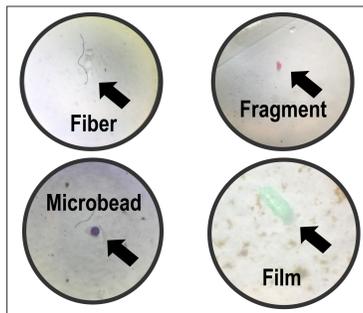


## Introduction

- Plastic pollution has increased drastically within the last century.
- Microplastics are defined as plastic fragments  $\leq 5\text{mm}$ .
- Microplastics originate from industrial raw materials ("nurdles"), beads, or from the breakdown of larger plastic products.
- Little is known about the effects of microplastics on marine organisms.
- The abundances and types of microplastics in wild organisms have not been extensively researched.
- The eastern oyster, *Crassostrea virginica*, and the Atlantic mud crab, *Panopeus herbstii*, were examined in this study.



Common types of microplastics at 20x magnification  
Photo credit: Christian Pilato



*Crassostrea virginica* is a filter feeder.



*Panopeus herbstii* is a predatory mud crab found on oyster reefs.

## Methods

- 30 oysters, 30 crabs, & 5 1-L water samples were collected at each site.
- Organisms were collected from intertidal oyster reefs at low tide.
- Oysters were frozen within 12 hr of collecting.
- Crabs were placed in tanks with aerated, filtered water (= tank water) for 5 days in the laboratory before freezing. Water from containers was then filtered.
- Organic tissue from the oysters and crabs was digested using 30% hydrogen peroxide ( $\text{H}_2\text{O}_2$ ).
- For every 5 g of organic tissue, 200mL of  $\text{H}_2\text{O}_2$  was added and then placed in a oscillating incubator at  $65^\circ\text{C}$  and 80 rpm for 24 hr (NOAA 2015).



Methodology: Measurements, dissection, digestion in incubator, vacuum filtration and examining filters.

- Digested material was kept at room temperature for 24 hr.
- Digested material was vacuum filtered through a  $0.45\ \mu\text{m}$  filter.
- The type and quantity of microplastics were recorded using a 40x magnification microscope.
- Preliminary trials determined this procedure had a 86.7% percent recovery of nylon and 89.5% percent recovery of polypropylene fibers.**
- A two-way ANOVA was used to compare the number of microplastics between sites in water samples and oysters.
- A three-way ANOVA was used to compare the number of microplastics between sites and tank water vs tissue in crabs.

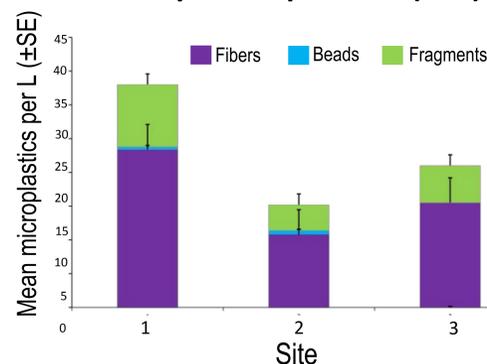
## Questions

- What are the abundances and types of microplastics found in *Crassostrea virginica* and *Panopeus herbstii*?
- Do the abundances and types of microplastics differ between sites for each organism?



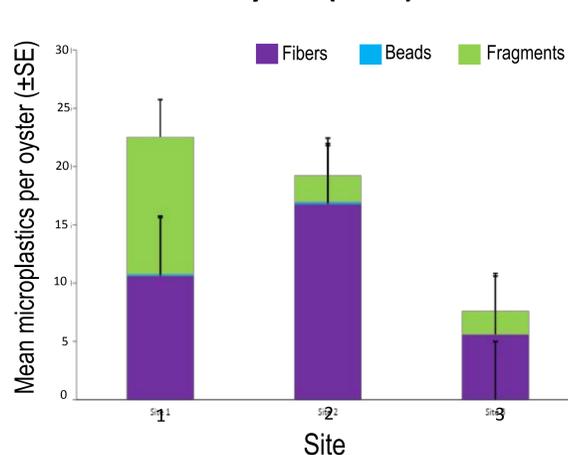
## Results

### Water Samples: Mean # of Microplastics per Liter (n=5)



- A total of 165 microplastic pieces were found at Site 1, 76 pieces were found at Site 2, & 81 pieces at Site 3.
- There was no significant interaction between site and plastic type (**2-way ANOVA:  $p > 0.01$** ), but there was a site effect ( **$p < 0.01$** ) & a type effect ( **$p < 0.001$** ).
- Fibers were the most common microplastic type.
- Site 1 had more microplastics than Site 2 and 3.

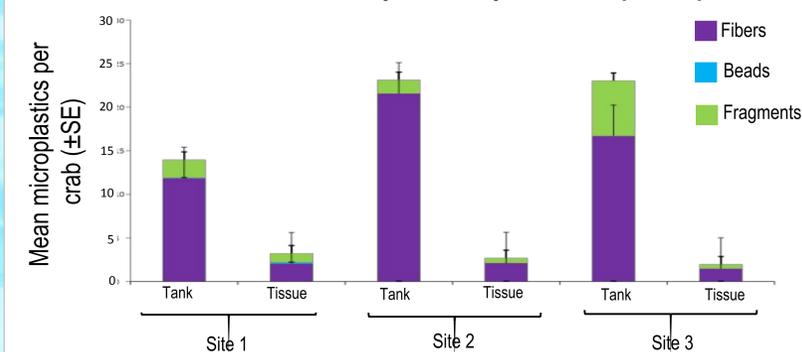
### Mean # of Microplastics per Oyster (n=30)



- A total of 676 microplastic pieces were found in oysters at Site 1, 577 at Site 2, and 229 at Site 3.
- There was a significant interaction between plastic type and site (**2-way ANOVA:  $p < 0.001$** ).
- While Site 1 had more microplastic pieces overall, Site 2 had the most fibers. Site 3 had the least amount of microplastic pieces.

## Results continued

### Mean # of Microplastics per Crab (n=30)



- A total of 455 microplastic pieces were found at Site 1, 774 at Site 2 and 750 at Site 3.
- For both sites, more microplastics were found in the tank water than in the digested tissue (Site 1: 79.3%, Site 2: 89.7%, and Site 3: 92.1%).
- Fibers were the most common type of microplastic at all locations.
- There was a significant interaction between plastic type, site and tank water vs tissue (**3-way ANOVA:  $p < 0.001$** ).

## Discussion

- Fibers were the most common type of microplastic in the water samples, oysters, and crabs. Fibers were mainly blue or clear in color and may originate from clothing, fishing materials, or boat ropes.
- In crabs, most microplastics were found in the tank water (87%). This suggests that most microplastics were trapped in the gills & expelled within 5 days.
- The significant interaction between plastic type & site for both organisms suggests that location in the lagoon affects the microplastics present in the tissues. This may be influenced by proximity to anthropogenic activities.
- High amounts of microplastics in water samples, crabs, and oysters suggest that microplastics are widespread in the Mosquito Lagoon.
- Recording the quantity and type of microplastics present in these organisms may lead to a better understanding of bioaccumulation and transfer of microplastics up the food chain. Higher concentrations in crab tissues may suggest bioaccumulation through ingestion of oyster tissue as food.

### Acknowledgements

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Photo credit: Dr. Paul Sacks