



Photo: RJ Adams

# The Effects of Water Temperature on Blueband Hermit Crab (*Pagurus samuelis*) Behavior

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Photo: SIMoN Tools

## Introduction

- Hermit crabs are a poikilothermic animal whose body temperature fluctuates with its environment, meaning temperature has a direct influence on metabolic rate.
- Metabolic rate is the amount of energy expended by an animal over time.
- Since temperature influences the metabolic rate in hermit crabs, their behavior will be directly affected by the temperature of the water.
- With global temperatures increasing, information on Blueband hermit crab behavior in relation to the increasing water temperature can be beneficial in predicting the future of organisms in tide pool habitats.

## Objective

- This study investigates how water temperature influences Blueband hermit crab behavior.
- Hypothesis:** Hermit crabs will spend a greater proportion of time inactive in cold water and active in warm water.

## Methods

- Hermit crabs were surveyed at **4 locations:** Luffenholtz Beach, Trinidad State Beach, MacKerricher State Beach, and Pirates Cove.
- Each hermit crab was identified to species as the **Blueband** hermit crab.
- 2 forms of behavior** were recorded:
  - Active**= motion outside of its protective shell such as foraging, walking, or fighting
  - Inactive**= the crab is fully inside its shell or buried in the sand.
- A **10-minute survey** was conducted at low tide, the amount of **time spent active** was recorded in **seconds/600 seconds (10 minutes)**.

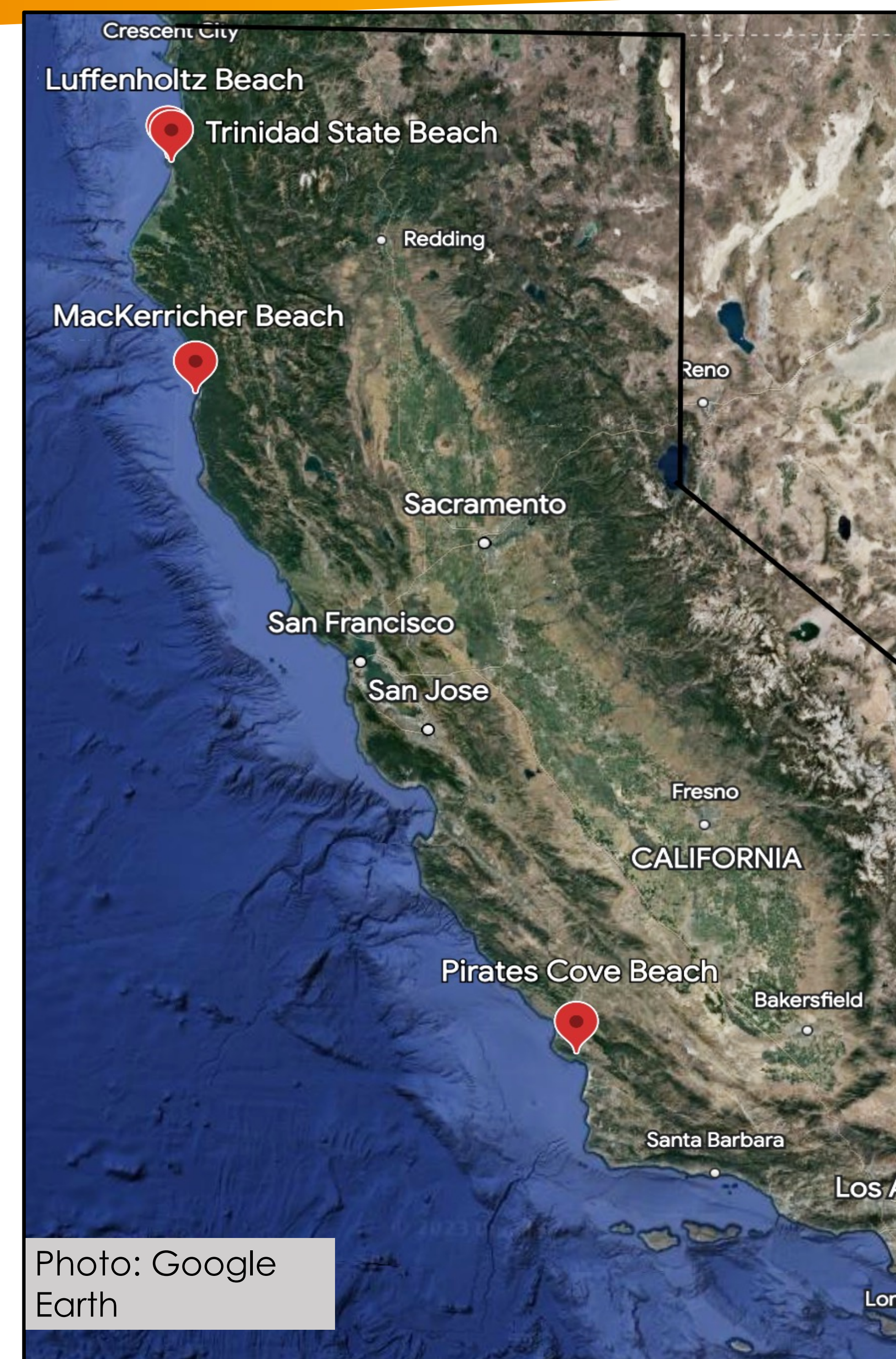


Photo: Google Earth

## Results

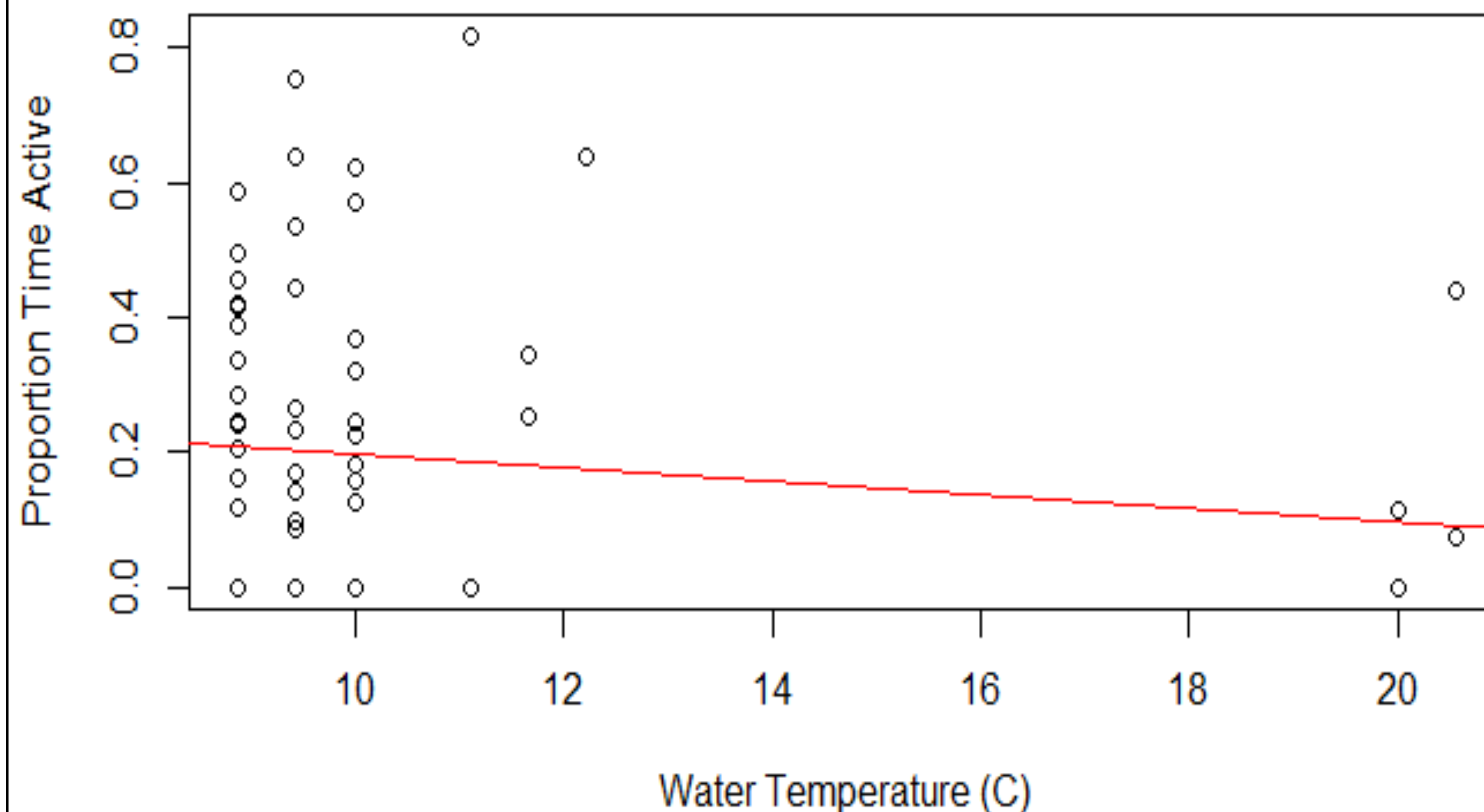
- High temperature** (20.5°C) has an average time active of **42 sec/600 sec** with a proportion of **0.07**.
- Low temperature** (8.9°C) has an average time active of **110.6 sec/600 sec** with a proportion of **0.18**.
- Mid range temperature** (9.4–12.2°C) has an average time active of **124.86 sec/600 sec** with a proportion of **0.21**.
- P-value= 0.1685** ; since the p-value is greater than 0.05, the data is nonsignificant.

## Discussion

- There is a **nonsignificant correlation** between the variables.
- Hermit crabs were **more active** in the **lower temperatures**.
- Other covariates such as shell size or time of day could affect hermit crab behavior.
- Further studies on hermit crab behavior must be conducted to further understand how the rise in global temperatures will affect hermit crabs in the long run.

## Acknowledgements

Thank you to Rob Blenk for the guidance and support throughout this study. Also, a big thank you to the wildlife department at Cal Poly Humboldt for the support throughout my time in this program.



**Figure 1.** Proportion of time active in Blueband hermit crab species (n=70) and water temperature (C) in California, February-April 2023.



Photo: iNaturalist