Proposal Defense

Ingestion of Common Microplastics by *Hemigrapsus oregonensis* in a Combined Diet versus Isolated Particles

Background - MPs

- Microplastics (MPs) are small plastics (<5mm)
- UV, wave action, and wind fragment particles
- Large presence in marine environment

- Small debris enter through oral or respiratory cavities
- Induce alterations in physiology and biochemistry

Background - Physiological harm

Metabolic rate: Temperature stress additive with plastic stress in amphipods

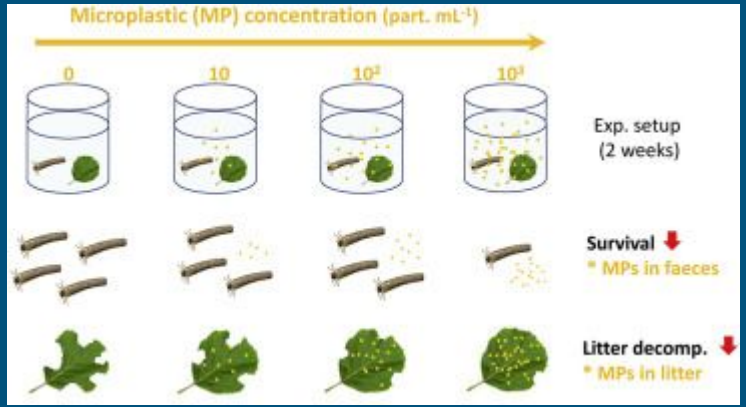
Feeding: Blockages in invertebrate intestines

Growth rate: Reduced growth rate in amphipods

Behavior: Swimming behavior in copepods and fish social behavior after accumulation in brain

Key ecological interactions are at risk for those affected:

Leaf litter decomposition by key invertebrates was reduced in a freshwater system, altering ecosystem functions.



Background - Hemigrapsus Oregonensis

- Small (35mm x 28mm)
- Sexual dimorphism
- Interact with **isopods, algae, pickleweed, host many parasites**
- late-winter/early-spring reproduction
- **Nutrient cycling**
- Natural predators: **Shore Birds**
- Unnatural predators: **European green crab**

Background - European green crabs

Competing invasive species such as European green crab (*Carcinus maenas*) outcompete native species

Comparative responses to microplastic accumulation is not well understood

Diet of *H. Oregonensis*

Could infer green crab plastic accumulation.

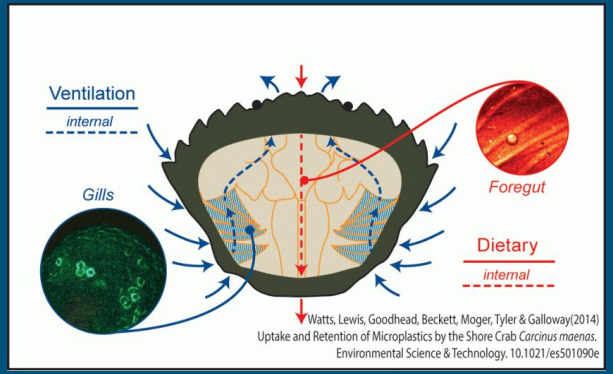
Research Question

Do microplastics impact oxygen uptake in hairy shore crabs and/or accumulate in their gills and tissues?

H (0): No impact of oxygen uptake and microplastics will not accumulate
H (a): Decreased oxygen uptake and microplastic accumulation in gut and gills

Research Question & Hypotheses

- Microplastics will affect the rates of CO2 production in yellow shore crab species
- Microplastics impact the rate of digestions, causing intestinal damage
  - Polypropylene plastic caps impact the metabolic pathways of yellow shore crab species due to intestinal damage and reduced oxygen intake, resulting in a decrease in CO2 production and lowered mobility and activity rates.
- Null Hypothesis: Microplastics feature no effect on the metabolic rate of crabs



Research Question & Hypothesis

How do microplastics affect shore crabs & crab species in general in accordance with the production of CO2?

- Intestinal blockage: Debris accumulation within the digestive tract of crustaceans decrease the available surface area for nutrients absorption
- Clearance rates of MP from chronic exposure exacerbates nutrient malabsorption
- Chemical compounds can disrupt and impede metabolic functions on a cellular level

Research Question & Hypothesis

What outcomes do we expect if the Hypothesis is true?

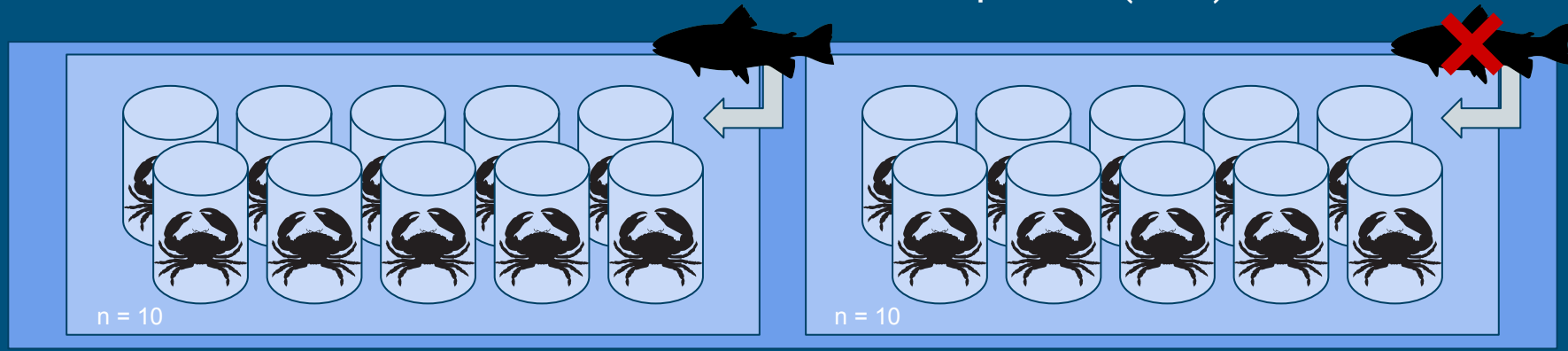
- Primarily we should note a decrease in the overall uptake of O2 and a downstream effect of lowered CO2 production
- Decreased metabolic activities result in less energy available; this will cause an overall decrease in physiological processes
- A decrease in the available food supply, since more nutrients are needed to sustain metabolic function

Experimental Design

- Jarred crabs in two groups, maintained in identical conditions
- MPs in alone group “scented” with fish material before feeding

Parameters measured:

- Respirometry with Resazurin
- Microplastic particles counted
- Glucose (TBD)
- BCA protein (TBD)



Group #1 - MPs & food

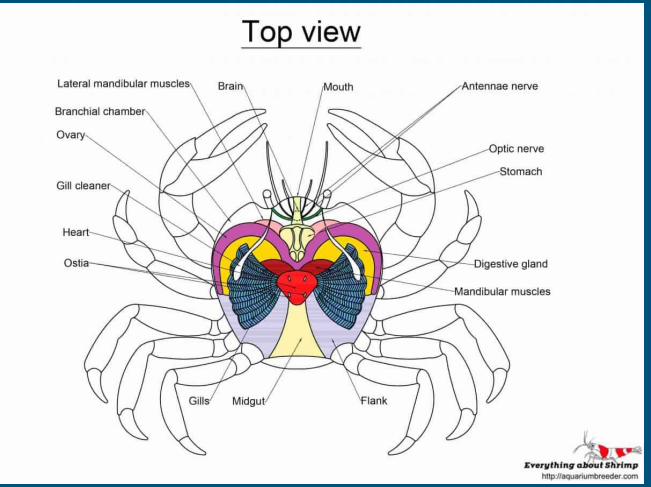
Group #2 - MPs alone

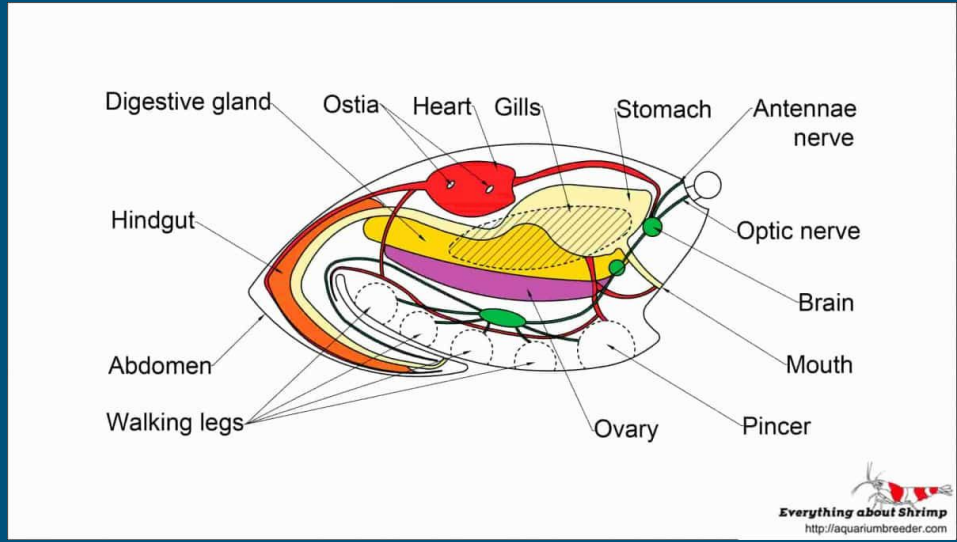
Setup

- The crabs will be held at approx. 13°C in individual jars within a larger tank (10-15 gal).
- The water will be kept at a salinity of 30 ppt
- Microplastic preparation
  - Obtain blue bottle caps (mixed plastic, color: blue)
  - Shave plastic to MP with file
  - Marinate MP in mackerel juice (2hr)
- Prepare feeding samples for MP group and MP + food group
  - Group #1: 2.5g MPs + food mixture (1% plastic, 25mg)
  - Group #2: 25mg MPs (marinated plastic pieces)

Dissection Process

- At end of experiment, all crabs weighed then dissected
- Examining digestive tract, claw muscle, and gills for particles
- Use ImageJ to count plastic particles for each area examined





Questions?