



Adding an out-of-town harbor: Comparison of the number of microplastics in Wrangell harbors' seawater over three years

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Introduction

Microplastics can be found all over the world. Microplastic exposure can affect human and animal health due to transfer of chemicals attracted to the microplastics and blockages in the digestive system (Ajith et al., 2020). Microplastics come from clothing or any synthetic cloth, boats, paint, debris, vehicles, litter, and other plastic that have broken down over time (An et al., 2020). This is an important one health issue for Wrangell because people in Wrangell live a subsistence lifestyle using both the ocean and our environment to survive. RASOR students sampled 2 harbors in town, Heritage and Reliance in 2023 and 2024. In 2025 Shoemaker harbor was added to add a larger sampling size to research. In 2023-2024 the data that shows that there has been a similar if slightly increased number of microplastics found.

Hypothesis

We predict Shoemaker Harbor will have fewer microplastics compared to Heritage and Reliance Harbors due to the fact that it is farther from town and has less boat movement through this harbor. We predict that the amount of microplastics in the other harbors will be similar to previous years that we have data for.

Methods



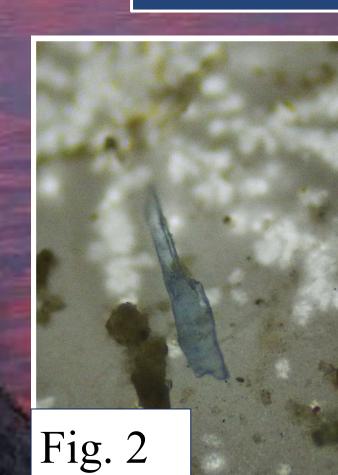




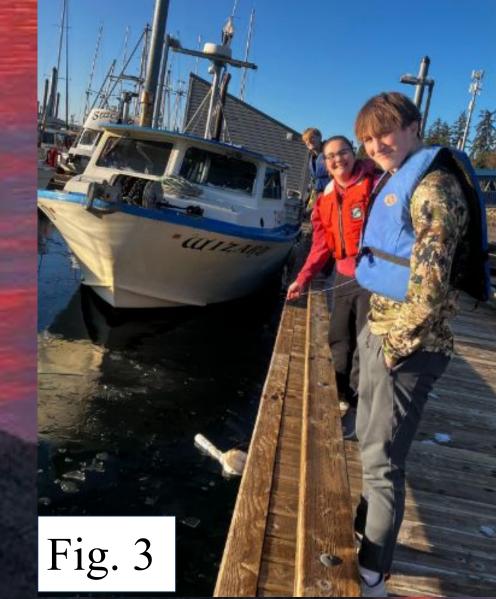
Fig. 1. Map of sample sites Reliance, Heritage, and Shoemaker Bay Harbors in that order. Screenshot taken from Google Maps. Fig. 2. Two microplastics found on different filters one is a shard and the other is a fiber. Fig 3. Microplastic tow done by researchers Ian Nelson, Clara Edens, and Ben Houser (left to right). Photo taken by Kim Wickman.

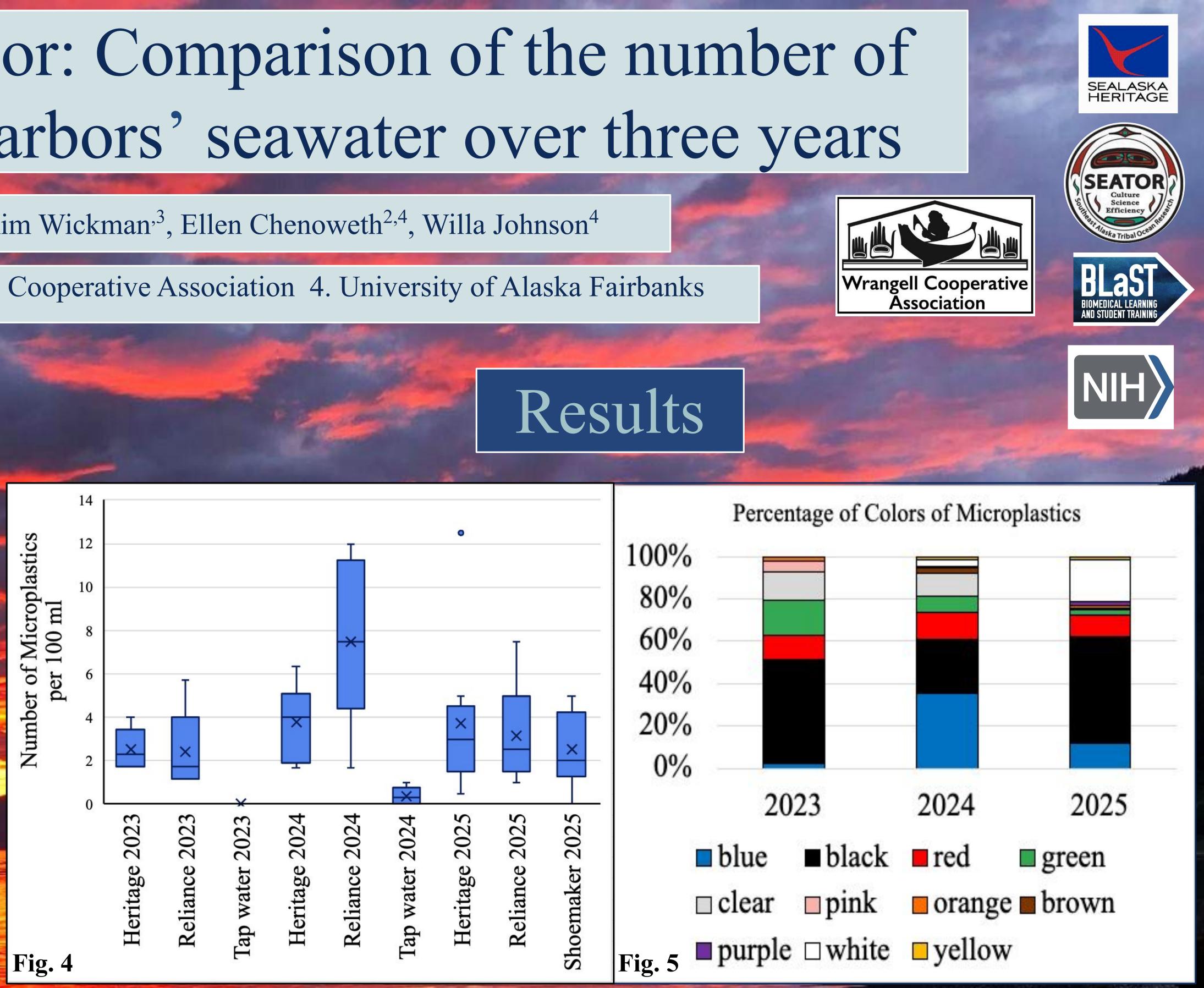
There were 9 seawater samples with three subsamples each for a total of 27 taken at three harbors: Reliance, Heritage, and Shoemaker Bay. The samples were taken by three students who each made a net tow and then samples were stored together in a jar until the samples were filtered onto three filters and stored until observation. Information was recorded about how the conditions were around the areas where samples were taken. The information recorded was weather, temperature, and water transparency. The samples were taken on Feb. 3, 2025, from Shoemaker Bay and Reliance Harbors. February 5th, a sample was collected from Heritage to complete one set of samples from each site. The second sample set was taken the following week on February 10th and 12th. The third set was collected on March 10th and 12th. After the samples were filtered using a vacuum filter, the filter papers were stored in jars to avoid contamination. Contamination was also avoided through the use of cotton lab coats and tweezers. After the samples were filtered, they were searched for microplastics and fibers using a microscope at 10x magnification. Suspected microplastics were tested using a heated needle, which would melt a microplastic but burn natural material. The samples were counted in the Wrangell Cooperative Association building. The microplastics were recorded, taking note of the color. The results were compared between sites and previous years.

References:

Ajith, N., Arumugam, S., Parthasarathy, S. et al. Global distribution of microplastics and its impact on marine environment—a review. Environ Sci Pollut Res 27, 25970–25986 (2020). <u>https://doi.org/10.1007/s11356-020-09015-5</u> An, Li-hui & Liu, Qing & Deng, Yixiang & Wu, Wennan & Gao, Yiyao & Ling, Wei. (2020). Sources of Microplastic in the Environment. 10.1007/698_2020_449.







Our data does support our hypothesis because Shoemaker had slightly less microplastics than the other harbor both from this year and previous years. Comparing this years amount of microplastics to past years it shows that all three harbors have similar amounts except Reliance 2024. A possible reason we found these results is because nothing has happened in Wrangell to allow for there to be more microplastics in our harbors. One limitation to our research is finding the difference in microplastic in winter compared to in summer when the harbors are used more. An area for future research would be the amount of microplastics on land near harbors and or the size of these microplastics. One area of research we had hoped to do was take a sediment sample from the ocean's floor in the harbors to see if there are microplastics mixed in. Our research is important to the community because most of Wrangell's residents rely on subsistence harvested fish and other marine animals. Microplastics research in seawater is an important One Health research topic because it is connected to human health, animal health and the environment.

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• Our hypothesis was supported: Shoemaker Harbor had fewer average microplastics per 100mL (Fig. 4). • The majority of microplastics found where fibers.

• One take away shown is there is a similar amount of microplastics across three years (Fig. 4). • We see that Shoemaker has a slightly smaller amount of microplastics compared to the other harbors (Fig. 4). • One take away is we have had more black microplastics that 2024 and the number of red microplastics hasn't changed much between all three years (Fig. 5).

