2021 MICROPLASTIC ANALYSIS OF BED SEDIMENTS IN ELLIOTT BAY, NEAR SEATTLE, WA

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MICROPLASTIC PROBLEM

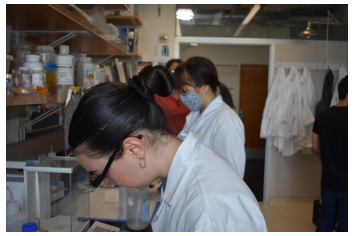
- Plastic waste is a large source of marine debris globally (NOAA 2022)
- Composition of synthetic polymers, microplastics (MP), are harmful to marine ecosystem health, reproduction, and overall survival
- MPs can form due to degradation of macroplastics (>5mm) into particles <5mm or by direct discharge into the environment
- Elliott Bay is home to the Port of Seattle, being the 9th busiest port in the U.S., and a popular place communities in WA gather recreationally (Wikipedia 2022)

OBJECTIVES

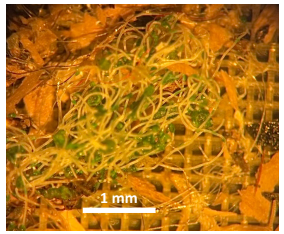
- Isolate and characterize MPs in ocean-bed sediments in Elliott Bay, WA
- Determine the relationship between sediment grain size and MP concentration

METHODS

- Sediment collected by the DOE Marine Sediment Monitoring Group in 2021 using a $0.1m^2$ stainless steel Van Veen grab
- Thirty-seven stations in Elliott Bay were sampled
- MPs processed and analyzed through a series of density separations, sieving, and manual extractions (Masura et al. 2015)
- Each MP was characterized by type, color, and size

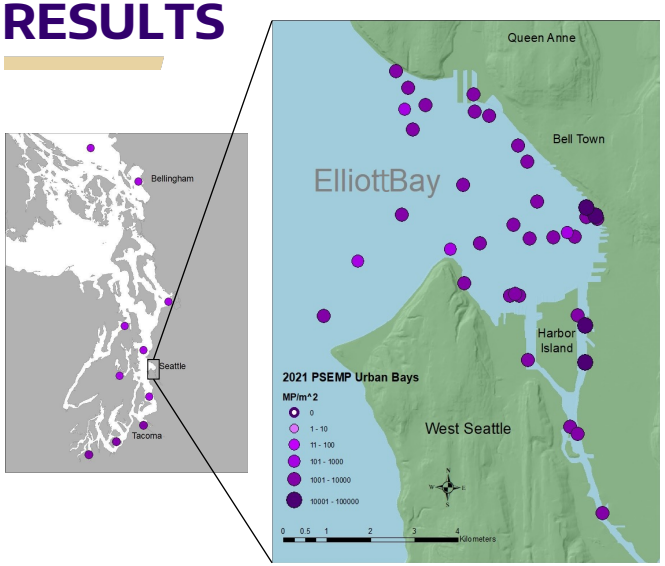


MP analysis at a University of Washington Tacoma lab

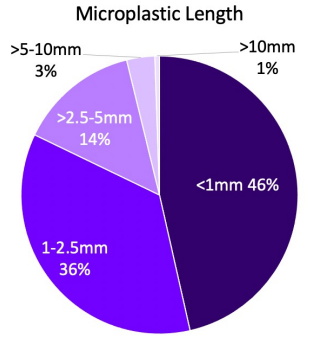


Fishing net observed during MP analysis

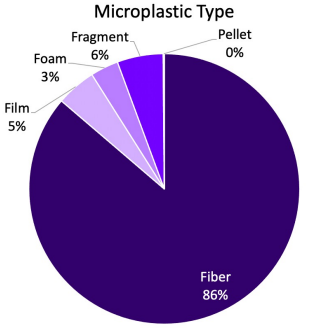
RESULTS



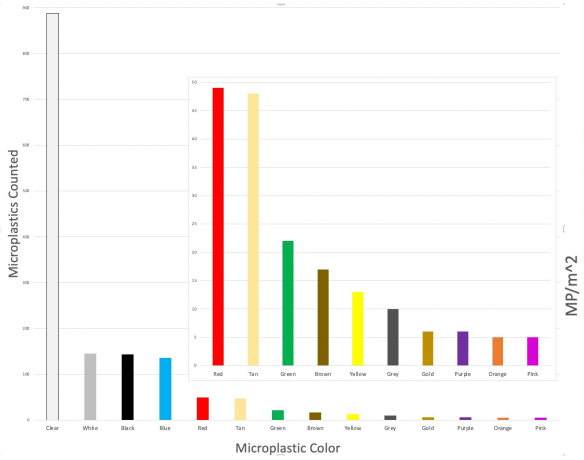
2021 concentrations of microplastics in Elliott Bay. Sample locations are expressed by purple dots. Larger and darker dots represent higher concentrations of microplastics.



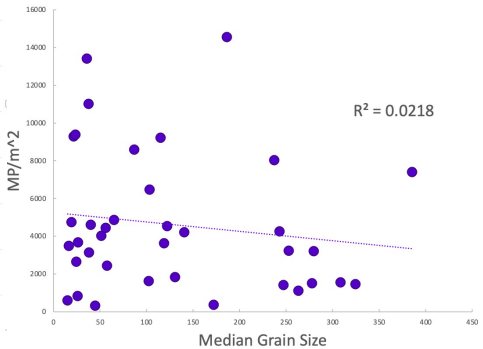
Percent of microplastic length across all samples (n=1494).



Percent of microplastic type across all samples (n=1494).



Microplastic color across all counted microplastic types and lengths. Colors not including clear, white, blue, and black are expressed in an individual section to better show the degree of concentrations counted (n=1494).



Microplastic concentrations per meter squared represented against medium grain size (n=1494).

SUMMARY

- MP fibers were most abundant type
- Clear fibers were most abundant color
- <1mm was most abundant length
- Inverse relationship between median grain size and MP abundance
- Higher concentrations of MPs east of Harbor Island and near downtown Seattle, south of Belltown

DISCUSSION

- Aquaculture gear could be a cause of increased MP build-up (Schoof and DeNike 2017)
- Wave action in nearshore locations cause MPs to resuspend thus increasing interactions with marine organisms, and increasing negative effects on ecosystems (Gallo et al. 2018)
- Geotextiles and clothing could be a cause of MP fiber surplus (Bai et al. 2022)
- Offshore, coarser-grained sediment could act as a sink for MPs (Hengstmann et al. 2021)

WHAT'S NEXT?

- Increase regulations in electric washing machines to prevent MP fiber accumulation
- Greater MP extraction efforts in nearshore locations
- Identify possible sources of MPs in Elliott Bay

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