Marauders of the Water-detecting microplastics

By Sahil Kiran

Variables & Scientific Question

Variables

Manipulated

-The locations from where the water is collected

Dependent

-The presence and the size of microplastics

Controlled

-The quantity of water being tested

Manipulated Variables

Where I will collect the water samples from:

- Bow river
- Elbow river
- Carburn Pond
- Distilled water

Dependent Variables

The content of microplastics in the water sources

The types of Microplastics (Possible items):

-Fragments -Fibres

-microbeads -Foam

-Nurdles

Controlled Variable

-Quantity of Water being tested

-magnification on Microscope

-filter paper of the same mesh size

Scientific Question

The presence of microplastic in soil and water is a growing problem. I chose this project because I have seen a lot of water birds like ducks, geese, etc. in Calgary and I was curious to understand the extent of microplastic in the water bodies. This is why I wanted to do a project to test the presence of microplastics in the water bodies in Calgary.

My question is: Do the water bodies in Calgary contain microplastic, if so what is their Approximate size?

Background Research & Hypothesis

Background Research

- Microplastics are any form of plastic that are less than 5mm.
- They are categorized into 2 parts: Primary and Secondary Microplastics
- Primary: Made specifically to be miniature, cosmetics
- Secondary: Larger items decompose to microplastics ex. Water bottle
- Microplastic enter water bodies - rain pushing road and tire pieces
- Some say microplastics have no effect on body
- Others say it can cause oxidative damage, DNA damage and cancer development
- Microplastics - Found in antarctic ice

Background Research

- Paige Jackson made an experiment showcasing that:

  Calgary's sewage can't filter microplastics

  Causing the Bow River to be contaminated

- Natalie Tufenkji (McGill University) - trying to remove microplastics from water bodies

  She is also researching the effect of microplastics on human body

- Humpback whales - eat 200,000 pieces of microplastics

  -When animals reproduce, babies have chance to have microplastic

  -Vulnerability to illness

Hypothesis

When the different water bodies of Calgary are tested for microplastics, all water bodies will have microplastics in them and the size of the microplastics will be comparable to two microns.

Experimental set-up

Materials

- Plastic Water bottle x4 (300ml)
- Microscope
- Dropper
- Sliders
- Collected Samples
- Control - Distilled water
- Tissues
- Filter Paper (2 microns)
- Funnel
- Beaker
- Petri dish

Procedure

1. Collect water samples from the water bodies
2. Set-up the microscope
3. Using the dropper, put 2 drops of water on a slider
4. Put the second slider on top of the water and place the slide on the mechanical stage and fasten with the stage clips
5. Change the magnification to have a x40 magnification (with eyepiece magnifier)
6. Move the slide around the center to get the desired image in view
7. Record the image
8. Wipe both sliders being used for the sample you are testing before the next one
9. Repeat the steps from three to eight for each sample
10. Record the results
11. Organize the resulting data in a table

Filtration Procedure

1. Take the sample in the beaker

2. Place the funnel on the plastic bottle.

3. Fold the filter paper into quarters and open slightly to make it a cone

4. Place the cone inside the funnel

5. Pour the samples onto the filter paper and make sure not to overflow the water

6. Collect the filtered sample

7. Follow the same steps from the last slide to check the water for microplastics on the filter paper and the filtered water

8. Repeat steps one to seven for each sample

What Are WE Looking For?

What are we looking for in the water samples?

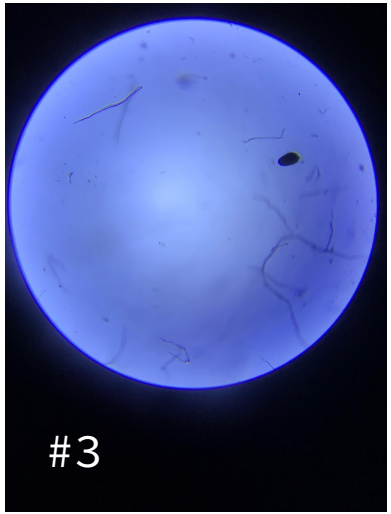
- Colourful objects
- Pieces of things like string
- Small clear particles

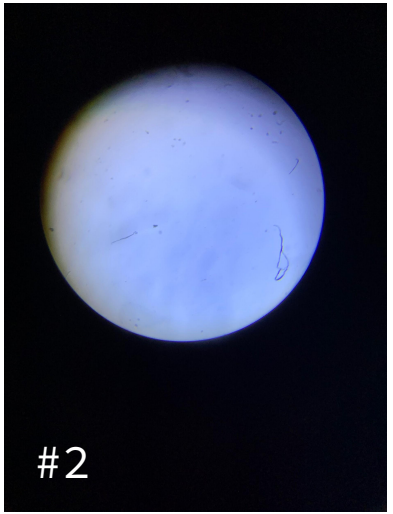
Observations and Data Analysis

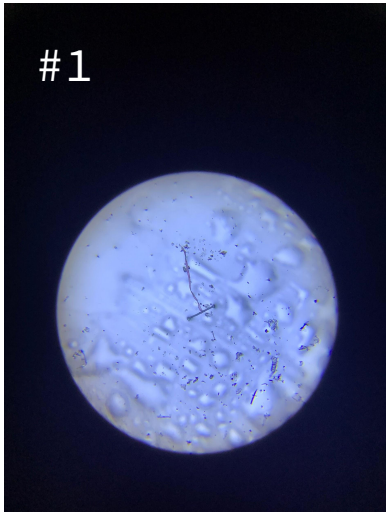
Carburn Park

Carburn Park

Trials	Presence	Observation
#1	Yes	-Red String -Thick, Short Pieces of Plastic -Small Pieces of Plastic
#2	Yes	-2 Thin Fibres
#3	Yes	-Microbead -Thin Fibres



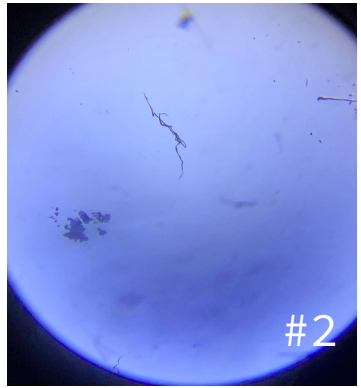


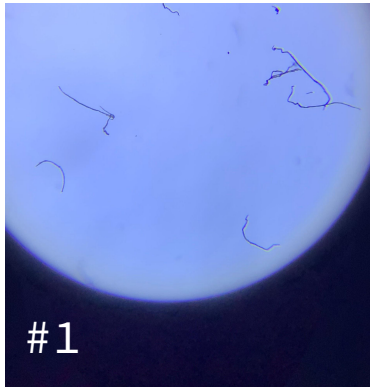


Inglewood Bird Sanctuary

Inglewood Bird Sanctuary

Trials	Presence	Observation
#1	Yes	-Mostly Clear -Small Fibres
#2	Yes	-Red String, Fibre -Strange Pattern
#3	Yes	-Small Fibres -Thick, Rubber-Band-Like Plastic

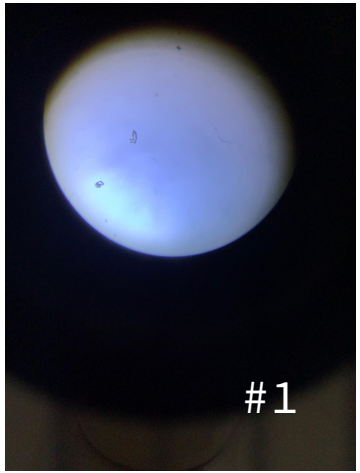


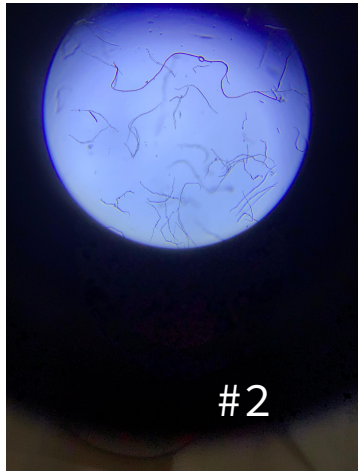


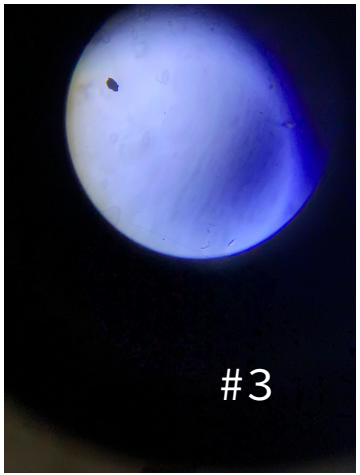
Confluence Park

Confluence Park

Trials	Presence	Observation
#1	Yes	-Small Plastic Particle -Almost Nothing
#2	Yes	-Long, Red, Tangled String -Many Small Fibres
#3	Yes	-Microbead -Almost Nothing



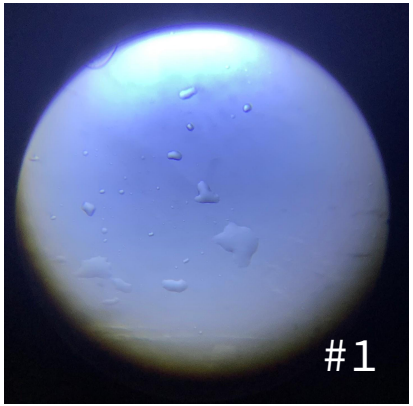


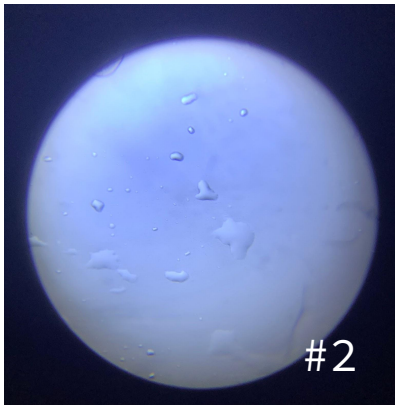


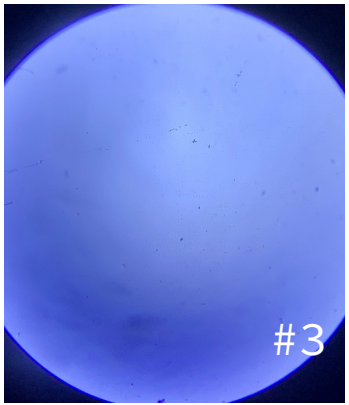
Distilled Water - Control

Distilled Water - Control

Trials	Presence	Observation
#1	No	Clear
#2	No	Clear
#3	No	Clear



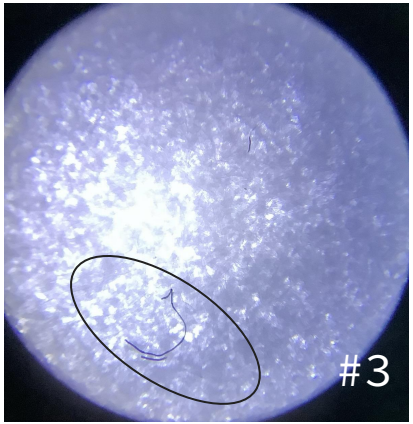


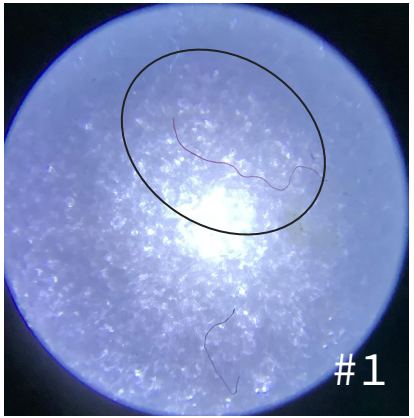


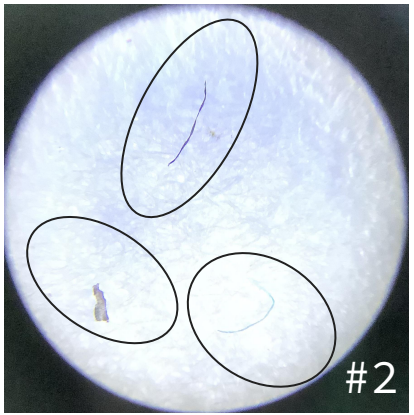
MICROPLASTIC ON FILTER PAPER

Filtration Of Samples (Filter paper)

Samples	Presence	Observations
Inglewood Bird Sanctuary (1)	Yes	-Curvy Red String -Thin Black Fibre
Carburn Park (2)	Yes	-Blue String -Red String -Odd-Shaped Plastic
Confluence Park (3)	Yes	-2 Black Strings of Plastic

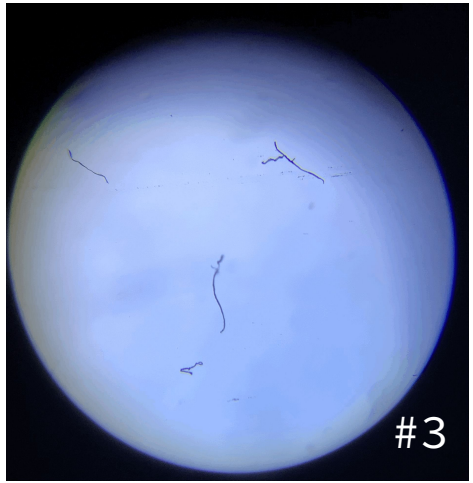


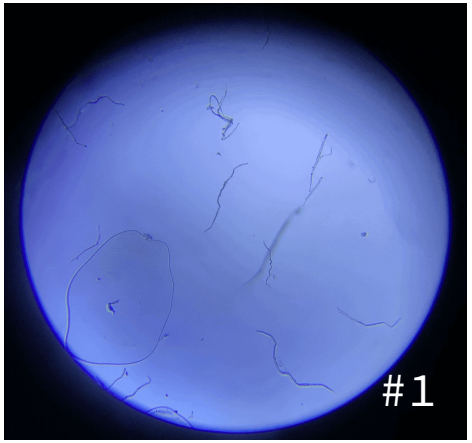




Filtration Of Samples (Water)

Samples	Presence	Observations
Carburn Park #1	Yes	-Black Fibres, tangled
Confluence Park #2	Yes	-Small Black Fibres
Inglewood Bird sanctuary #3	Yes	-Small red Fibre -Black Fibre

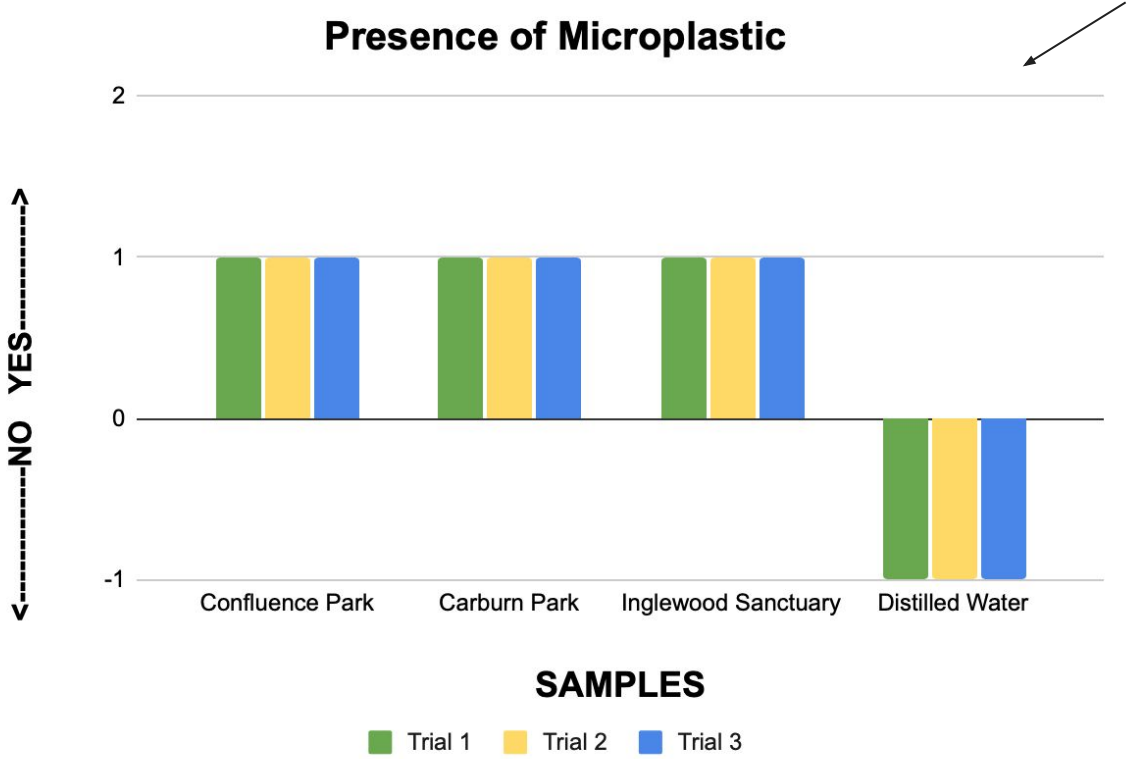




Data Analysis

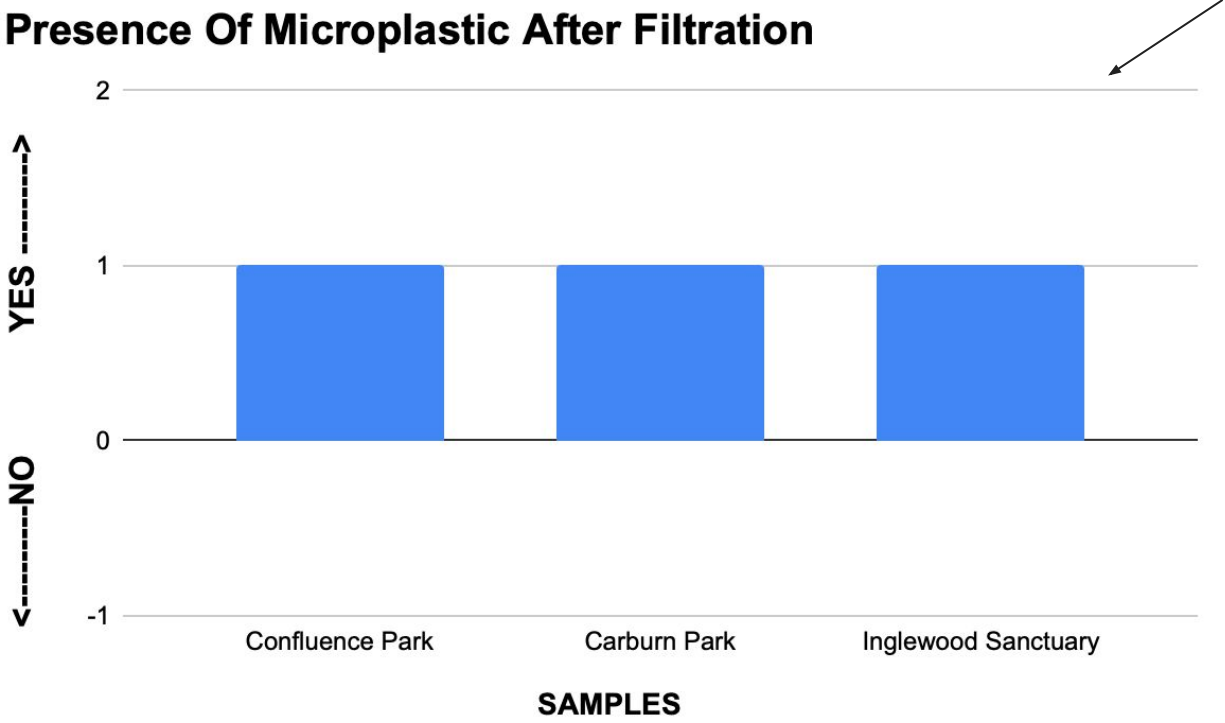
Data analysis

Before Filtration



DATA ANALYSIS

After Filtration



Results

The results of this experiment show that each water sample collected from different locations contained microplastics. The control, which was Distilled water did not have any content of microplastic. The filtration results showed that some microplastics were greater than two micron but the water still contained microplastics smaller than two microns that escaped the filter paper.

Improvements and Future Purposes

Real-Life applications

The use of this project in real life can be to help to protect the marine wildlife. The City of Calgary can consider if they need to make bylaws or take action about the problem of microplastics in Calgary waters and their effects on wildlife.This project can raise awareness to communities about the microplastic issue and help them take action.

Future Questions

After doing this experiment some questions I got were:

Is it possible to filter nanoplastics, if so what kind of mesh is needed?

Does Blue lake in New Zealand have microplastics? (cleanest lake on earth)

Does having microplastics in water change it's number on the PH scale?

Sources of error

In this experiment, some sources of error I discovered were that I collected the samples from the banks of the flowing water. ThEre could be a possibility of an error as the content of microplastic flowing in the centre of the river could be less.

Ways to Improve the Project

Ways to improve the project:

-Collect More samples from lakes (I wasn't able to due to the water freezing)

-Use a different filtration process (reverse osmosis/distillation)

-Search for more types of microplastics (fragments/nurdles)

The End