Investigating how eelgrass (*Zostera marina*) beds influence microplastic concentrations in farmed oysters (*Crassostrea virginica*).

Kianne Benjamin, Class of 2024.

Maine's aquaculture industry, thriving primarily on the cultivation of shellfish (oysters, mussels, lobsters) is projected to undergo rapid expansion, with exports valued at $800 million by 2025. However, climate change and pollution threaten the health and productivity of marine ecosystems and aquaculture. Approximately 6-12 million tons of plastic waste enter our oceans annually, with this number projected to rise to 23-37 million by 2040. Plastic from clothing, water bottles, fishing gear, and personal care products undergo UV degradation into small particles. These particles, less than 5mm in diameter, are classified as microplastics.

The ubiquitous nature and small size of microplastics make filter feeders like mussels and oysters particularly susceptible to their harmful effects. Previous studies conclude that ingestion of microplastics results in reduced reproduction rates, gastric rupture, poor offspring performance, and DNA damage in filter feeders. (Corami et al., 2020). Marine canopies like eelgrass meadows have the potential to retain microplastics via sediment accretion (de Los Santos, 2020). Eelgrass is an underwater flowering plant species found in coastal marine habitats and estuaries that form dense meadows, providing critical habitats and nurseries for many juvenile fish and mollusks. Eelgrass (*Zostera marina*) is a critical foundation species that may be able to reduce microplastic concentrations in the water column (Zhao et al, 2022). Eelgrass not only affects the mixing and horizontal transport within the ocean's water column but also affects the sedimentation rates of microplastics by accelerating the sinking of these pollutants. The study of microplastics, an emerging field, is critical to the protection and preservation of livelihoods, marine ecosystem health, and human health.

This project investigated how various aquaculture methods influenced microplastic concentrations in oysters grown within eelgrass meadows and mudflats. The following questions were examined; How do microplastic concentrations in oysters vary when oysters are grown in mudflats vs eelgrass beds and how does this difference impact oyster growth rates? Which type of aquaculture method; bottom vs off-bottom methods, produces larger oyster yields?

To answer these questions, a field experiment, as well as sample processing was executed. Juvenile American oysters (*Crassostrea virginica*), obtained from the Quahog Bay Conservatory were cultivated in grow bags in mudflat and eelgrass meadows in Ash Cove, Harpswell, Maine for four weeks. Oysters from each site and nursery type; a floating bag at the water's surface, a suspended mid-water cage, and a tray anchored to the ocean floor were collected for sample processing of microplastic concentrations. After collection, the body tissue of oysters was dissolved and filtered to removed all organic tissue. Filtered samples were inspected under a microscope to identify and quantify the volume and type of microplastics present. Analyses are ongoing

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