Identifying Microplastics in the Pacific Northwest

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Introduction

- Plastic usage is now an everyday part of life, and its usage is prevalent around the world. With constant use of plastics, microplastics are formed, polymers less than 5 mm in length.
- With microplastics are found in water, soil sediments, beaches and virtually everywhere around the world. This is problematic due to microplastics potential toxicity to many different organisms.
- This research aimed to determine how much microplastic pollution was in samples collected in the Pacific Northwest, and what types of microplastics were found in it. This research creates awareness of microplastics within the environment, and the potential detrimental effects that microplastics can cause.
- Samples were taken directly from 12 locations (fig. 1) throughout the Pacific Northwest and were processed in lab through a combination of isolation techniques to progressively break down organic materials and further segregate microplastics.
- Brightfield microscopy was used to analyze the samples and sorted them based on material type, color, and size.
- This research serves as a gauge to see how prevalent microplastics are within the Pacific Northwest's waterways. This will be used to inform new guidelines on the use of plastic in the Pacific Northwest.

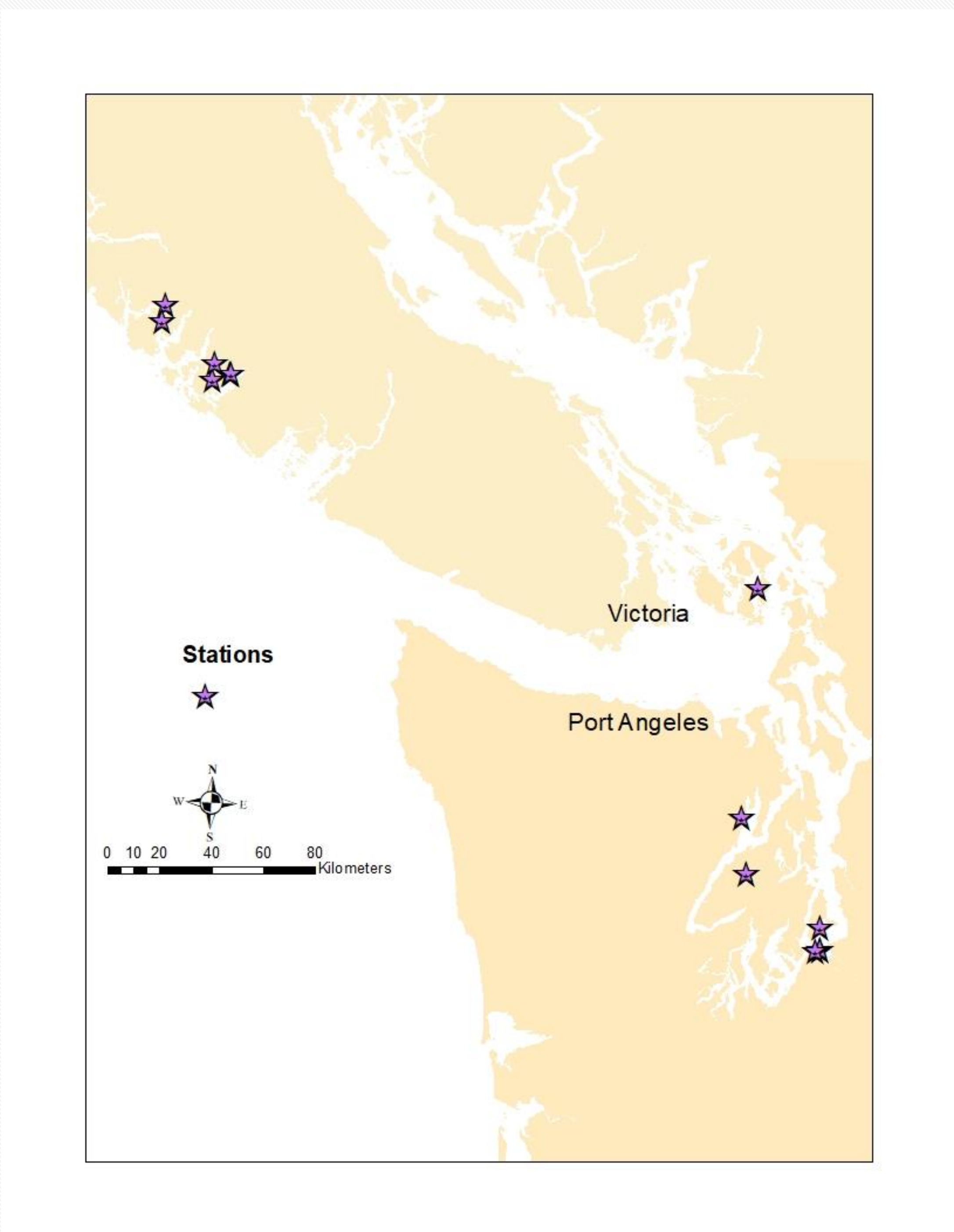

Figure 1. A map of the greater Pacific Northwest region. Collection locations (Purple Stars).

References

Methods

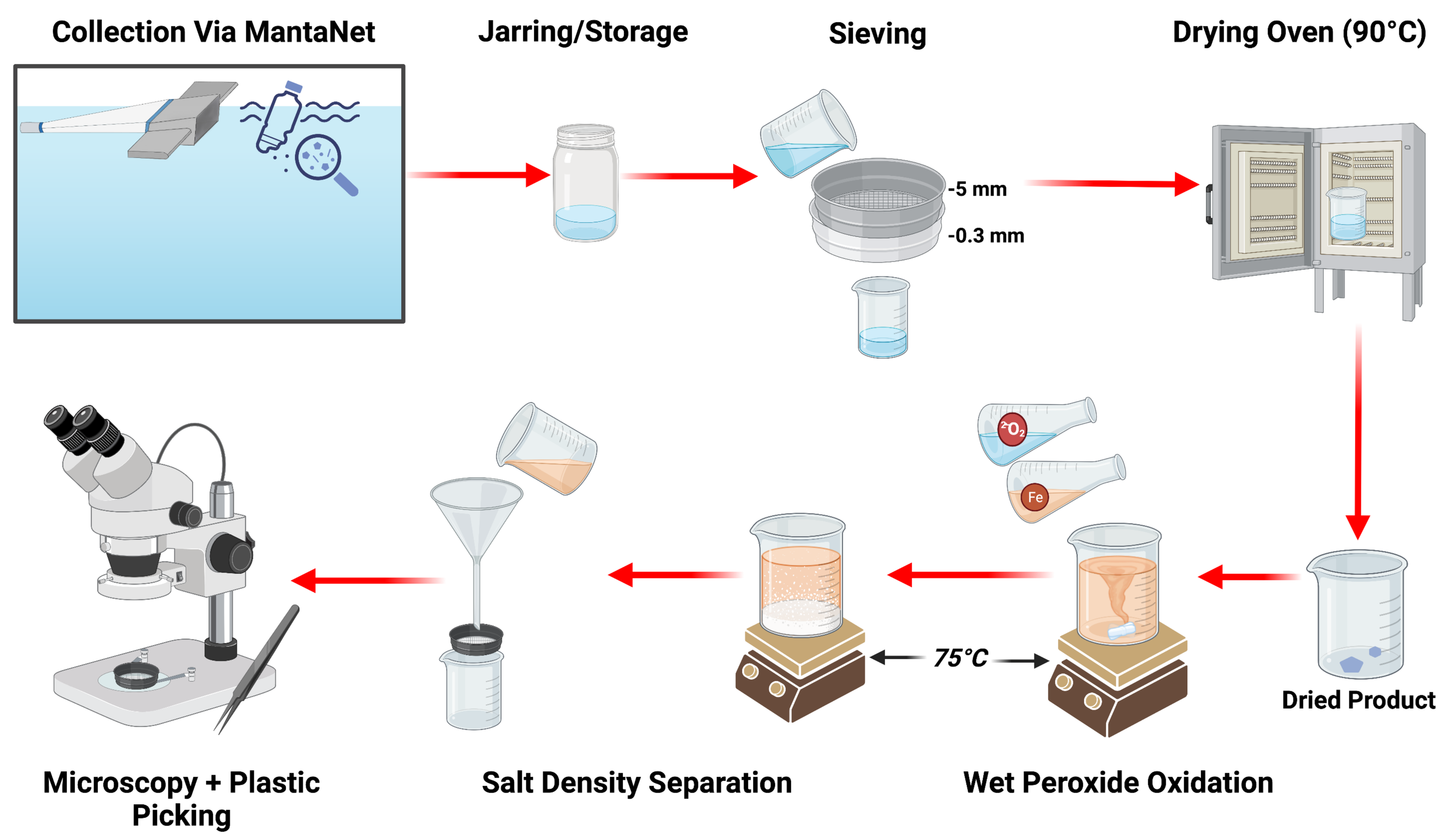

Figure 2. Flow chart of the methodology to isolate the microplastics from a field collected sample. *Created with BioRender.com*

Manta Net Collection (fig. 2)
- The MantaNet was used to skim across surface levels of sea water within the Pacific Northwest.
- Water samples were largely collected within bay areas, and enclosed water ways like the Puget Sound.

Sieving (fig. 2)
- Sieving was used to isolate the larger plastic contaminants from the microplastics and microparticles.
- Two sieves were used, a 5 mm sized mesh as well as a 0.3 mm mesh sized sieve.
- Deionized water was used to rinse the sieves to ensure that all the microplastics were collected within the 0.3 mm sieve and moved into the collection beaker.

Drying Oven (fig. 2)
- Once microplastic samples were collected in a beaker, they then could be placed in a drying oven over night (90°C) to evaporate any remaining water.

Wet Peroxide Oxidation (fig. 2)
- Wet peroxide broke down any residual organic materials left in the sample after the sieving technique.
- 20 mL of an aqueous Fe (II) solution was used as a catalyst.
- 20 mL of 20% hydrogen peroxide was then added, this continued until the reaction stopped occurring.

Salt Density Separation (fig. 2)
- Salt was added to help disperse differently weighted object. Plastics will stay near the top of solution while any heavy molecules will fall to the bottom.
- 6 grams of table salt (NaCl) was added for every 20 mL of liquid within a sample. Salt was then mixed with a stir bar on a hotplate (75 °C).

Plastic Picking (fig. 2)
- After samples dried, they were picked with tweezers under a dissecting microscope.

Results and Discussion

- Fibers were found to be the most common type of microplastic (75%) of the total microplastics collected, followed by fragments (17%) (fig. 4).
- The average length of all microplastics collected was 2.51 mm (fig. 3), and white microplastics were found to be the most common color of microplastic (fig. 4).
- Further analysis of these microplastics could help to identify if there is a common source of these pollutants. This could be helpful in implementing new policies to prevent future contamination.

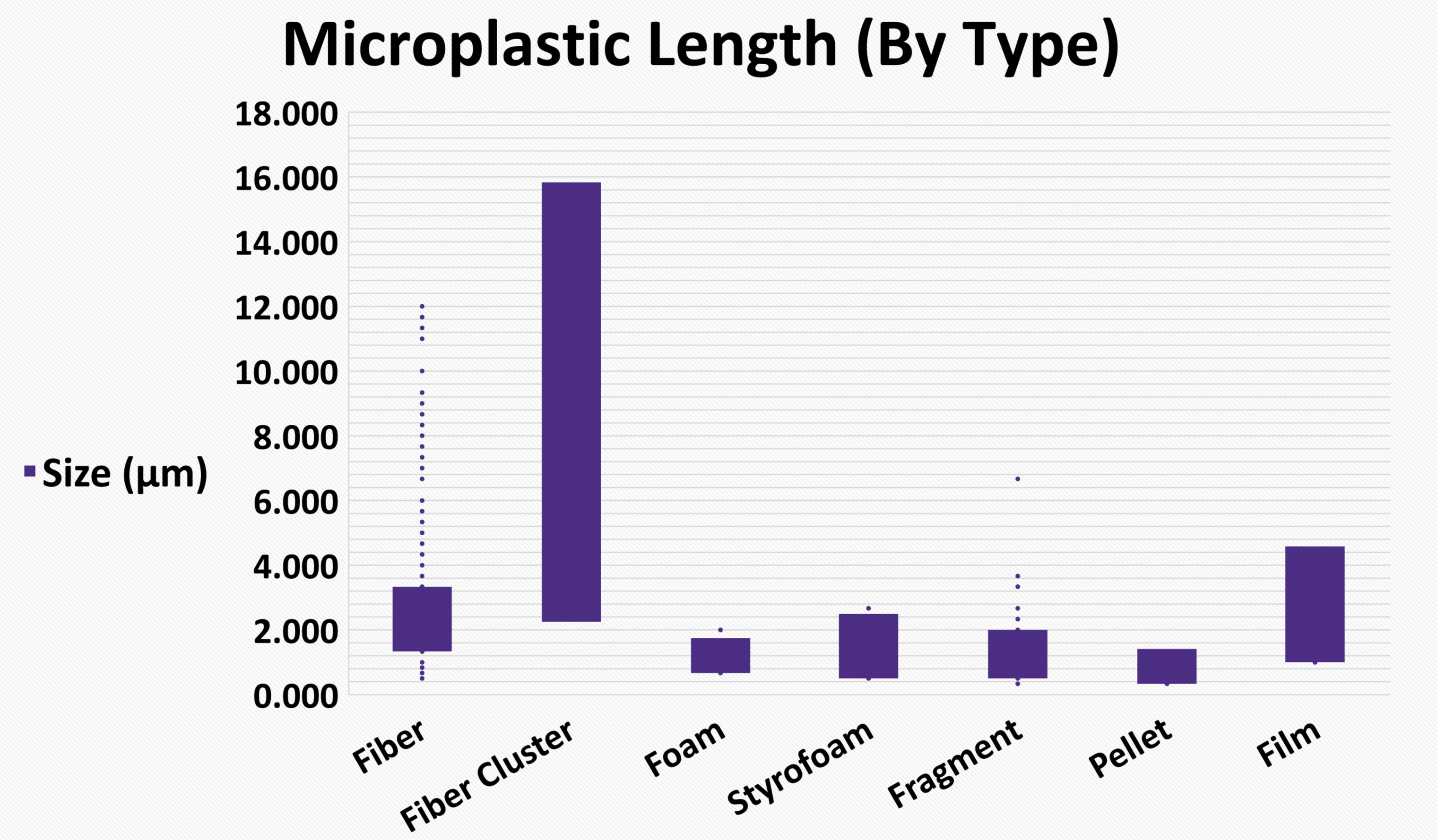

Figure 3. The average length of each type of microplastic collected from the Pacific Northwest.

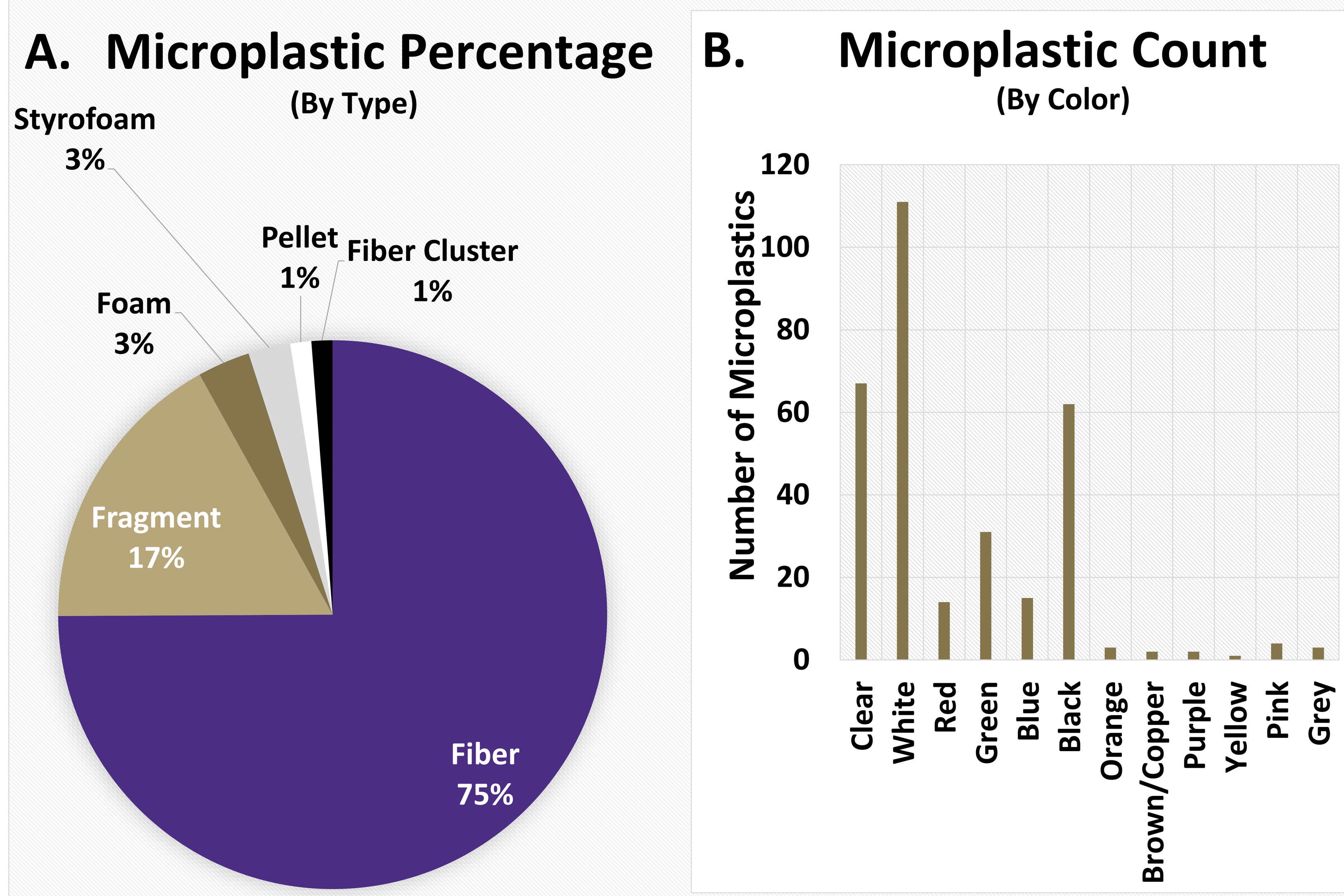

Figure 4. A. Pie chart of the total microplastic identified with this study, separated by microplastic sub-type. B. A breakdown of the microplastics identified by color.