

2025 Analysis of Microplastics in Bed Sediments of Elliott Bay, Puget Sound, WA

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Introduction:

Microplastics are introduced into marine environments through two primary modalities. One is physical erosion of plastic debris like tires, textiles, and other reused goods; the other is chemical reduction, where plastics degrade by chemical processes. The sources of microplastics in the Puget Sound are storm water, garbage dumping, and textiles/plastic made goods. Microplastics are characterized by their size as being 5mm-100nm. For this project we analyzed a total of 8 samples. This analysis was conducted to quantify the abundance of microplastics (MPs) in MPs/m^2 on the sea floor.

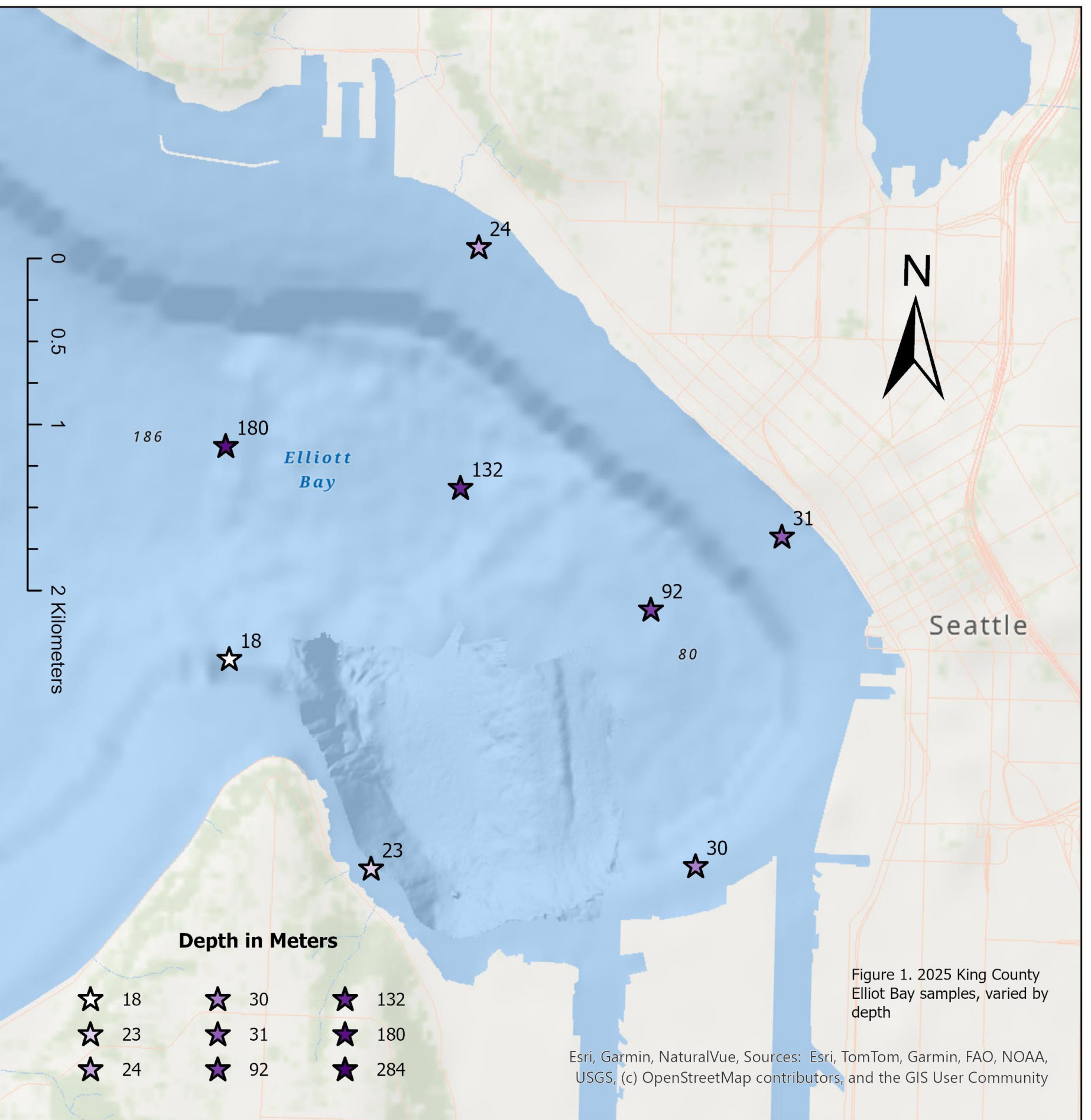


Figure 1. Map including each sampling station with depth.

Microplastics Quick Facts:

- Microplastics measure between 100nm-5mm (Ocean Conservancy 2023)
- Two Main Types: Primary and Secondary (Ocean Conservancy 2023)
- Microplastics collect and retain other pollutants

Methods (Field):

- Samples collected by the Marine Sediment Monitoring Team from the Department of Ecology
- Ten locations in Elliot Bay, WA
- Van Veen grab sampler was utilized

Methods (Laboratory):

- Sub sample 200g of sediment
- Disaggregate sediment using potassium metaphosphate
- Density separation with Lithium Metatungstate ($d=1.6 \text{ g/mL}$)
- Dried sample treated with 30% hydrogen peroxide
- NaCl added for final density separation
- Solution strained and counted in 0.3-mm custom sieve



Figure 2. The eight samples processed and picked representing the microplastics identified.

Results:

- Most of the microplastics were clear (23%) and black (23%) with a smaller percentage being other colors (Figure 4.)
- Most of the microplastics were fibers (44%) (Figure 3.)

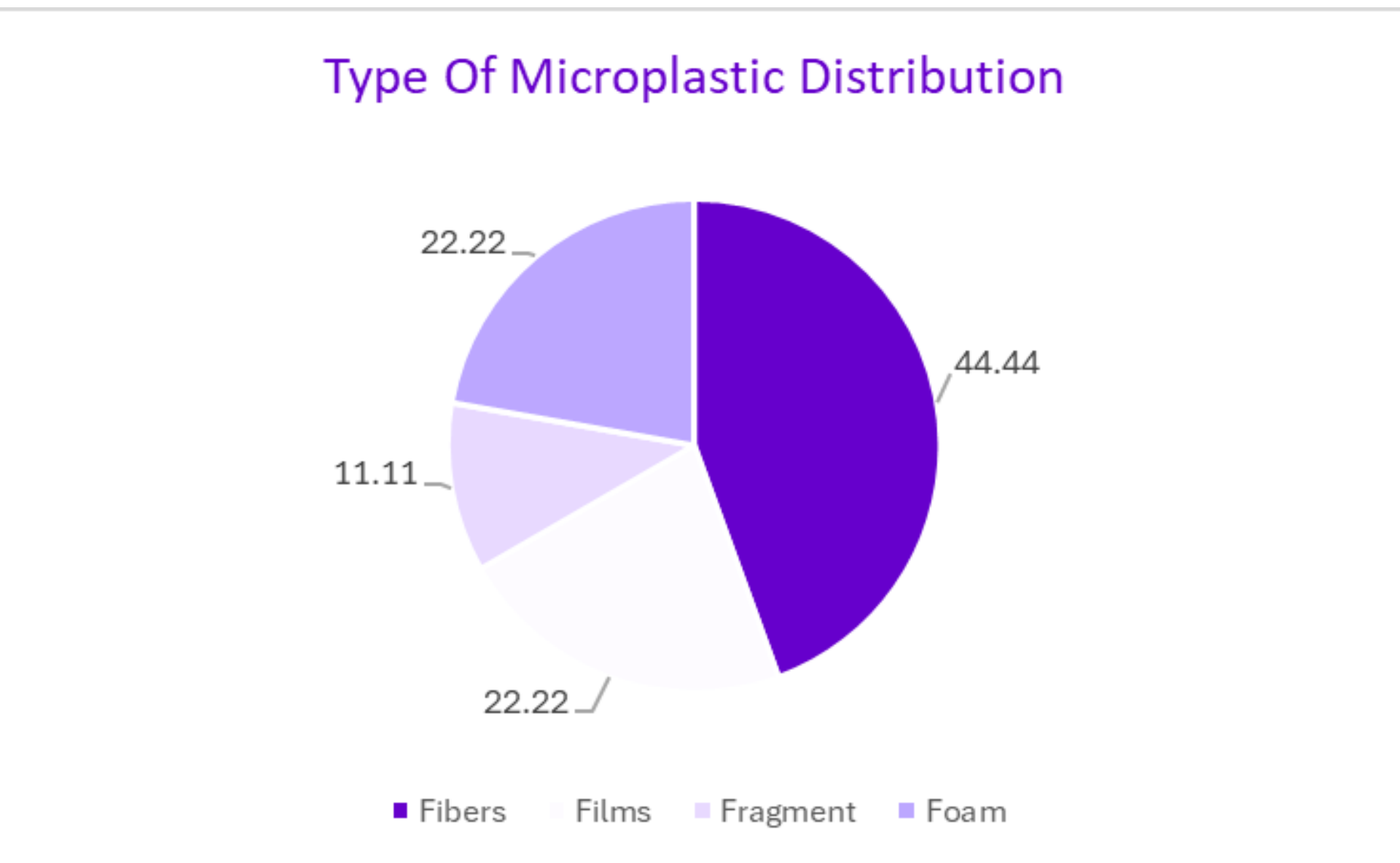


Figure 3. Percentage of microplastic by type.

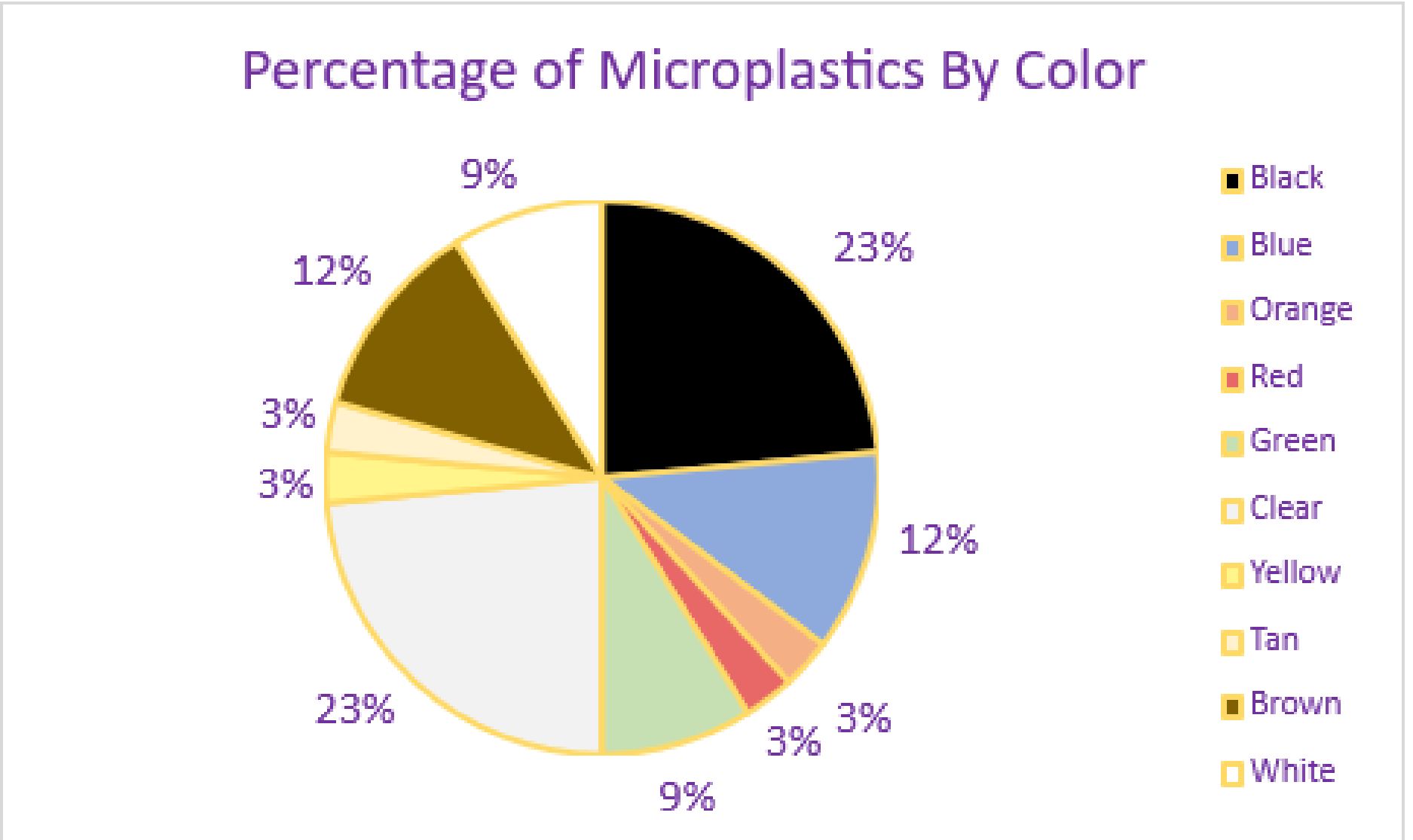


Figure 4. Distribution of microplastic colors represented as a percentage.

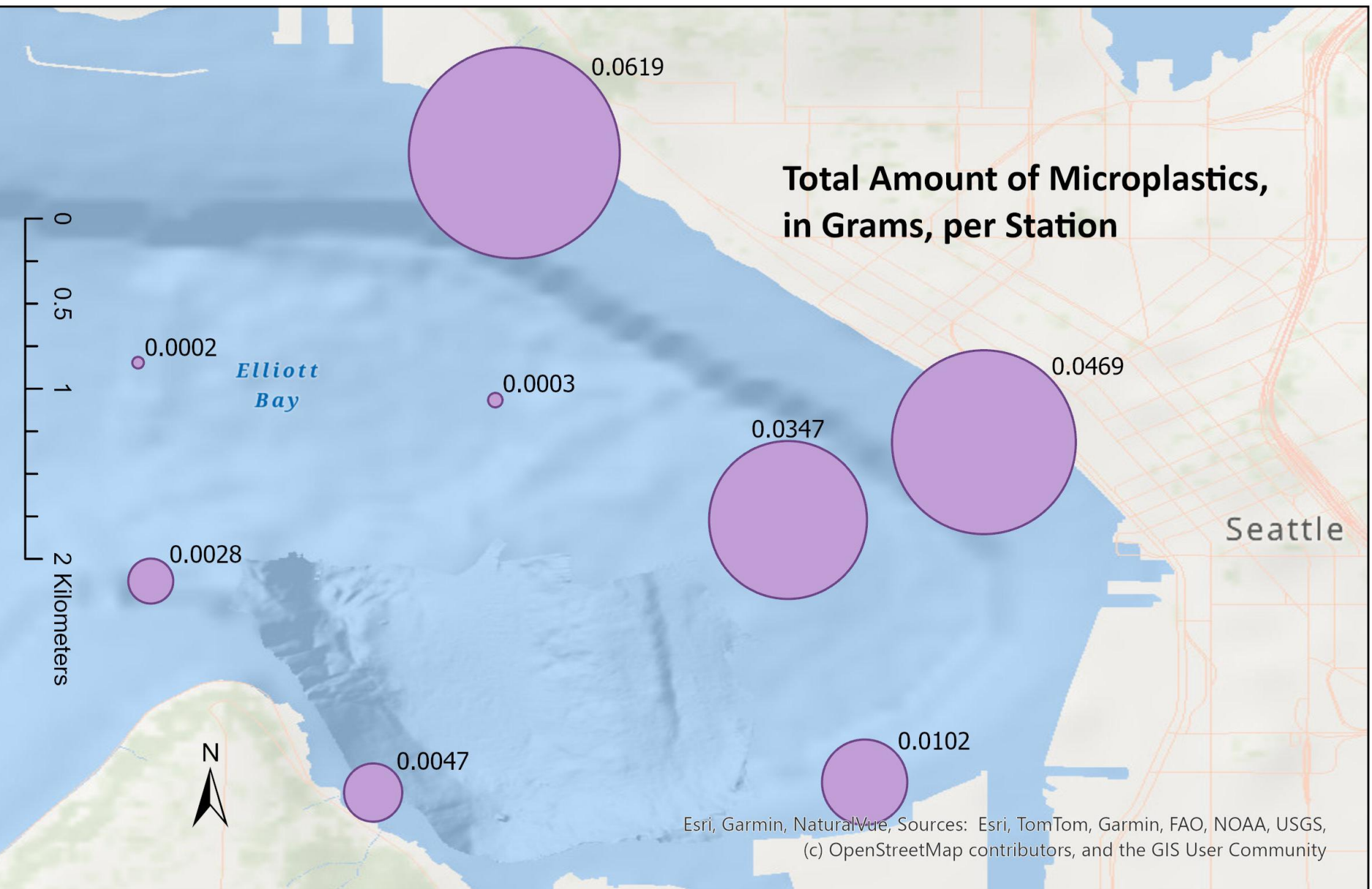


Figure 5. Total microplastic mass in grams related to sampling station location.

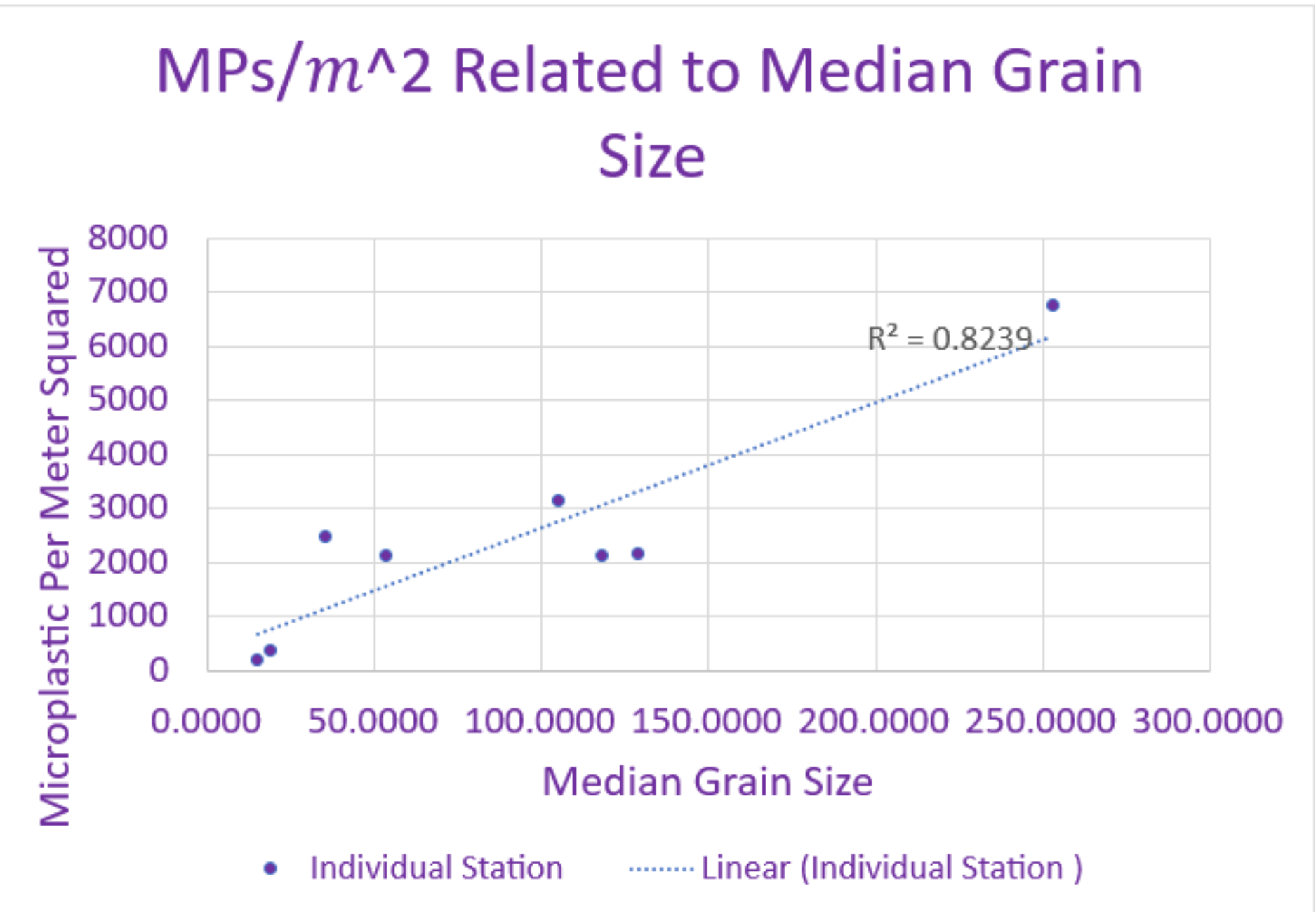


Figure 6. Microplastics per meter squared related to the average grain size of each station.

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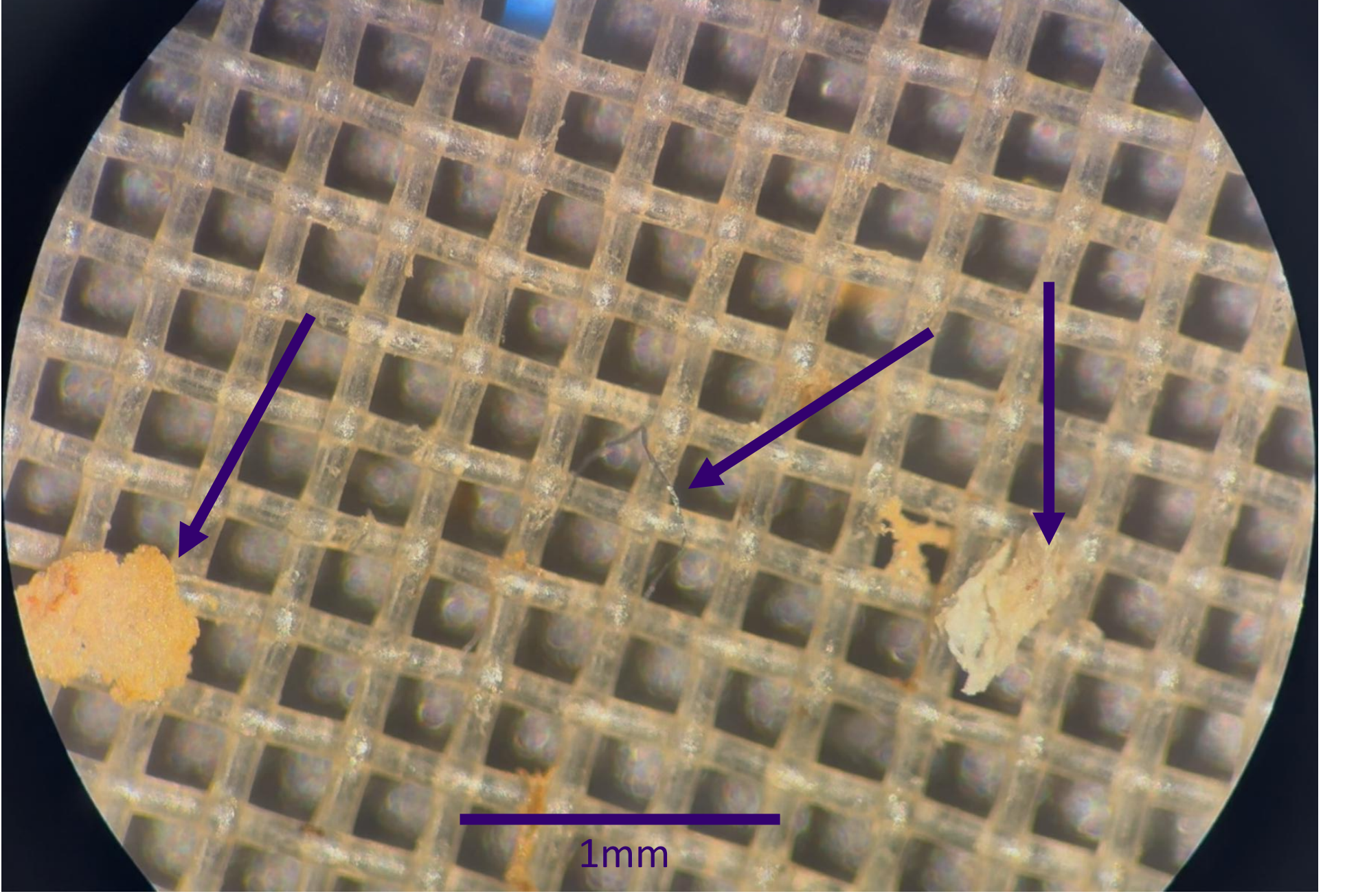


Figure 7. An example of microplastics along side organic materials. (Left organic material, center microplastic, right organic material)

Results:

- The microplastic per meter squared related to median grain size had an R^2 value of 0.8239 which indicates a strong linear relationship (Figure 5.)

Conclusion:

Our findings suggest that clear and black fibers are the most abundant in these samples, with the stations closer to shore having the highest incidence of microplastics. Due to the suggestion of a strong correlation between median grain size and MPs per meters squared, it behooves scientists to seek a greater sample size in this location. With that being said, microplastics can be considered harmful because they are easily able to get into bivalves which humans consume, like clams. Future work analyzing microplastics from this location will continue. Due to limitations of time because of a small power outage, two of the samples remain to be analyzed, giving students the opportunity to continue this work. It is important that scientists strive to better understand the depositional and abundance patterns of microplastics in our ecosystems.

References →

