The Impact of Microplastic Ingestion on the Bivalve Filtration Efficiency of the Hooked Mussel (*Ischadium recurvum*) from the Chesapeake Bay

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Introduction

- Global plastic production has increased to ~250 million tons/year
- Mass production of plastic led to plastic pollution infiltrating marine environments
- Microplastic pollution can block intestinal function and cause physical damage
- *I. recurvum* (Hooked Mussel) Has a key role in purifying the water of the Chesapeake Bay
- Microplastics are plastic particles ranging in size from 5 mm to 10 nm
- Hooked Mussel utilizes a bivalve system allowing it to filter toxins out of the water by intaking seawater through an inhalant siphon
- Water is then filtered through the gills to separate water, toxins such as bacterias, and food items
- It is possible that microplastic ingestion could cause negative implications on the filtration capabilities of *I. recurvum*

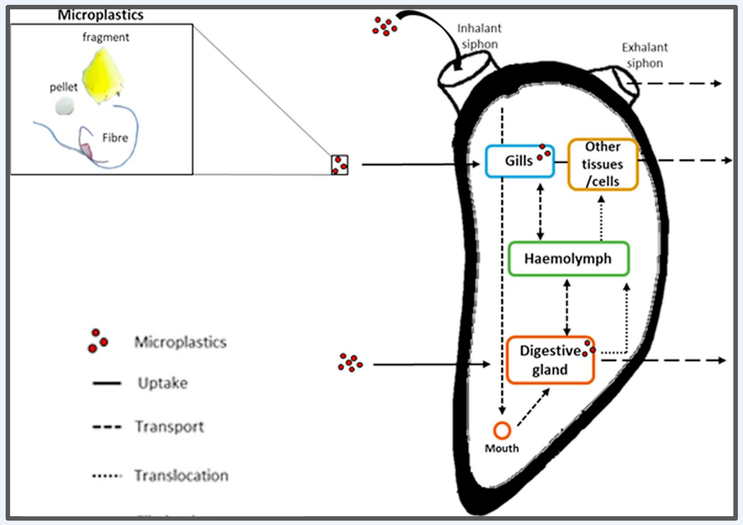


Figure 1: Routes of Microplastic in Bivalves

Research Question

Does an accumulation of microplastics affect the filter efficiency in mussels?

- It is hypothesized that micro-plastics will reduce the efficiency of the Hooked mussel and affect its ability to filter toxins that are deteriorating water quality

Methods

Collection

- Dozen mussels will be collected for each trial
- Mussels will be transported to in a refrigerated container at 4°C

Mussel Examination

- Before the acclimatization period, all mussels will be scrubbed to remove epiphytes from the valves
- Externalities will contaminate the water source for experimentation and alter the results of algae filtration

Control and Test Scenario

- Mussels placed in the 10-gallon water sample with a set amount of algae concentration
- One hour to filter the water
- Water quality test before and after the filtration period for comparative results
- Same mussels will be placed into the same conditions with 10-micrometer diameter tan spherical microplastics for easy ingestion

Water Filtration

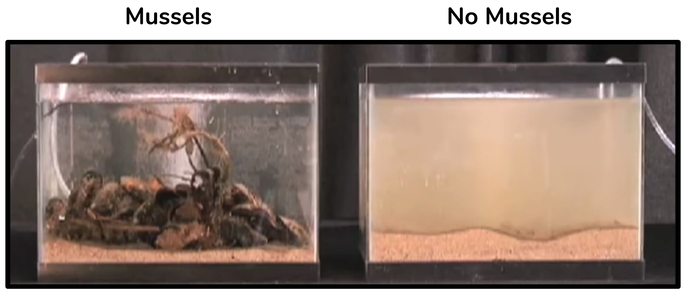
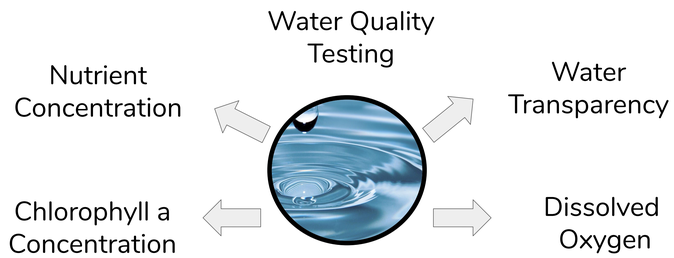


Figure 2: Filtration Comparison

Four Contributions to Results



Expected Outcomes

Figure 3: Microplastic vs. Control Filtration Visualization

- Rate of control versus the filtration rate of the test group will likely diverge after a certain amount of time due to the buildup of microplastic in digestive tract
- Blockage will lessen cellular respiration capabilities, which disrupts ability to filter water
- Mussels are expected to filter the water at rate of about 75% of the mussels without microplastic, with the rate decreasing near the end due to microplastic accumulation

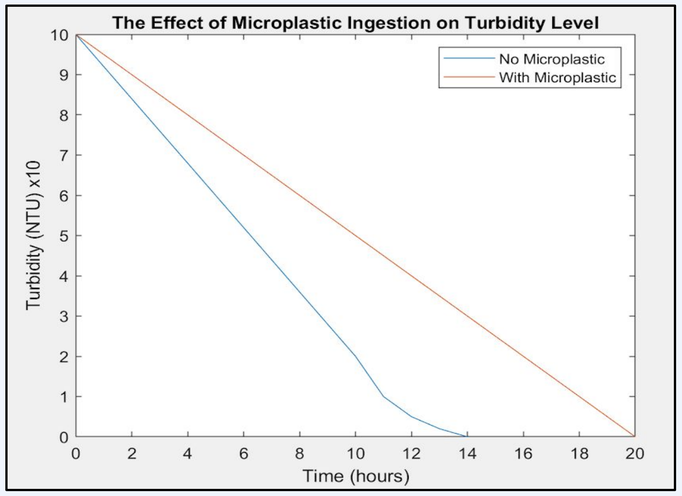


Figure 4: Expected Filtration Rate Change from Microplastic to No Microplastic Ingestion

References

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