Preregistration

My preregistration for the Fiddler Crab Project

Sherry Du[1]

[1] University of Toronto, Department of Ecology and Evolutionary Biology

22. September 2025

Study Information

Title	Changes in Atlantic marsh fiddler crab (*Minuca pugnax*) body size across latitude. My preregistration for the Fiddler Crab Project
Description	Bergmann's rule is a phenomenon that explains differences in body size across latitude within the same taxa. Specifically, this rule states that individuals at higher latitudes are bigger than those at lower latitudes. However, little is known about whether this applies to Atlantic marsh fiddler crabs (*Minuca pugnax*). The purpose of this project is to answer the following question: How does Atlantic marsh fiddler crab (*Minuca pugnax*) body size change across latitude?
Hypotheses	If latitude affects body size, I expect that Atlantic marsh fidder crabs will be larger at higher latitudes than lower latitudes.

Design Plan

Study type

Observational Study. This project is an observational study as we do not manipulate any variables. We are merely observing crabs at different latitudes in the Plum Island LTER. This data was collected from https://lter.github.io/lterdatasampler/articles/pie_crab_vignette.html.

Blinding

No blinding is involved in this study as this is on crabs.

Study design

Source: https://lter.github.io/lterdatasampler/articles/pie_crab_vignette.html

(If we were to make this study PRIOR to registration): Because this is essentially a survey, we would be conducting a cross-sectional study. The outcome that we would measure is body size, and the exposure is latitude. These two variables would be measured at the same time (i.e., present).

Randomization

We will try to randomize the crabs being sampled at each site.

Sampling Plan

Existing data

Registration prior to analysis of the data. As of the date of submission, the data exist and you have accessed it, though no analysis has been conducted related to the research plan (including calculation of summary statistics). A common situation for this scenario when a large dataset exists that is used for many different studies over time, or when a data set is randomly split into a sample for exploratory analyses, and the other section of data is reserved for later confirmatory data analysis.

Explanation of existing data

To avoid exposure to any patterns or summary statistics about this data, I have avoided analyzing the body size parameters against latitude that will be used in my study.

Data collection procedures	I will sample 25-37 adult male crabs each at 13 marshes varying across 12 degrees in latitude. This will occur from July 24 - August 13, 2026 across Florida and Massachusetts, USA on the Atlantic coast. We will measure their body size.
Sample size	The target sample size is 25-37 adult male crabs per each marsh (i.e., 13 marshes). Therefore, there should be approximately 325 - 481 crabs in total.
Sample size rationale	We haven't performed a power analysis yet, but we will using RStudio.
Stopping rule	We will continue sampling until we reach a maximum of 37 crabs due to sampling effort.

Variables

Manipulated variables	We did not manipulate any variables as this is an observational study.
Measured variables	We will measure latitude as our predictor variable in WGS84, and we will also measure body size of adult male fiddler crabs as our response/outcome. These are both continuous variables.
Indices	We will not being using any indices for this study.

Analysis Plan

Statistical models	To test for the effect of latitude on body size, we will use a linear regression with a normal distribution. The predictor variable in this model will be latitude, and the dependent/response variable will be body size.
Transformations	We will not be transforming out data.

Inference criteria	
Data exclusion	We will use Cook's Distance to determine if there are any outliers. If there are outliers, we will report both the linear regression outputs when outlier(s) are removed and are not removed for transparency.
Missing data	Any fiddler crab that was collected, but does not have an associated latitude body size will be excluded from analyses.
Exploratory analyses (optional)	We will not perform exploratory analyses to avoid bias.

References

https://lter.github.io/lterdatasampler/articles/pie_crab_vignette.html