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Research Summary

Key Words: *Ligia pallasii*, kinematics, behavioral analysis, videography

Abstract: *Ligia pallasii* are high intertidal isopods that assist in nutrient cycling in their environment and can act as bioindicators of the health of local systems. This study investigated *L. pallasii* kinematics through video analysis of their walking and righting speed at temperatures ranging from 13C to 25C. Although not all the data was processed, preliminary results show that the isopods did not exhibit significantly different walking speeds as they explored the experimental tank at leisure, however, at 25C the remaining living animals had significantly longer righting speeds, showing that their thermal tolerance cannot withstand high water temperatures that may occur in a changing climate.

Summary:

Isopods are important to their ecosystem in a variety of ways including being detritivores that assist in nutrient cycling, soil oxygenation, and can be bioindicators of the health of intertidal habitats. Additionally, *Ligia* can be studied as model organisms for animals that have transitioned from the sea to the land because around the world they have adaptively radiated into 42 species and potentially even more cryptic species that are yet to be discovered. My study is specifically looking at the kinematics, the study of movement, of the local species *Ligia pallasii*. Kinematics and behavioral studies are important for understanding an animal's interaction with their environment and other nearby species along with giving an insight into an animal's metabolic requirements for various activities, especially in response to temperature. Higher temperatures generally increase the metabolic rates of an animal, like oxygen consumption, which in turn increases biological activities like walking or swimming until the animal begins to deteriorate due to an inability to keep up with the extreme external environments (Ellenby 1951, Herrera-Amaya 2025, Wilson 1970). Similar results can be shown for other terrestrial and Antarctic species, but has not been investigated in marine temperate species such as *L. pallasii* (Schuler et al. 2011, Young et al. 2006). For this study, it is expected that the *L. pallasii* will have increased walking speeds and decreased righting speeds at higher temperatures until they reach their maximum temperature tolerances.

Animals were gathered from Deadman's Bay during low tide on two different occasions. The animals were kept in the laboratory flowable in a chamber with objects from their habitat like rocks and seaweed for hiding and consumption. For each treatment, ranging from the control of 13C with increases of 3C until 25C, the entire group of animals was placed in a heated seawater bath for 24 hours before videos were taken. The order of the treatments was randomized to ensure the animals were not able to properly acclimate to increasing temperatures over time and for each treatment 5 random individuals were placed in a recording tank of the

same temperature. The animal's walking speed was recorded and then they were manually flipped on their back to record their righting speeds. The first group of animals from Deadman's Bay were recorded for the control temperature, but only 2 out of 15 were alive and recorded after being exposed to 25C. The second group of animals were once again recorded at the control temperature and were exposed to the rest of the treatments, concluding with 22C where 7 out of 13 remained.

Unfortunately, due to time constraints not all of the data was analyzed before the conclusion of the summer A quarter, but it will eventually be processed and analyzed. The preliminary results showed that the controls were not significantly different, meaning that they could be grouped together for analyses. For walking speed, there is a slight increase in temperature from 13C to 22C before a decrease at 25C which is not significant, but follows the predicted pattern. Righting speed decreased slightly from 13C to 22C with no significant difference, but both varied significantly from the increased righting speed at 25C. The more obvious pattern is likely observed because walking speed is a behavior the animals can exhibit in their own time without being disturbed while being upside down actively endangers the animal and would expose it to predators, which would drive the animal to act at its maximum capacity. However, other qualitative behaviors were also observed during experimentation like difficulty in getting the animals to walk freely at high temperatures, they instead needed to be gently prodded to move along. Additionally, after recording, especially at high temperature, the isopods would raise their pleons in order to increase oxygen flow over their gills after the strenuous activity of righting many times in a row in the recording chamber.

In conclusion, more data needs to be processed before final results are confirmed, but the currently observed data yields interesting patterns like the lower than expected temperature tolerances of the local *L. pallasii*. Further investigations could quantitatively investigate the recovery time of the animals after exposure like time spent raising pleons after or confirming the metabolic activity requirements of each activity with an oxygen probe. Lastly, photos of the dorsal and ventral side of each animal (28 individuals) were taken which will allow for future morphometric analysis of intraspecies morphological variation, further characterizing the species.

Sources:

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The Trials and Tribulations of Isopod Ambulations

By Cassy DeBlois





Introduction

- The importance of isopods
 - Detritivores involved in nutrient cycling
 - Soil oxygenation
 - A model organism for the transition to land
 - This genus has radiated on land and contains 42 species
 - Bioindicators of environment health
- The importance of kinematic studies
 - Understanding animal behaviors and interactions
 - Indication of animal metabolic requirements

Methods

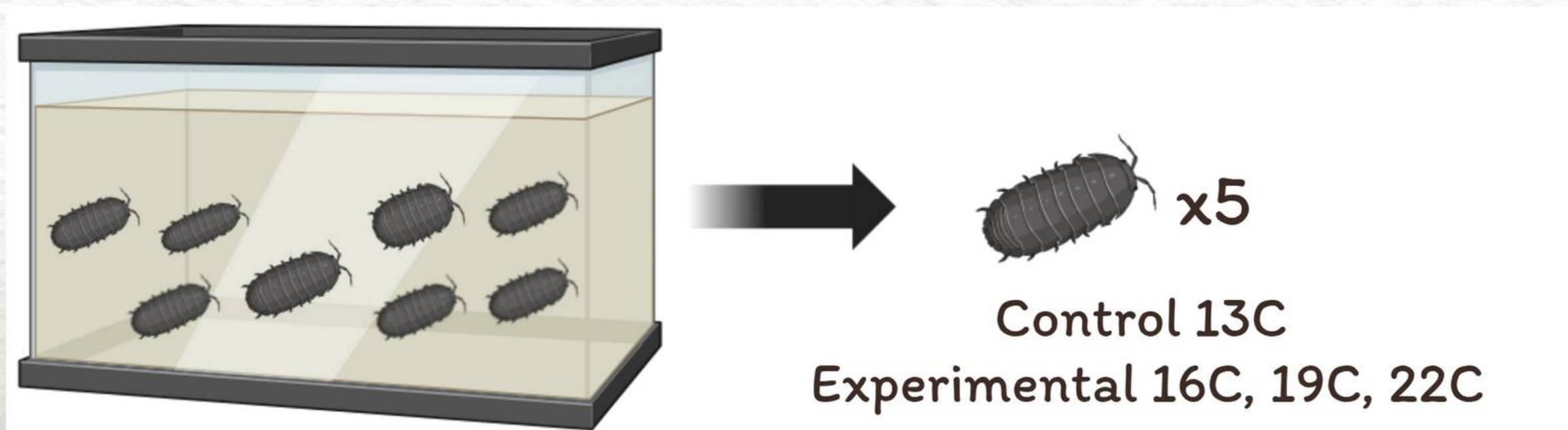
- Gathered animals from Deadman's
- Acclimate them to their treatment condition
- Record behaviors with iPhone 14
 - Swimming
 - Walking
 - Righting



Methods



Experimental Design

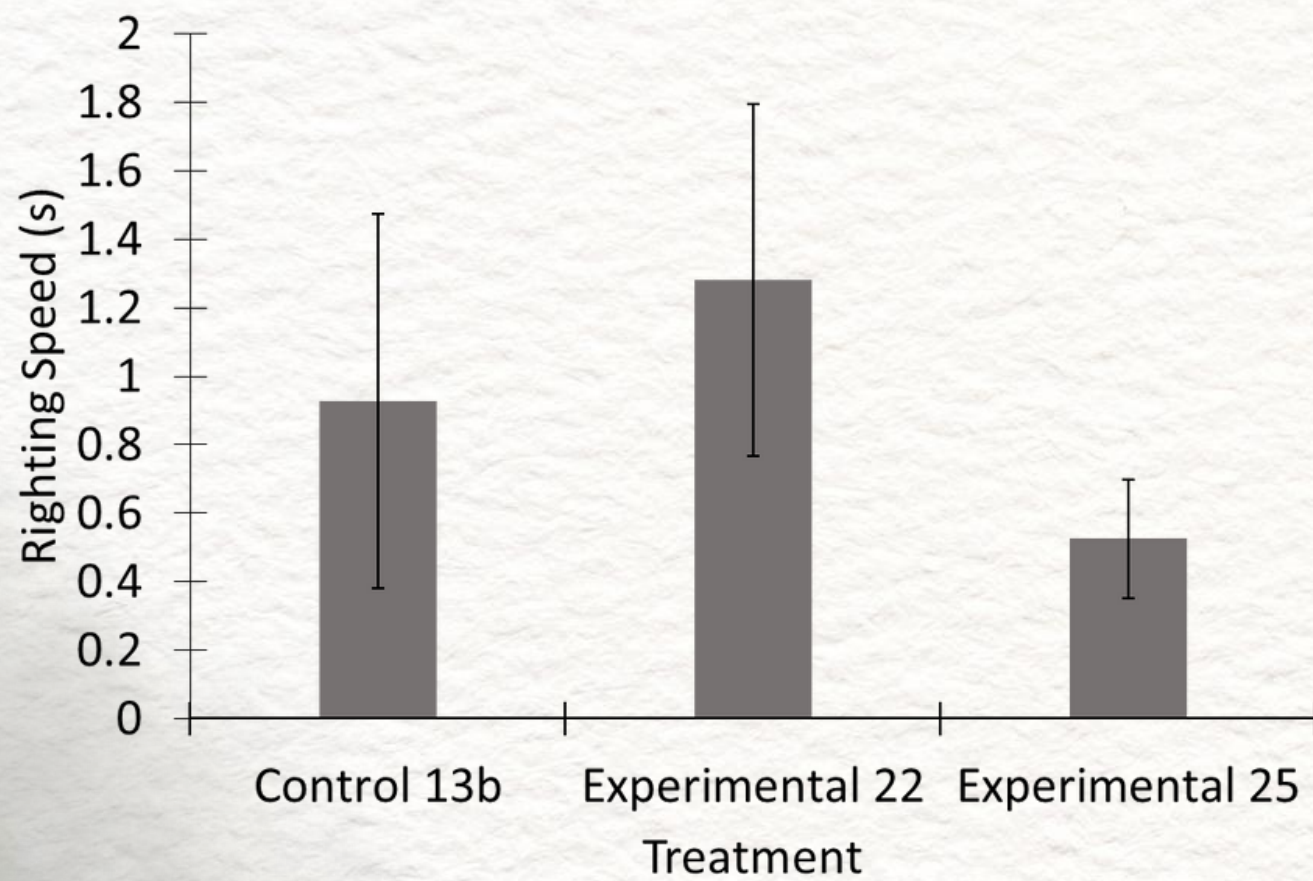


Experimental Design

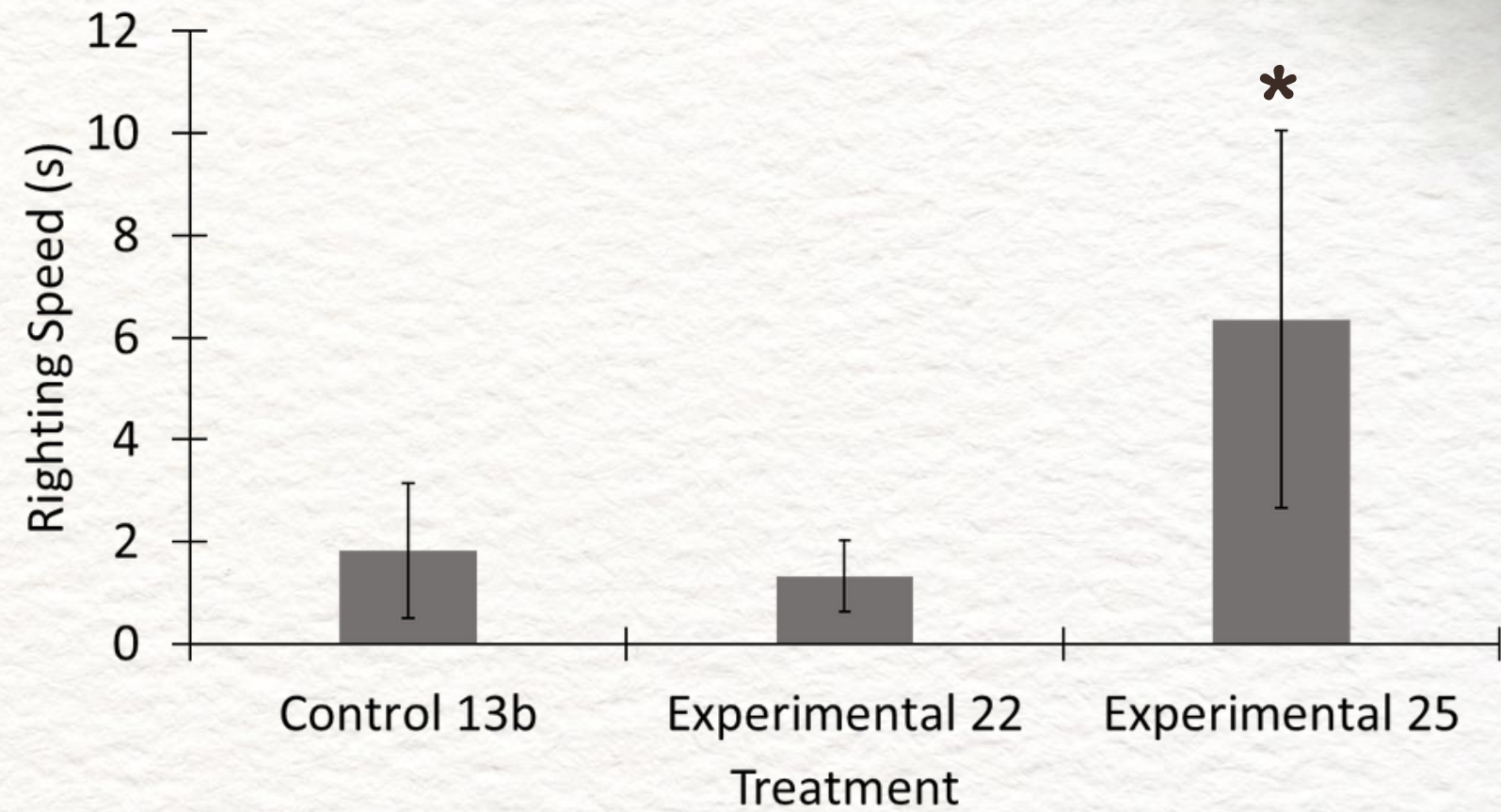


Results

Walking Speed



Righting speed



Results



Next Steps

Finish data analysis!

Conduct morphometric analysis!

Write a scientific paper about it!

