Preregistration

Morphological differences in Leptograpsus rock crabs

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Study Information

Morphological differences in Leptograpsus rock crabs using MANOVA and PCA.

Description This project will explore the potential differences in morphology in two colour morphs of the rock crab *Leptograpsus variegatus* using data collected by Campbell and Mahon (1941). I will be using the data orginally collected for this study and attempting to recreate some of their analyses and figures.

Hypotheses The blue and orange colour morphs of *Leptograpsus variegatus* will exhibit significant differences in their morphological features beyond the blue/orange colour differentiation.

Design Plan

Study type	**Observational Study**.
Study design	We have a factorial design with two factors (sex and colour morph) each with two levels (male/female and blue/orange).

Sampling Plan

Existing data	**Registration following analysis of the data**. As of the date of submission, I have accessed the full dataset and have visually examined the distribution of the variables (histograms).
Explanation of existing data	In accessing the data, I have only completed simple visualizations of data distributions (histograms). I have only read through the introduction and data collection procedures of the manuscipt for which the crabs data was originally collected Campbell and Mahon (1974).
Data collection procedures	Samples were collected in western Australia (Fremantle, W.A. (32”S., 117”E.) and measurements were taken with vernier calipers, accurate to the nearest 0.1mm.
Sample size	For each colour morph, 50 male and 50 female individuals were collected for a total of 200 individuals.
Sample size rationale	Campbell and Mahon (1974) do not provide a reasoning for sample size selected. Additional data for these populations from other data sources was not found due to time constraints.

Variables

Measured variables	Measured variables include: frontal lobe size, rear width, carapace length, carapace width, and body depth. All variables are continous and measured in millimeters.
Statistical models	A multivariate analysis of variance will be used to determine if significant differences in morphology exist between the blue/orange colour morphs or male/female sexes.
Exploratory analyses	We anticipate that the colour morphs will exhibit differences in body shape and/or size, or in the relationship between morphological traits. A principal components analysis of the crabs morphological trait data will be used to explore potential morphological differences between colour morphs and/or sexes in multivariate space.
Transformations	Based on initial examination of the data, no transformations are planned.
Inference criteria	Significance of MANOVA tests will be determined using a significance values of $p > 0.005$ for the F statistic. Principal components will be kept or discarded based on the Kaiser-Guttman criterion which suggests retaining components with eigenvalues >1.
Data exclusion	No samples will be excluded from the analysis.
Missing data	Data is complete as all observations have values for each measured variable.

References

Campbell, N., and R. Mahon. 1974. A multivariate study of variation in two species of rock crab of the genus Leptograpsus. Australian Journal of Zoology. 22(3):417 Available online at: http://www.publish.csiro.au /?paper=ZO9740417.