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Allie Smith
Ohio Wesleyan University

Rebecca Lipster
Ohio Wesleyan University

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Investigating Crayfish (*Orconectes rusticus*) Aggression and How it Varies with Resource Availability

Rebecca Lipster, Allie Smith, and Dr. Shala Hankison. The Zoology Department.
Ohio Wesleyan University.



ABSTRACT

Animals that express agonistic behavior toward one another are prone to recognizing hierarchical status among individuals. Recognizing status has proven to be evolutionarily advantageous for crayfish (*Orconectes rusticus*) because it allows dominant individuals to maximize resources and permits subordinate individuals to steer clear of potentially costly battles. More specifically, two crayfish experiencing aggression can generally determine who the dominant and subordinate individuals are in a fight. A higher social status within a social hierarchy can allow for increased access to differing resources, such as food, mates, and shelter. In this experiment, we want to see if limiting resources will affect aggression levels in crayfish. To do this, we limited food availability and shelter availability and measured crayfish aggression over several rounds of interaction. While we did not find that resource availability affected crayfish aggression we did find that status does affect crayfish aggression.

INTRODUCTION

Crayfish aggression can often be determined by resource availability

- We looked at how food availability affected this
- We also looked at how shelter availability affected this

Crayfish establish dominance hierarchies and as such dominant individuals can attain more resources than subordinate individuals

Aggression affected by resource availability helps us to understand dominance hierarchies

- Helps determine general characteristics that dominant and subordinate individuals display

METHODS

General: Counted the number of interactions and aggression of interactions for three five-minute rounds. Performed this on four pairs and allowed them to rest for 20 minutes between rounds.

Week 1: Fed on a regular schedule and no addition of shelter

Week 2: Fed after the procedures and no addition of shelter

Week 3: Fed on a regular schedule and addition of shelter

Week 4: Fed after the procedure and addition of shelter



Figure 1. Tank set up.

RESULTS

- Two-Way ANOVA run to reveal a significant difference in status (p-value = 0.008946; df = 1; f-value = 8.0926)
- Highest average aggression scores recorded in the “no food, shelter” (NFS) experimental set-up (mean = 3.113); lowest average aggression scores recorded in the “no food” (NF) experimental set-up (mean = 2.369)

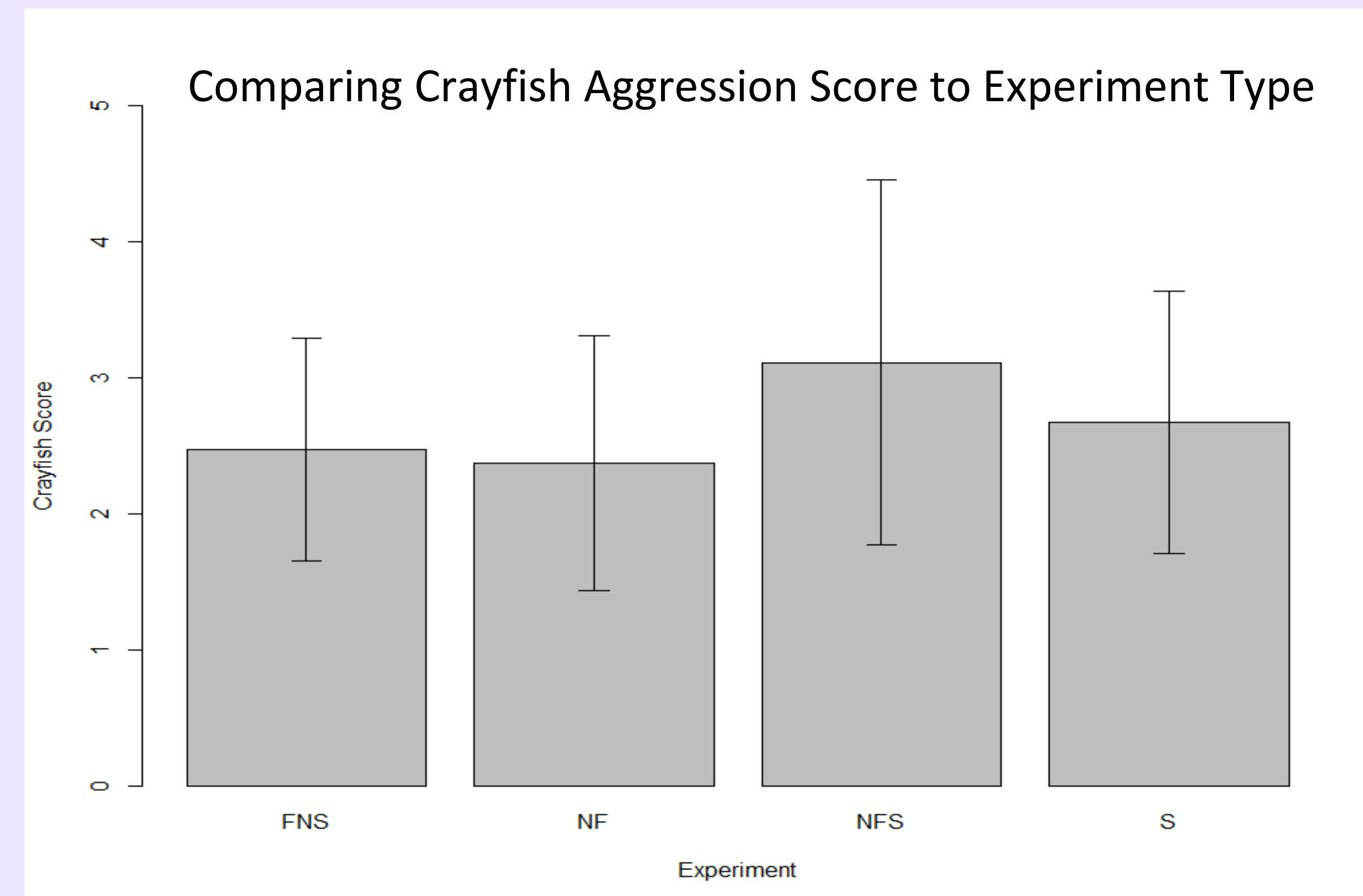


Figure 2. Crayfish aggression scores compared to each experimental type assessed in this study (±SD). FNS = Food, no shelter; NF = no food; NFS = no food, shelter; S = shelter

- Dominant individuals had a higher aggression (mean = 3.138) than subordinate individuals (mean = 0.775).

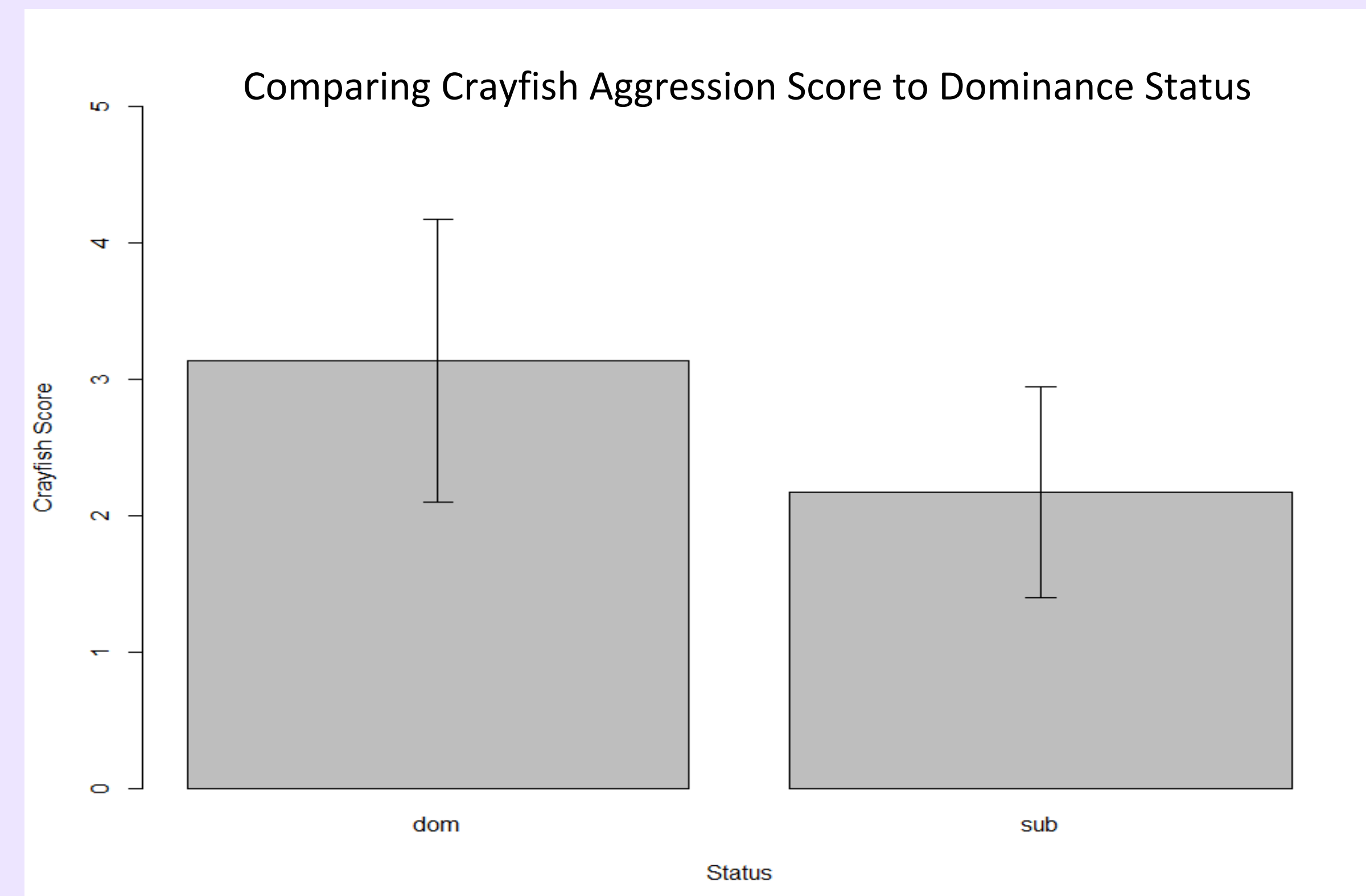


Figure 3. Crayfish aggression scores compared with hierarchy status (±SD). dom = Dominant individual; sub = Subordinate individual



Figure 4. A crayfish in the fighting arena

DISCUSSION & CONCLUSION

- There was no significance observed when comparing the treatments
 - Varying amounts of resources did not have an effect on aggression levels
- Hierarchy status did have a significant effect on aggression
 - This was expected because crayfish are known to have hierarchy status
 - Aggression varies between dominant and subordinate individuals
 - Dominant individuals typically release chemical signals through their urine
 - Individuals that are exposed to the urine typically show more defensive/subordinate behavior



Figure 5. A crayfish in a resting chamber.

- Based on what we found, varying resources do not portray differences in aggression
 - However, more research is needed



Figure 6. Two crayfish interacting with a shelter.

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