



Heterandria formosa metabolic response to simulated food variability

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INTRODUCTION

1. Background

- in a similar study, sea urchins with a low metabolic rate due to decrease in food availability had a decrease in gonad mass (Spindel et al. 2021).
- least killifish experience a change in reproductive biology with a decrease in food availability (Leatherbury and Travis 2018)
- *H. formosa* is a model species because of their ability to withstand a wide range of environmental conditions



2. Question

- How does variable food impact oxygen consumption of least killifish?

3. Goal

- The goal of this experiment is to explore the effects of decreases in food availability due to climate change

4. Hypothesis

- Lower food availability may reduce metabolic function in *H. Formosa*

RESULTS

1. Preliminary Results

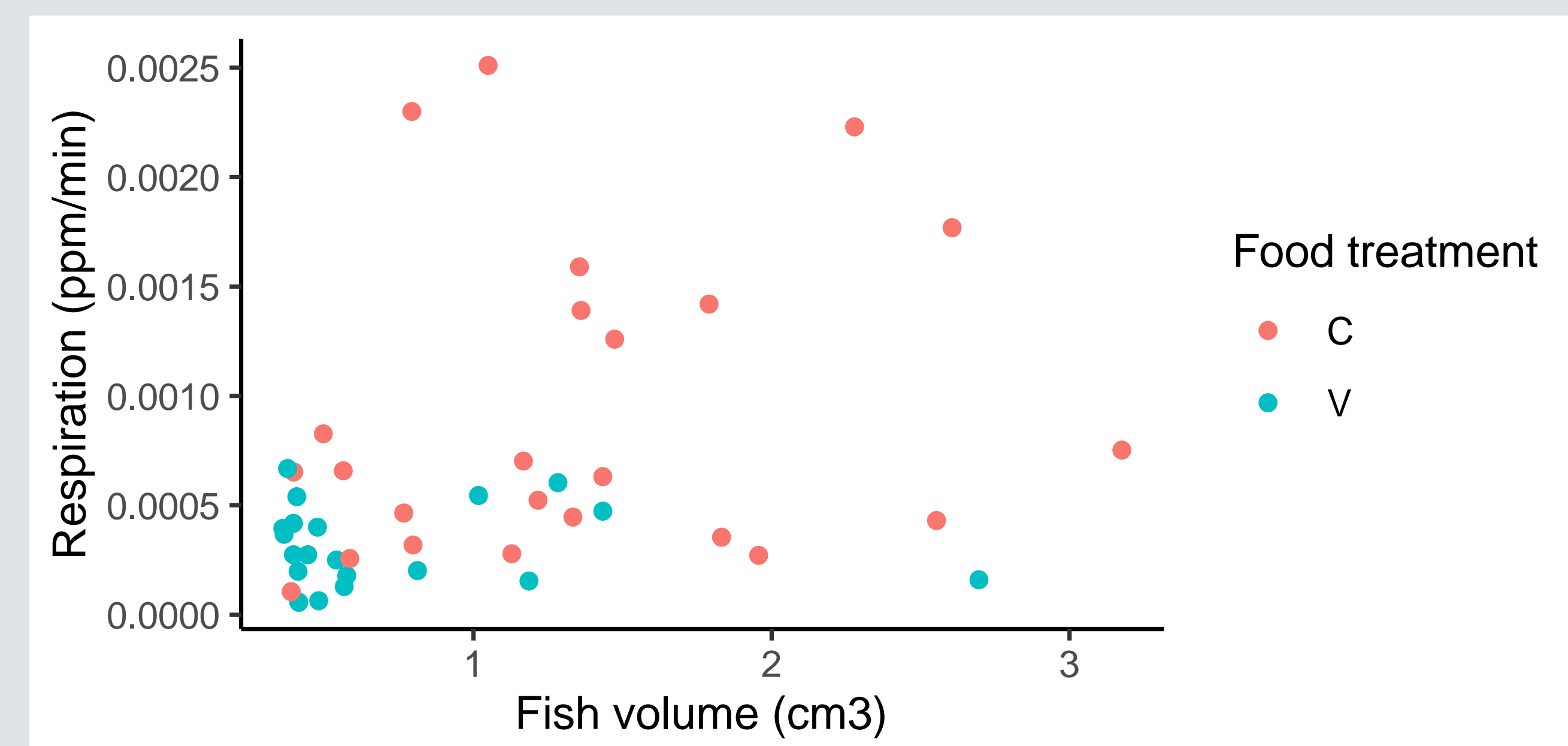


Figure 2: Metabolic rate by size and food level

2. Statistical Analysis

- A Chi-square test of deviance on a log-link Gamma-likelihood model with respiration $\sim \log(\text{body volume})$ and food showed a p-value for effect of the Variable food factor of <0.001 .
- About 29% of the fish (about half each from each food treatment) had data showing negative respiration rates and were not usable

DISCUSSION

1. Conclusions

- climate change ultimately leads to an increase in temperature and a decrease in biodiversity and species richness
- the decrease in overall food availability and certainty of food can cause organisms to lower their metabolic rate and lower oxygen consumption

2. Future Studies

- future studies will focus on specific temperature changes following the least killifish, showing that a decrease in temperature from their original habitat will cause a slowing in oxygen consumption
- Improving the respirometry methods and accuracy of the "blank" chamber is necessary

METHODS

- *H. formosa* individuals used in this experiment are mature, lab-bred males and females across a range of sizes.
- Using the respirometer shown in Figure 1, and Presens oxygen sensors, fish are placed into the chambers of the respirometer and acclimated for 3 minutes
- After 3 minutes, Presens software records oxygen levels in ppm/L in chambers with fish and an identical control chamber without fish
- RStudio is used to calculate rates of consumption of ppm O₂ per minute, and fishes' rates are contrasted at different sizes and in different food treatments by fitting a generalized linear model

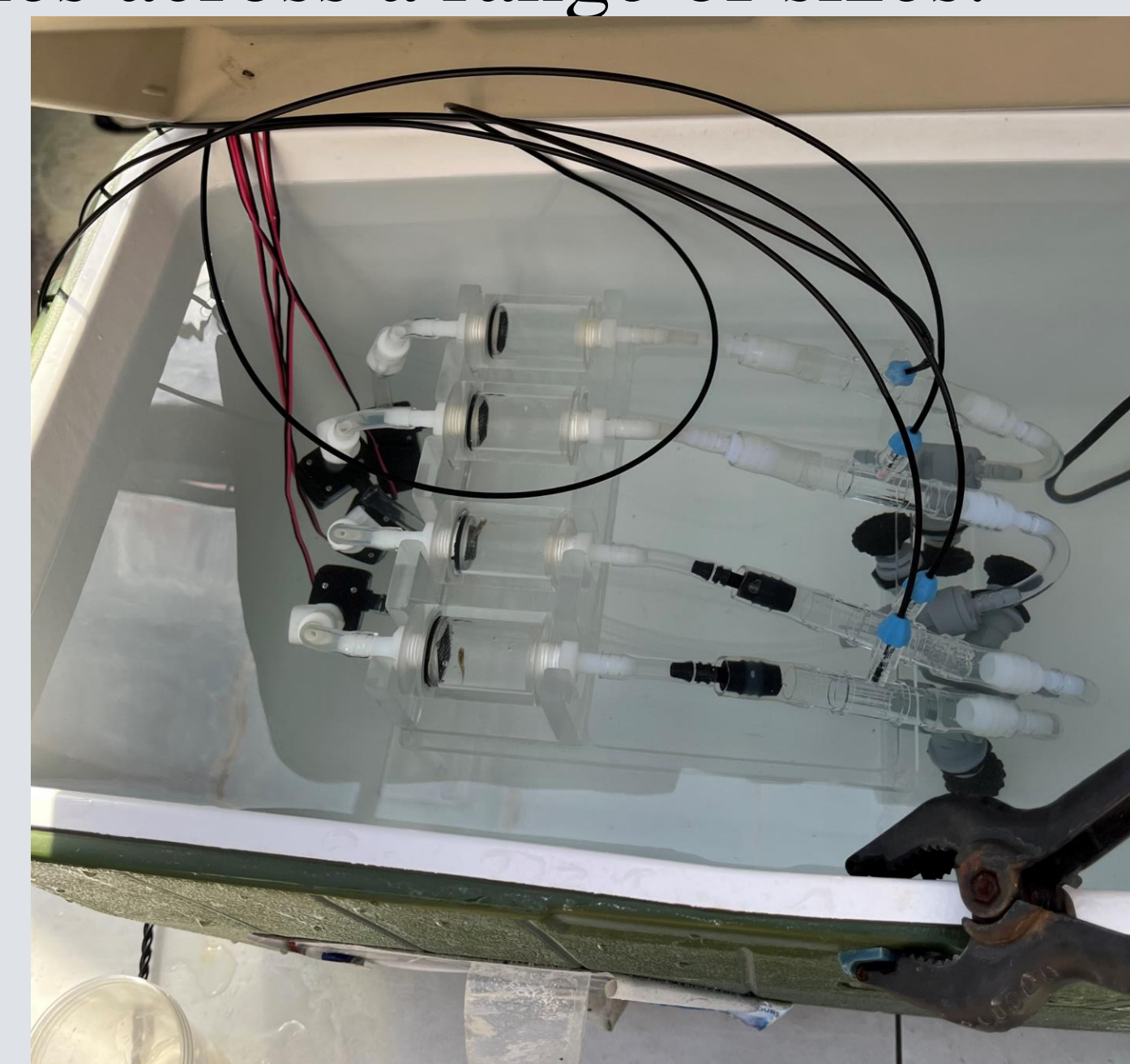


Figure 1: Respirometer chambers

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- Leatherbury, Kathryn N., and Joseph Travis. "The effects of food level and social density on reproduction in the Least Killifish, *Heterandria formosa*." *Ecology and Evolution* 9.1 (2019).

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