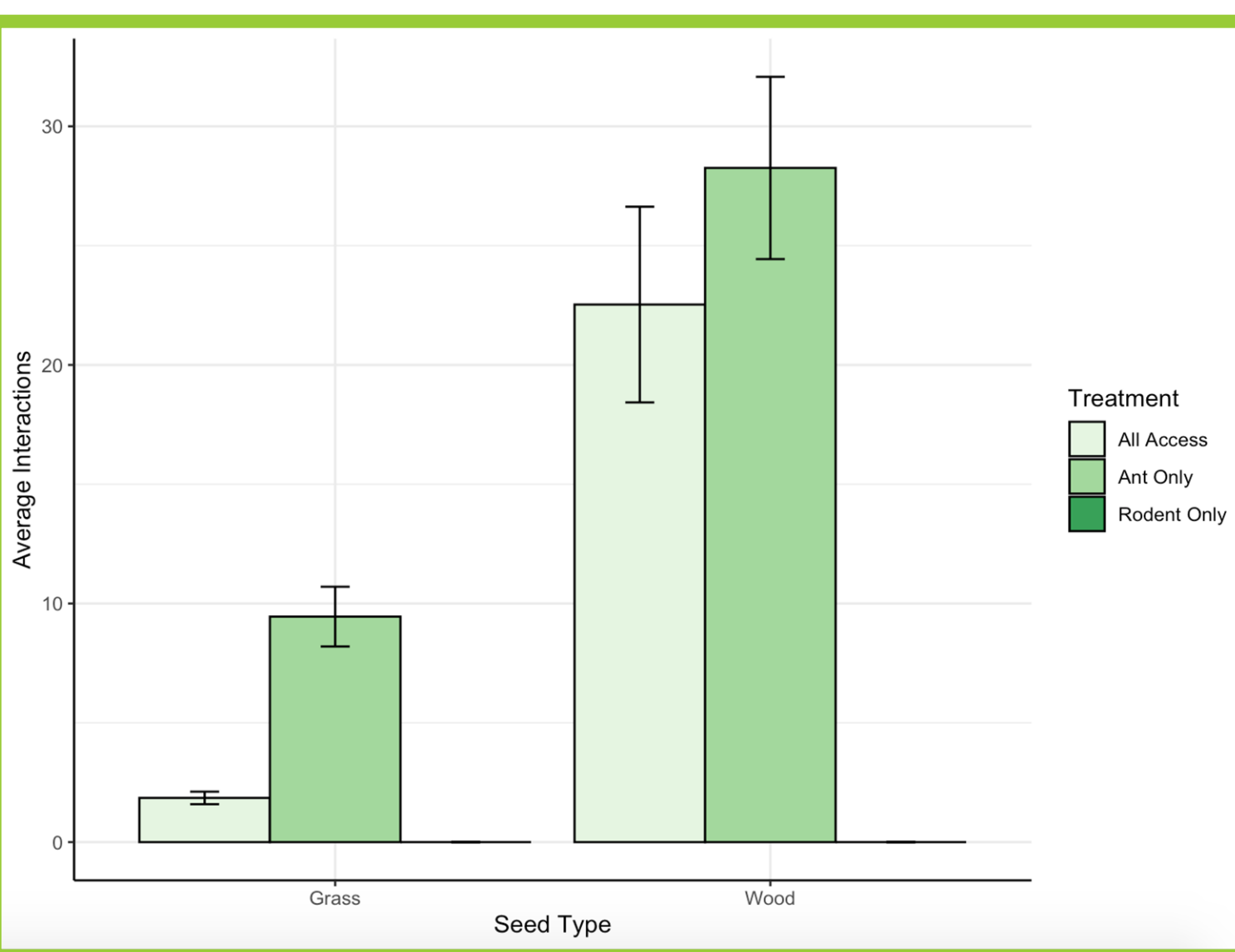


Figure 3: Average number of ant interactions with grass and wood seeds for each of the three treatments. We found ant interacted with wood seed significantly more than grass seed (GLMM, p-value < 0.001). Ants interacted significantly more with seeds, regardless of type, in Ant Only treatments when compared to other treatment types (GLMM p-value < 0.001). The Rodent Only exclusion treatment worked successfully and there were no ant seed interactions for that treatment.

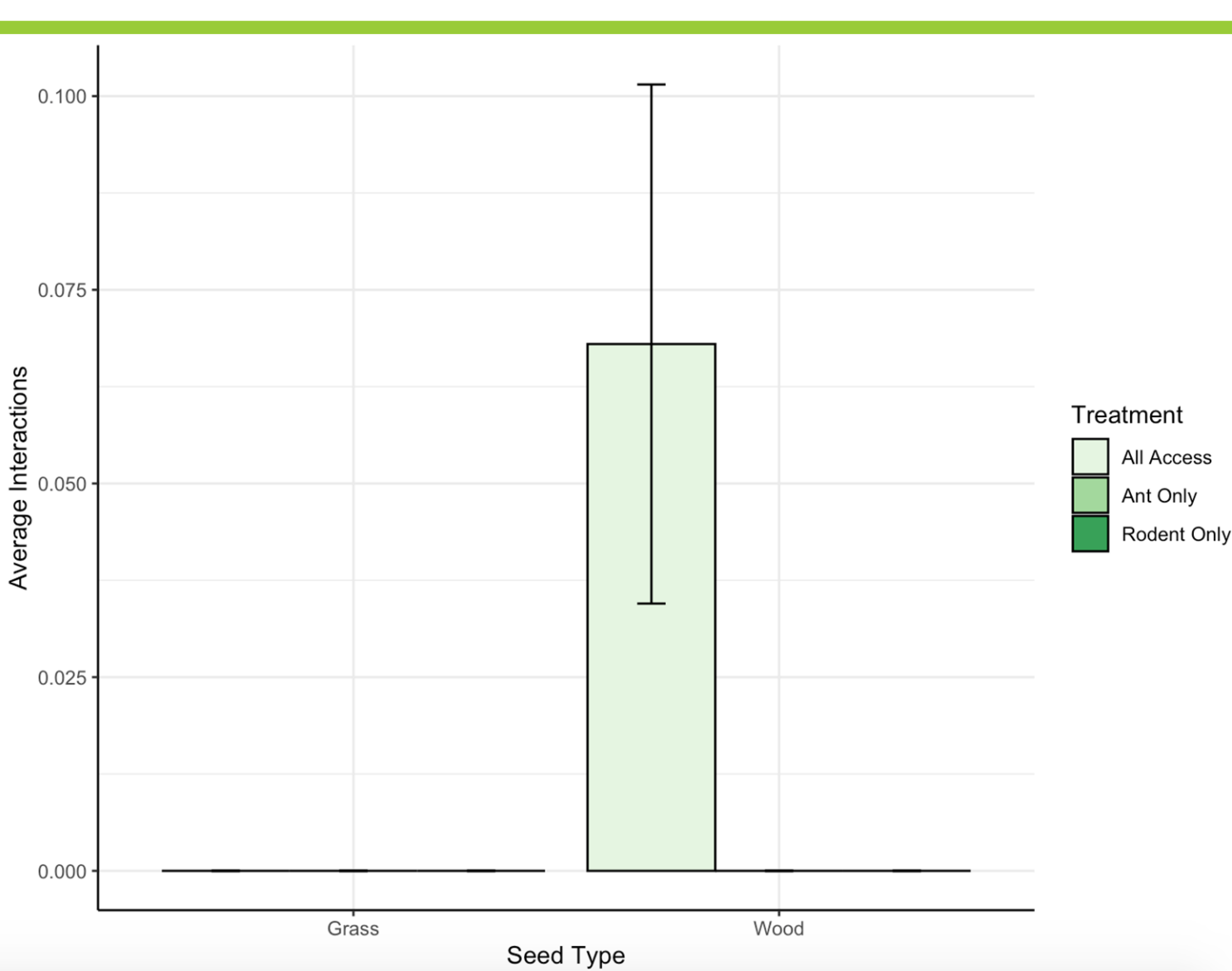


Figure 4: Average amount of rodent interactions for grass and wood seeds for each of the three treatments. We did not find any significant differences between treatment types, or seed types (GLMM, p-value = 1.000). The Ant Only exclusion treatment worked successfully and there were no rodent seed interactions for that treatment, however we also saw no rodent interactions in the Rodent Only treatment type.

3. Do ants or rodents have a preference for seed species?

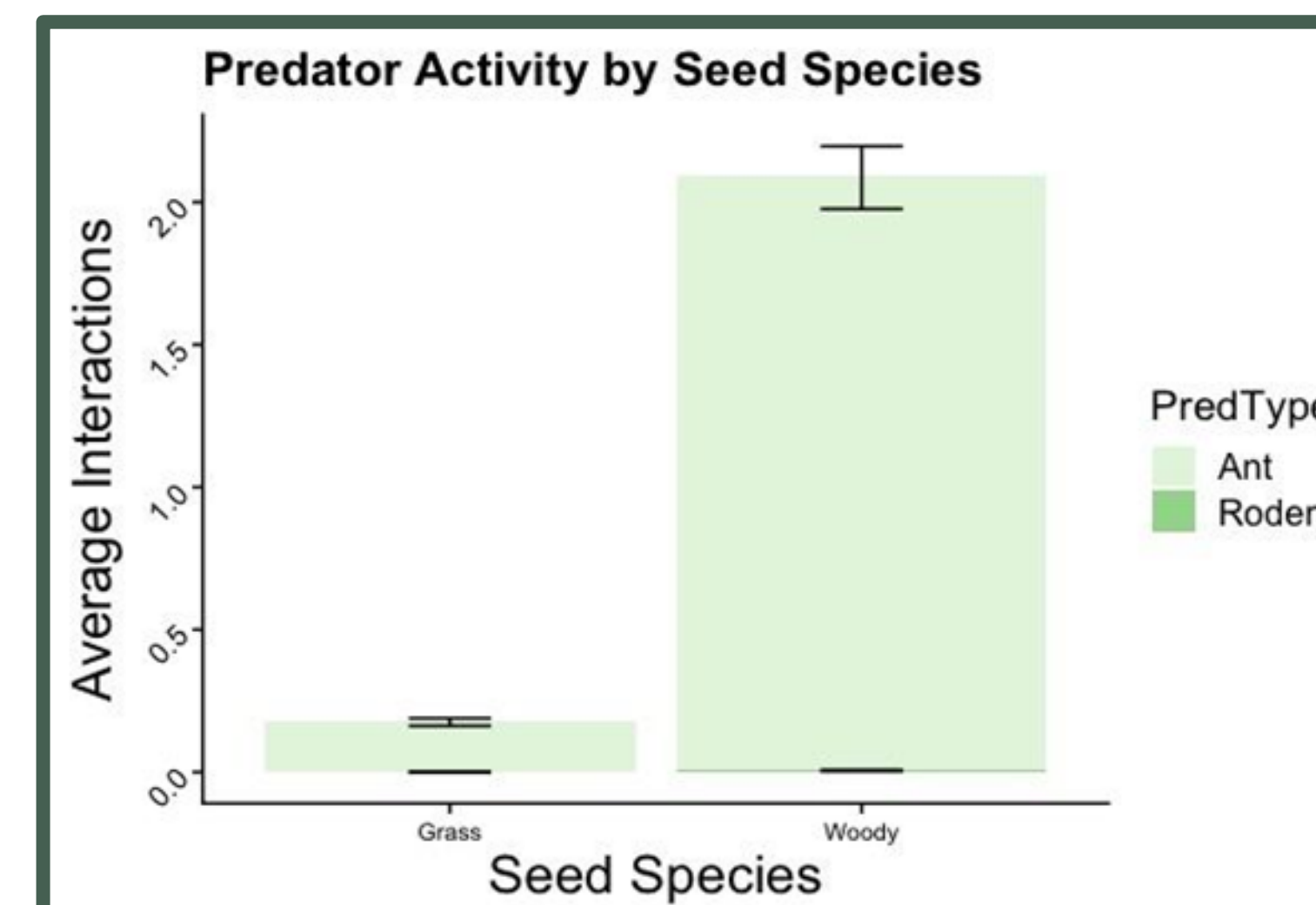


Figure 5: Total number of ant and rodent interactions with grass and woody seeds in all access trials. We found ants preferred woody seeds over grass seeds (Two-way ANOVA, p < 0.001). Ants preferred woody seeds more than rodents preferred grass or woody seeds (Two-way ANOVA, p < 0.001).

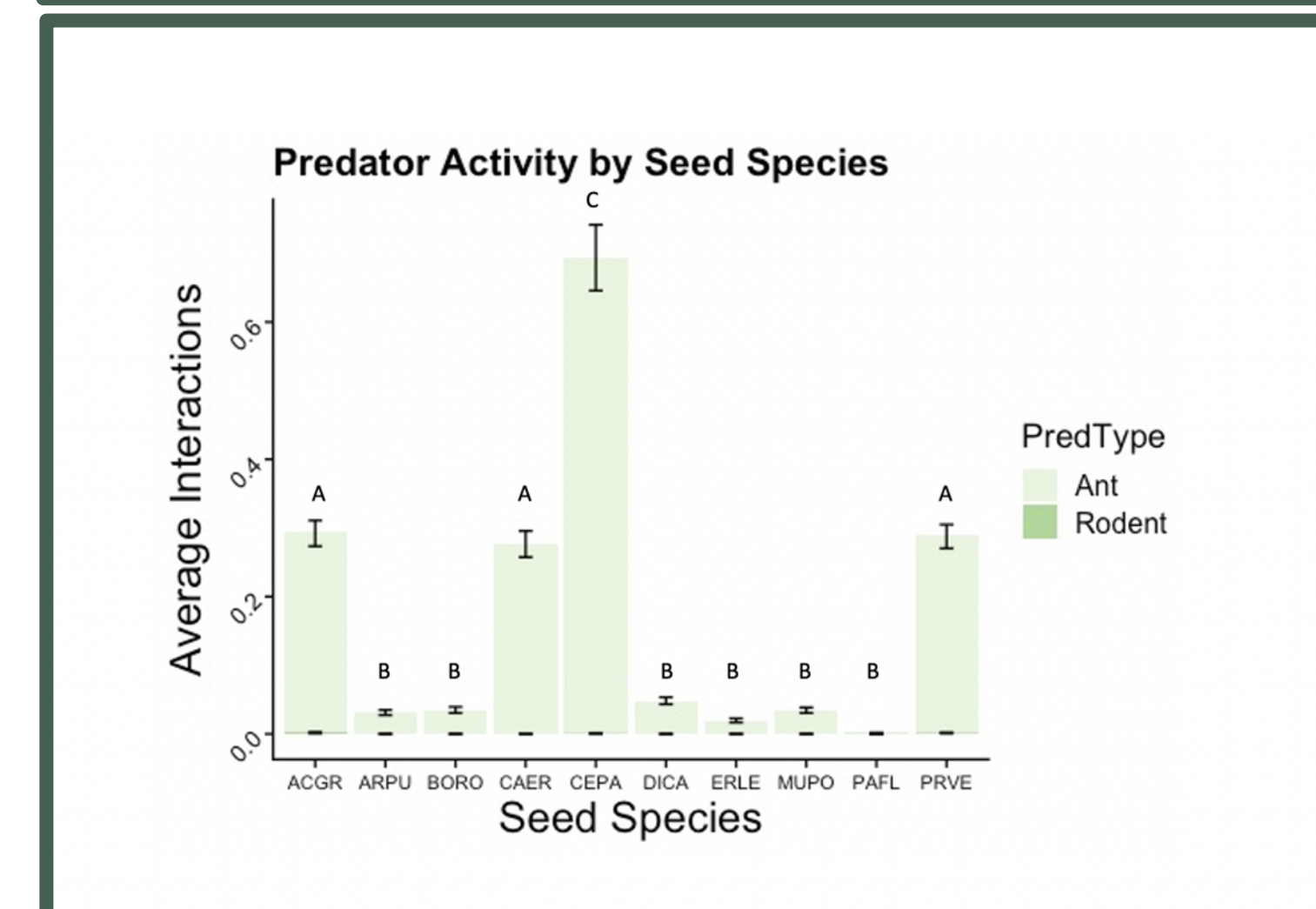


Figure 6: Total number of ant and rodent interactions by seed species in all access trials. We found ants preferred CEPA most (Two-way ANOVA, p < 0.001). Ants also has a significant preference for ACGR, CAER and PRVE (Two-way ANOVA, p < 0.001). Rodents showed no preference between seed species (Two-way ANOVA, p > 0.05).

Discussion

- Q1:** Ants were shown to have more interactions with seeds. Ants interacted with seeds more during the night. Though it has been suggested rodents could compete with ants for seeds, our results indicate ant interactions are more significant [1]. Further research should focus on changes to plant composition when given artificial access to both grass and woody seeds on a local experimental scale. Ant also were most active at night. This aligns with previous research that suggests ants foraging times are influenced by ground temperature [3].
- Q2:** Treatment did not affect ants choice of seed type and ants preferred woody seeds meaning that this preference could be impacting the grassland transition. This study did not find any significant seed preference results for rodents. Brown et al. 2016 found that rodent interactions were limited in their study because rodents did not have time to adapt to the equipment [4]. Therefore, this experiment should be done for longer periods of time so rodents can adapt to the equipment.
- Q3:** The four seed species preferred by ants were all woody species. This result conflicts with previous research that found seed preference reflective of diet composition [5]. There is a need for additional analysis that considers seed removal instead of interactions since woody seeds used in this experiment were too large for ants to remove them from the petri dish. This would give a better indication for potential changes in plant composition within grassland landscapes.

Acknowledgments

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