THE PREDATION OF MUDFLAT BURROWING SHRIMP BY NATIVE OREGON CRABS RED ROCK CRAB (*CANCER PRODUCTUS*) AND DUNGENESS CRAB (*CANCER MAGISTER*) VERSUS AN INVASIVE CRAB EUROPEAN GREEN CRAB (*CARCIUS MAENAS*)

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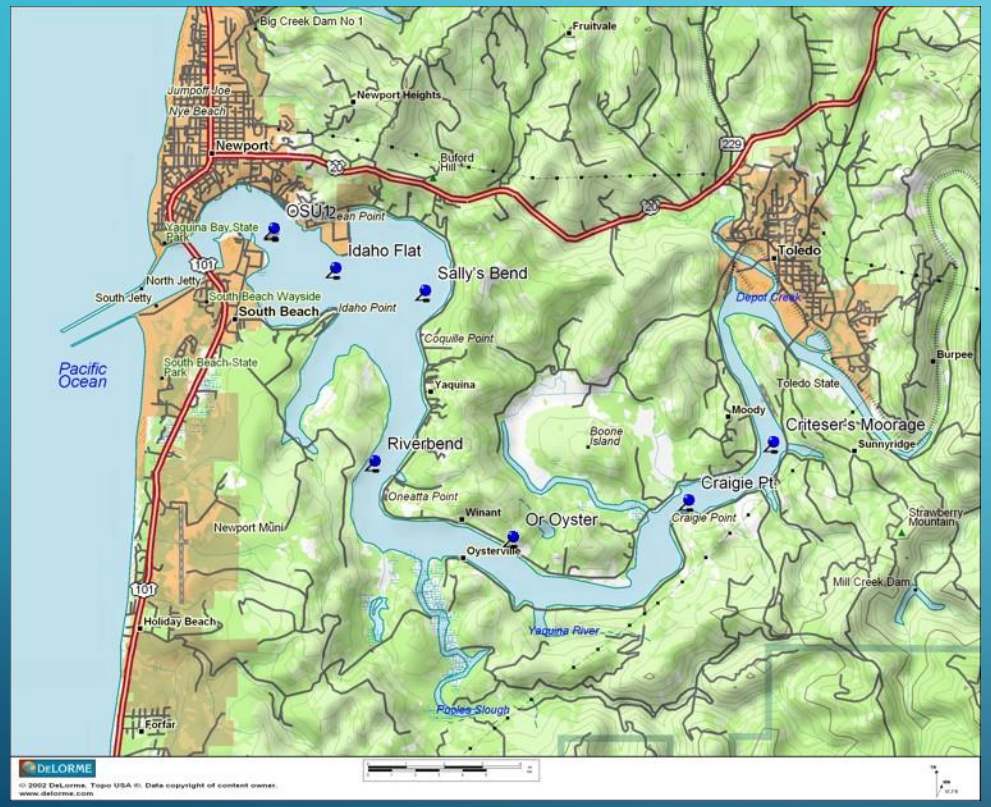
YAQUINA BAY



http://hmsc.oregonstate.edu/yaquina-bay-environmental-monitoring-forum-summary

- Yaquina Bay, Oregon is a drowned river mouth estuary (Lewis and Henkel 2016) with tidal flats covering 60% of the whole area (15km^2) of this shallow tidal basin.
- Humans have changed the ecosystem by introducing invasive species to the system.

THE CRABS

The native crabs

Dungeness crab (*Cancer magister*)

Red rock crab (*Cancer productus*)

The invasive crab

European green crab (*Carcius maenas*)

- European green crab (*Carcius maenas*) is an invasive species that came to the California coast in 1980's (Cohen et al. 1995) and is spreading up the West Coast to British Columbia.
- Sylvia Yamada has seen a steady population here in Yaquina Bay
- We do know that these crabs do compete for prey between each other (yamada et al. 2010)

http://eattheinvaders.org/green-crab/ https://www.pinterest.com/pin/312929874085568108 http://www.dfw.state.or.us/mrp/shellfish/crab/about_red_rock.asp

THE SHRIMP

Mud shrimp (*Upogebia pugettensis*)

Ghost shrimp (*Neotrypaea californiensis*)

- The Ghost shrimp and Mud shrimp are a hard-shell animal that lives on the mud flats (Feldman et al. 1997; Chapman and Cater 2014).
- The Mud shrimp is already in danger from one invasive species *Orthione griffensis*, a parasitic isopod that has lead to declining Mud shrimp populations.
- In estuarine benthic communities burrowing shrimp are important ecosystem engineers (Dumbauld et al. 2014).

https://inverts.wallawalla.edu/Arthropoda/Crustacea/Malacostraca/Eumalacostraca/Eucarida/Decapoda/Thalassinidea/Upogebia_pugettensis.html

http://catfishbait-carpbait-recipes.com/ghost-shrimp-pump/

QUESTION

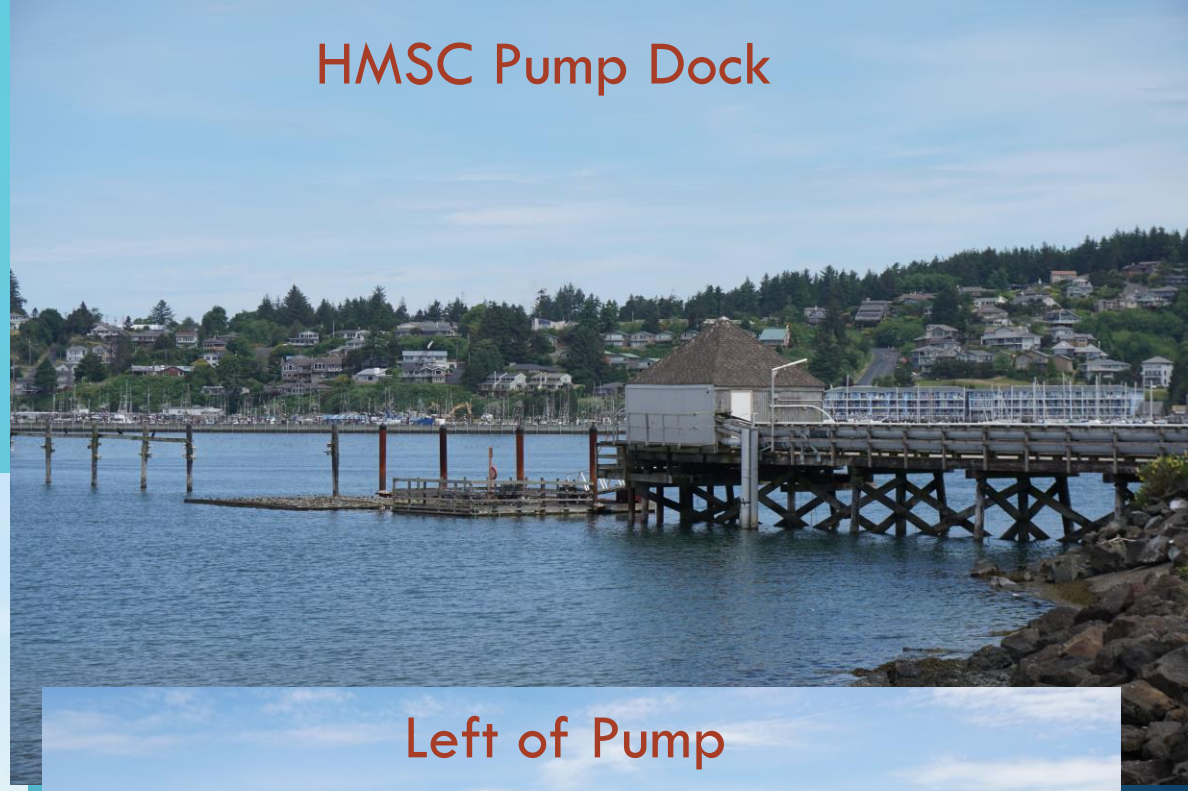
- Are the European green crab eating the burrowing Mud and Ghost shrimp on the Yaquina Bay mudflats?
- If so, are they out competing the native crab species (Red rock and Dungeness crabs)?

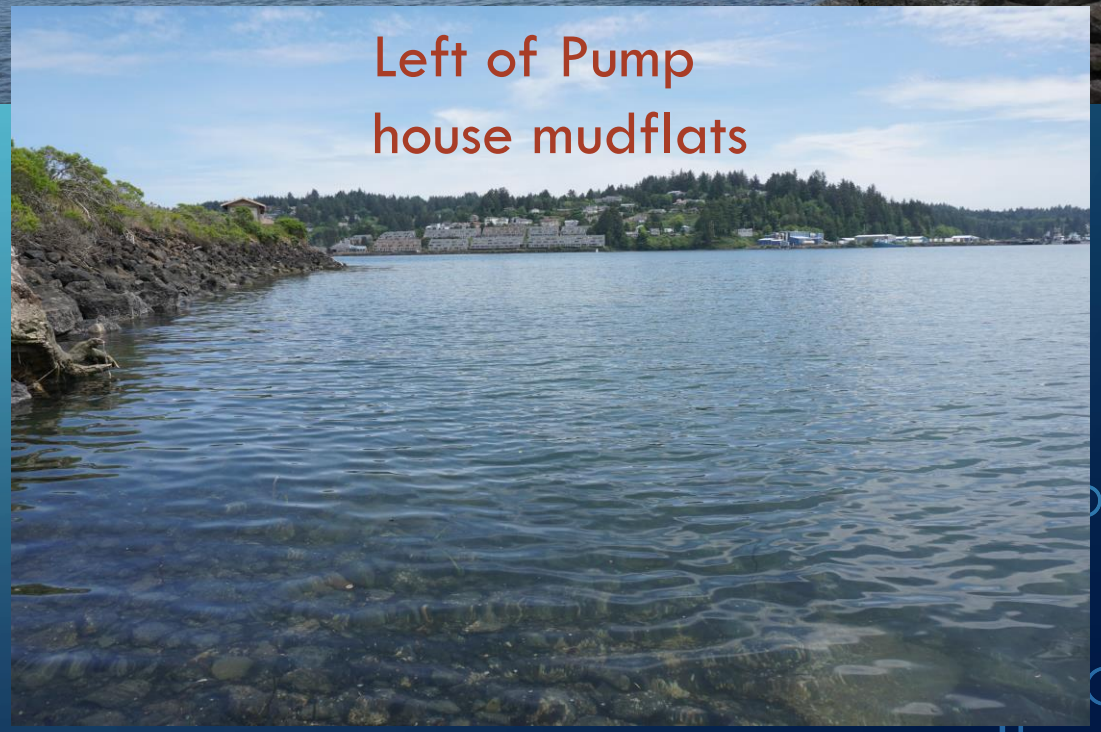
HYPOTHESES

1. The Red rock crabs will out compete the European green and Dungeness crabs for predation on the burrowing shrimp because of my observations of the mobility of the Red rock crab's Claws
2. The European green crab will out compete the Dungeness crab because the European green crab has a stronger crushing strength (Yamada et al. 2010)
3. That the smaller shrimp will be eaten more because the bigger ones can dig deeper.

COLLECTION

Yaquina Bay mudflats

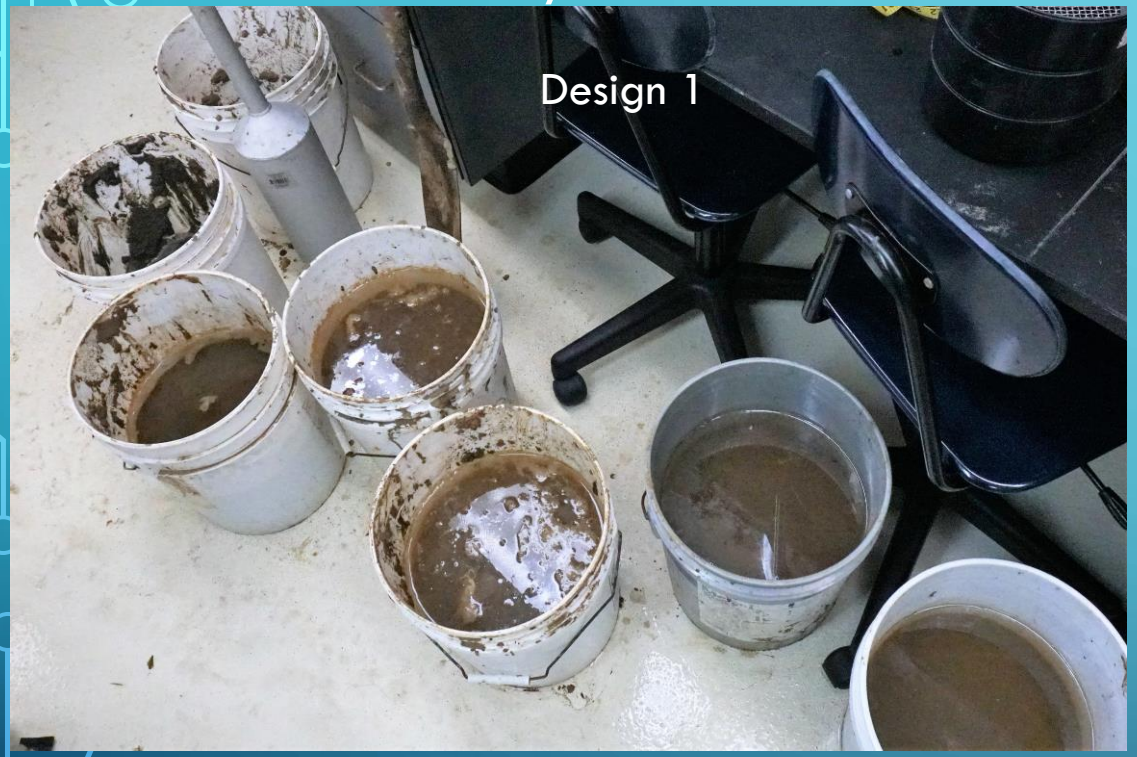

HMSC Pump Dock

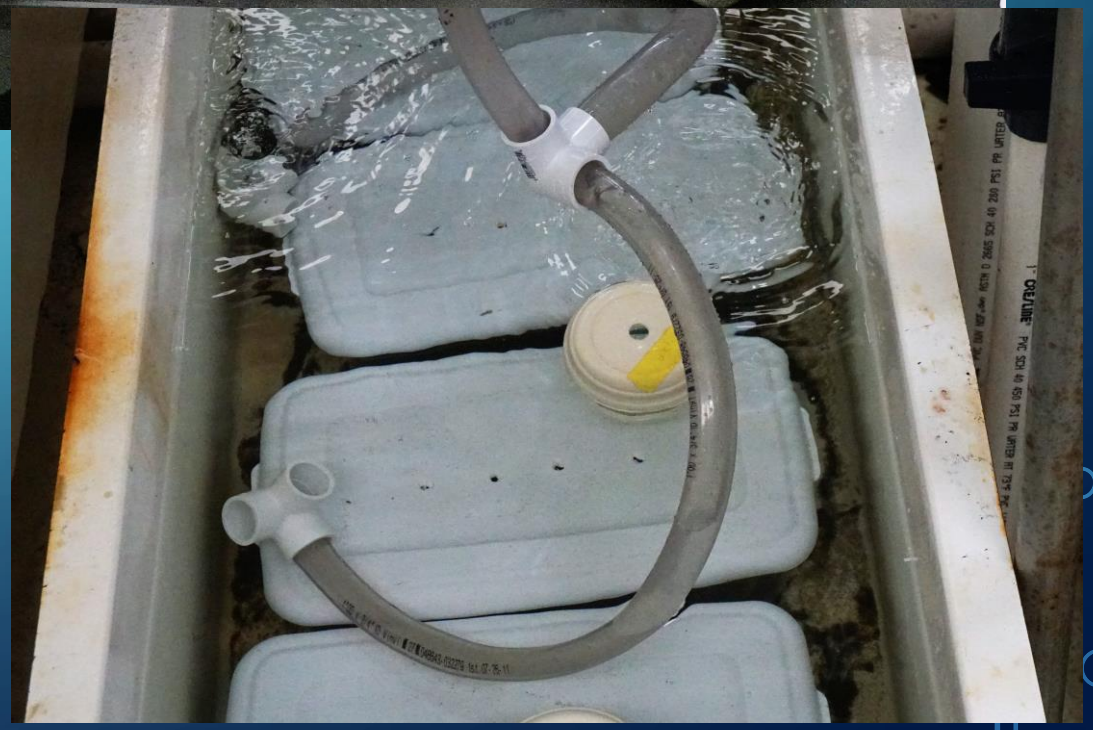

Left of Pump
house mudflats

PRELIMINARY TEST

EUROPEAN GREEN CRAB EATING SHRIMP

DESIGN/METHODS

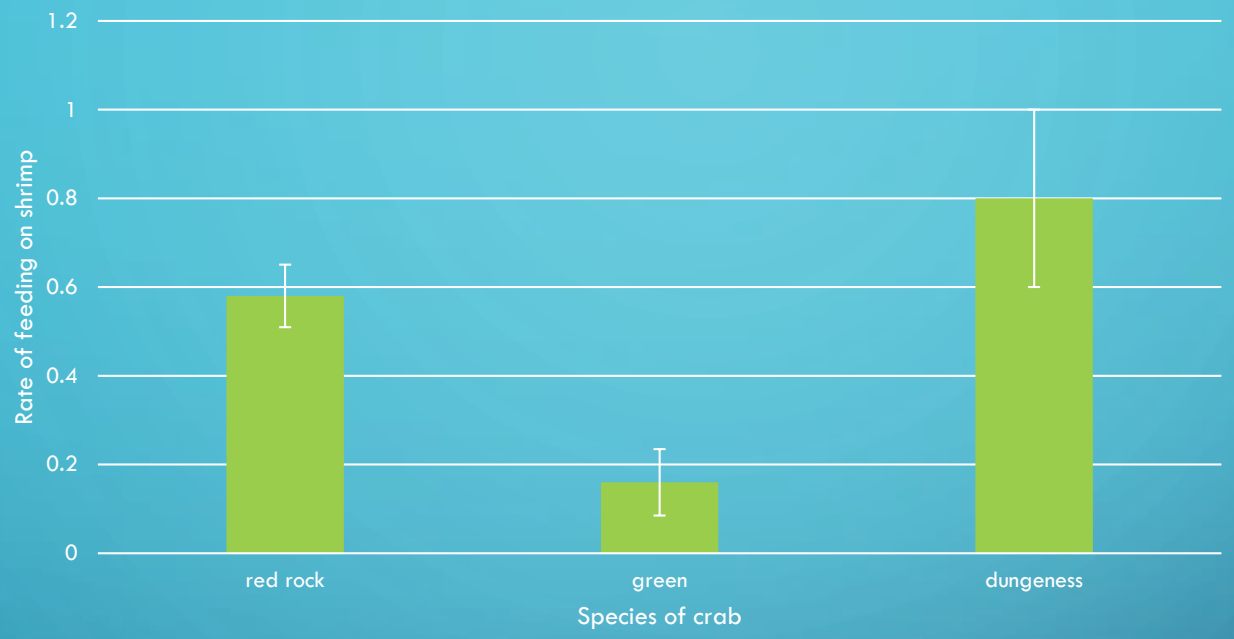




Trial time line

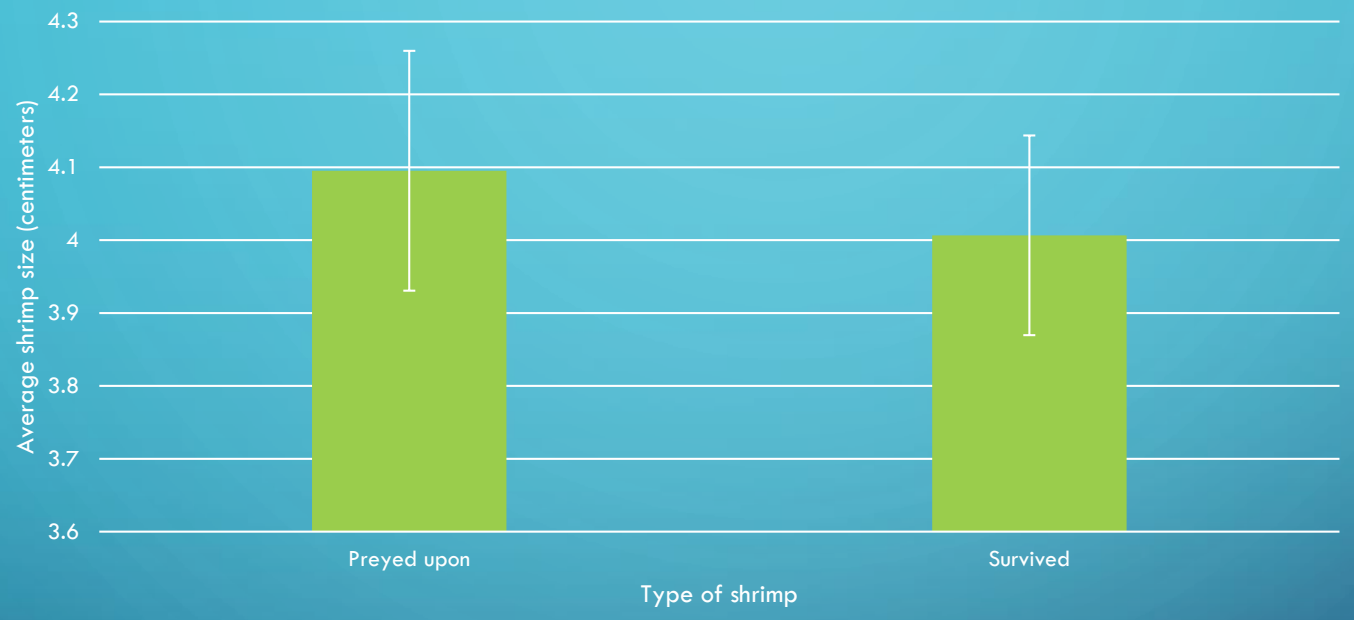
- Put 5 shrimp in and let burrow for 4 hours
- Put 1 crab in and wait 12 hours
- Take crab out and carefully dig up shrimp

RESULTS HYPOTHESIS 1



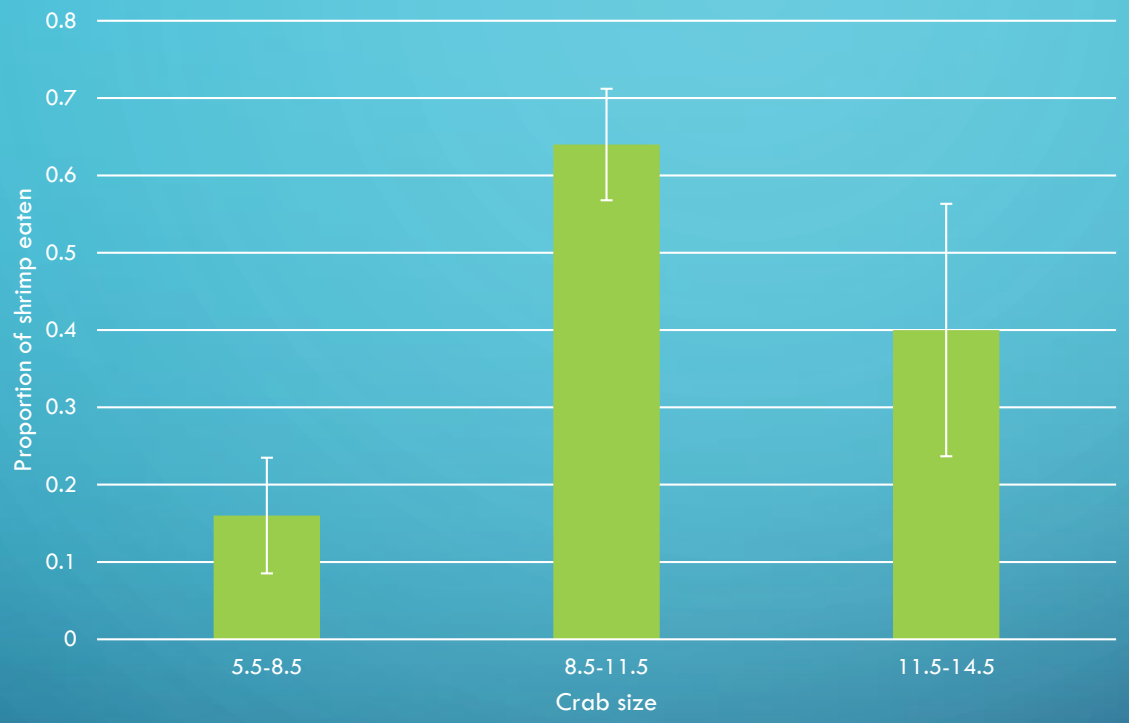
- The Chi-square test had a p-value =0.001 when using Native species versus European green crab.
- I had to combine the Dungeness and Red rock due to only catching 1 Dungeness.
- I reject my first null hypothesis that all the crab would compete equally. The native crab are out cometing the European green crab. Now I can not say the Red rock is the best crab at getting the shrimp overall.
- Hypothesis 2 could not be tested due to only catching 1 Dungeness. However, I do speculate the Dungeness would out compete the European green crab which is against my hypothesis.

RESULTS HYPOTHESIS 3



- A two-sides t-test gave a p-value=0.68
- I could not reject the null hypothesis that there was no difference in size between the shrimp preyed upon and the shrimp that survived.

ADDITIONAL RESULTS



- Chi-square test results gave a p-value=0.001
- The middle size range (8.5-11.5) had a significant higher proportion of shrimp eaten.

CONCLUSION

- The European green crab is not out competing the Red rock and Dungeness crab for the food source of the Mud and Ghost shrimp.
- There is a burrowing crustacean (*Corophium volutator)* that lives in the natural area of the European green crab but it does not use it as a major food source (Pihl 1985).
- Would recommend continue to watch this for possible changes in the future.

SPECIAL THANKS TO

- Sylvia Yamada
- Brett Dumbauld
- Sarah Henkel

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