**Microplastics contamination in Harpswell Sound**

**Lucy Dutton, 2025**

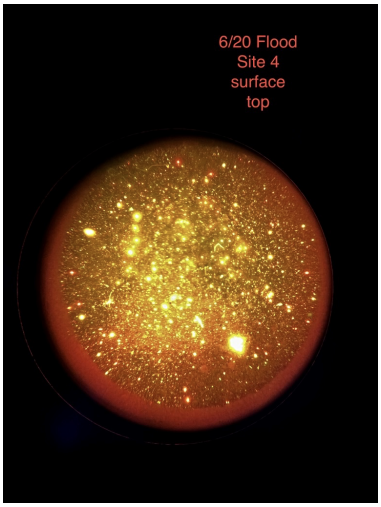
**Introduction:** This summer I studied the extent of microplastic contamination in Harpswell Sound. Microplastics are plastic particles smaller than 5 mm in size and are divided into two types. Primary microplastics are manufactured in micro size for industrial or domestic purposes , while secondary microplastics are particles created from the degradation of larger pieces of plastic . Microplastics are a ubiquitous pollutant across the planet and they can take millions of years to degrade (Auta et al. 2017, Uddin et al. 2021). Once they enter the ocean, these microscopic particles are nearly impossible to remove, making studying their impact and distribution crucial to their mitigation.

Rivers annually release between 0.8 and 2.7 million metric tons of plastic into the ocean (Meijer et al. 2021). As a result, estuaries have been studied as major sinks for microplastics. Harpswell Sound, in Maine, is a reverse estuary. While it receives no direct river input, fresh water from the Kennebec River is pulled into the sound with the tide, bringing brackish water and potentially microplastics.

**Methods:**

*Sample Collection:* Along with my lab partner Annika Bell, I captained the Schiller research vessel the 21' Parker to sample 1L water samples from the surface and midwater at 5 sites along Harpswell Sound using a Niskin bottle. We collected temperature, salinity, and pH data for each sample using a YSI.

*Sample Digestion, Density Separation, and Vacuum Filtration:* Samples were digested in 1 M NaOH to dissolve organic plankton and other debris. To separate out plastics, we conducted a density separation experiment using 1.2 g/cc NaCl. Plastic floated to the top while dense sediment and other undissolved material sank to the bottom. Once separated out, we filtered both the top and bottom half of the samples onto glass microfiber slides using a vacuum filtration system.




*Nile Red Dye and Counting:* Filters were then dyed with nile red dye and incubated at 30℃ for 30 min to set the dye (as seen in the image on the right). Nile red dye stains plastic which will then fluoresce under blue light to help identification. We were then able to identify plastic particles and count them using ImageJ analysis.

**Discussion:** By identifying the distribution and type of plastics found in Harpswell Sound, I will be able to determine the source of these plastics. From previous research during the Bowdoin Marine Science Semester, I found a higher presence of microplastics closer to the ocean, suggesting that these plastics are coming in with the tide from the Kennebec River. Different types of plastics such as fibers indicate that there is runoff and pollution from land based sources. Identifying these types of pollution can be crucial to their mitigation. While results are still being processed, I will be continuing this research into the fall and as a potential honors project. This project was conducted in conjunction with Annika Bell's research on the ingestion of microplastics in mussels and oysters. We will compare water pollution with that ingested by these bivalves to determine aquaculture contamination.

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