Ocean’s Waste the Fish’s Taste

Science Fair: Background Research Paper

Sahil Kiran

6B

Mr. Baillie

Webber Academy

Feb. 3. 2025

Microplastics as one can imagine are microscopic pieces of plastic. These little pieces of plastic may seem harmless however they can cause major problems to aquatic animals and even us!

In this experiment I will be testing water samples from water bodies in Calgary to see if they contain microplastics. I had thought of this project when I was going birding with my family in the parks of Calgary. There I could see aquatic birds like geese and ducks. Seeing them made me think, the water that they're in, how contaminated is it?

First, how small are microplastics? They are pieces of plastic which are 5mm or less in length. Microplastics are everywhere - from the trash we dispose of to the cosmetics our mom buys, these microplastics are in more places than one. Microplastics have entered the waters because of us humans and whose properties against humans are unknown.

Microplastics are a harmful substance to us, animals and the Earth itself! The process of creating plastics and destroying them can cause greenhouse gases to enter the atmosphere. This has led to climate changes causing a big impact on our planet. In some cases microplastics have been found in some of the deepest trenches. The dangers of microplastic for aquatic animals are severe. They can cause choking and a vulnerability

to illness. In some cases this can be fatal for some animals like the Humpback Whales who eat almost 200,000 pieces of microplastic. The worst part though is that when animals reproduce, the babies have a chance of getting those microplastics. This means that whole families of aquatic animals can be affected by microplastics.

Microplastics can get into a water body in one way or another. One of the many ways that rivers are filled with microplastics are the small parts of asphalt and car tires being washed away into the rivers. When parts of asphalt break away from the road, it sits there until rain falls. The rain causes them to be pushed into the rivers which eventually wreak havoc on the aquatic ecosystem. Another way that water comes in contact with microplastics is fishing nets. When fishing nets are lowered into the water, they can shed things like microfibers which contaminate the water. Plastic pellets are sometimes found in oceans due to larger plastic items entering the oceans. Microbeads are another source of contamination. These are released due to things like face washes and toothpaste entering our drains and eventually into water treatment plants and facilities. Even something like a water bottle can cause major damage to aquatic life. Water bottles can contain hundreds of microplastics, however, if those microplastics break down into nanoplastics, (100 times smaller than microplastic), they can cause significant damage. During the pandemic of COVID-19 when everyone wore masks and would also quickly dispose of them, the plastic fibres from the masks caused a massive increase in microplastic content which caused major impacts on the aquatic ecosystem.

Types of microplastics - Microplastics are categorized into 2 sections - Primary and Secondary. Primary microplastics are items that are specifically made miniature in size for commercial use. Secondary microplastics are the opposite of primary microplastics. These are formed when larger items decompose into smaller parts, for example microfibers from textiles or any other plastic item that breaks down forms microplastics. However plastics don't just break down by themselves. Processes such as animal grazing, UV radiation, heat and wave action are some of the reasons they break down. These processes are either chemical or physical.

Natalie Tufenkji is the Tier 1 Canada Research Chair in Biocolloids and Surfaces and a chemical engineer. Tufenkji works at McGill University as a professor and her team is trying to remove nanoplastics and microplastics from wastewater. She says, "We know that bulk products can break down into microplastics."

What are some ways that microplastics enter water bodies in Calgary? The first way is the waste water system. The wastewater systems of Calgary are not designed to get rid of microplastics. They just instead are released into the Bow River, contaminating it. As mentioned in the last paragraph, asphalt pieces can enter water bodies due to rain. An experiment conducted by Paige Jackson, an undergraduate student who is enrolled in the University of Calgary and is in the Department of Biological Sciences, proves this. Jackson stated that, "Another significant source of microplastics in rivers that's been discovered more recently is the urban environment, such as when there's a big storm that

creates runoff from the road—things like tires and asphalt get into the stormwater and then enter rivers," Jackson explained

The microplastic issue has grown so much that human originated pollution has been found buried in Antarctic sea ice. Some cases have even had microplastic content in human drinking water. This could cause problems in the human body however that is not guaranteed. Some speculate that we get rid of microplastics when we go to the washroom. However, others say that microplastics can cause things such as DNA damage, oxidative damage and even changes in genes and a possibility of cancer development. Since the long-term effects of microplastics on the human body are unknown, this could pose a serious threat to humans.

The manipulated variable for this experiment is the locations that the water samples will be collected from. The locations that the samples are being collected from are the Elbow river, Bow River. For some locations like the Bow River, since it covers most of Calgary, samples will be collected from more than one part of the river like from Carburn Park and Inglewood Bird Sanctuary.

The responding variable is the presence of microplastics. The presence of microplastics will be checked by using a microscope. Since microplastics are 5mm or less, the microscope will allow us to see these microplastics clearly.

If the presence of microplastic is proved in the water bodies in Calgary, this project can be considered useful for the City of Calgary to see if any action should be taken to clean Calgary's water bodies. This is also helpful to wildlife protection groups who might take action to help Calgary or warn the city about this. There are many ways that microplastics can get into water bodies and contaminate our waters. This paper explains how water gets contaminated, the categorization of microplastics, the variables used for the project and the real-world applications. Now the next time we go to a preserved park we have to remember that water, even if it looks clean, it could be contaminated with microplastics.

BIBLIOGRAPHY

https://magazine.hms.harvard.edu/articles/microplastics-everywhere, January 8-14 2025, Stephanie Dutchen, Microplastics Everywhere

https://sustainability.yale.edu/explainers/yale-experts-explain-microplastics, January 8-14 2025, Yale Experts Explain Microplastics

https://education.nationalgeographic.org/resource/microplastics/, January 8-14 2025, Microplastics

https://uwaterloo.ca/news/media/scientists-can-now-remove-microplastics-our-water-94-cent, January 8-14 2025, Media Relations, Scientists can now remove microplastics from our water with 94 percent efficiency

https://www.bbc.com/future/article/20240110-microplastics-are-everywhere-is-it-possible-to-reduce-our-exposure, January 8-14 2025, Isabelle Gerretsen, Microplastics are everywhere: Is it possible to reduce our exposure?

https://www.cbc.ca/news/science/marketplace-canadian-bottled-water-microplastics-1.4606182, January 8-14 2025, Eric Szeto, Greg Sadler, David Common, Microplastics found in some Canadian bottled water

https://marinedebris.noaa.gov/what-marine-debris/microplastics, January 8-14 2025, NOAA Marine Debris Program, Microplastics

https://reporter.mcgill.ca/microplastics-and-the-environment/, January 8-14 2025, McGill Reporter Staff, Microplastics and the environment

https://www.watercanada.net/ucalgary-student-studies-microplastics-in-wastewater/, January 8-14 2025, Water Canada, UCalgary student studies microplastics in wastewater

https://news.stanford.edu/stories/2022/11/whales-eat-colossal-amounts-microplastics#:~:text=Humpback%20whales%20subsisting%20primarily%20on,million%20microplastic%20pieces%20per%20day, January 8-14 2025, Josie Garthwaite, Whales eat colossal amounts if microplastics

https://extension.msstate.edu/sites/default/files/publications/publications/P3243.pdf, January 8-14 2025, Mandy Sartain, MICROPLASTICS Sampling and Processing Guidebook

Eriksen, Marcus, (June 5th 2018), Junk Raft, Beacon Press

Simon, Matt, (October. 27 2022) , A Poison Like No Other,Washington DC: Island Press