Survey of Microplastics in Lake Hopatcong

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Introduction

Plastic production has been heavily present in this century and is increasing exponentially, which increases the abundance of microplastic in bodies of water. The source of microplastics in lakes are from surface currents, floods, runoffs, area-shoreline development, dam release, tourism, and fisheries (Alfonso et al, 2020). Lake Hopatcong is one of the largest lakes in New Jersey and is surrounded by residential areas and urbanization (Smith, 2015). It was hypothesized that there would be an increase in microplastic abundance towards the southern point of the lake due to the water draining towards a dam. The results were based off on the objective of quantifying the microplastic abundance, and to observe how much microplastics are found on plants in the lake.

Methods

Field Methods:

- 11 sites were sampled using a Manta Trawl. 4 sites were sampled in the middle of the lake and 7 sites were sampled along the shoreline.
- Whole water samples (1.8 L) were taken from each of the sites, along with plant samples.
- Water quality parameters were taken at each location with a YSI hand-held sonde, secchi disk and turbidity tube.

Lab Methods:

- Samples were filtered through a 63-micron sieve.
- The whole water samples were filtered through using a glass vacuum filtration (45-micron filter).
- Plant samples were dried and digested using the Fenton Reaction.

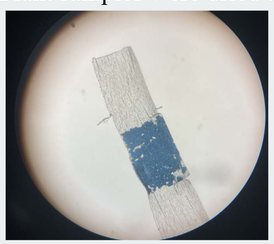


Figure 1 is a microplastic fragment recovered from the mid-lake south sample. The discoloration indicates possible oxidation of the plastic.

Figure 2 shows the Fenton Reaction being conducted on the plant samples from the first sampling date.

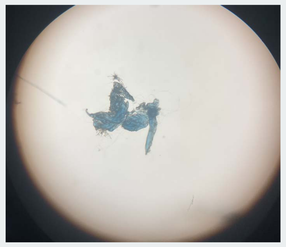


Figure 3 is a microplastic fragment found in mid-lake north sample. The rough and torn edges indicates that it could have been broken off from a bigger piece of plastic.

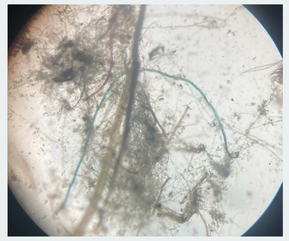


Figure 4 are microfibers collected from the Stone Water site. Shows attachment to plant matter indicating that the fibers interact with organic matter.

	Average	Standard Deviation
Temperature (°C)	23.9	1.92
Salinity (PPT)	0.19	0.06
Dissolved Oxygen (% Saturation)	84.07	16.44
pH	7.53	0.33
Turbidity (m)	1.28	0.62

Table 1 shows the average water quality of all the test sites. It shows that there was a small deviation between each of the sites and each of the parameters.

Results

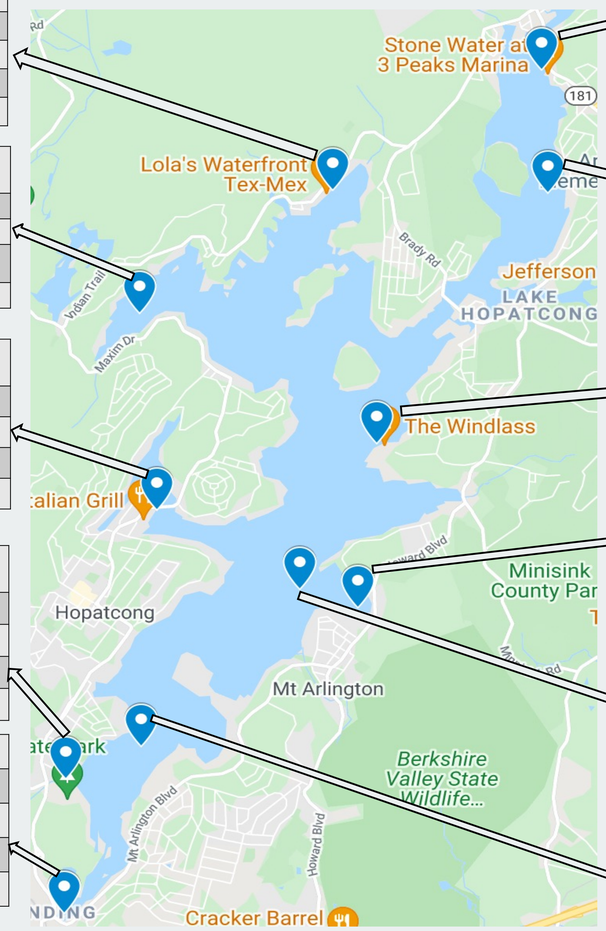
Plastic Type	Manta Trawl	Whole Water	Plants
Fibers	75	7	11
Filaments	9	4	6
Fragments	18	1	0
Beads	2	0	0

Plastic Type	Manta Trawl	Whole Water	Plants
Fibers	42	68	25
Filaments	12	35	15
Fragments	0	0	4
Beads	0	0	0

Plastic Type	Plankton Net	Whole Water	Plants
Fibers	47	15	50
Filaments	20	2	30
Fragments	1	0	16
Beads	0	1	0

Plastic Type	Manta Trawl	Whole Water	Plants
Fibers	120	33	33
Filaments	16	28	20
Fragments	7	2	0
Beads	2	1	4

Plastic Type	Plankton Net	Whole Water
Fibers	59	66
Filaments	21	45
Fragments	1	1
Beads	0	0



Plastic Type	Manta Trawl	Whole Water
Fibers	89	41
Filaments	51	19
Fragments	9	0
Beads	0	0

Plastic Type	Manta Trawl	Whole Water
Fibers	46	55
Filaments	7	0
Fragments	8	4
Beads	2	0

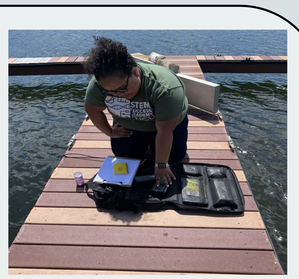
Plastic Type	Manta Trawl	Whole Water	Plants
Fibers	85	15	6
Filaments	37	10	3
Fragments	6	1	0
Beads	0	0	0

Plastic Type	Manta Trawl	Whole Water	Plants
Fibers	111	64	25
Filaments	53	38	3
Fragments	5	0	5
Beads	3	0	0

Plastic Type	Manta Trawl	Whole Water	Plants
Fibers	49	20	8
Filaments	3	8	1
Fragments	5	0	2
Beads	0	0	0

Plastic Type	Manta Trawl	Whole Water	Plants
Fibers	60	88	39
Filaments	24	49	22
Fragments	2	0	5
Beads	0	0	0

Discussion and Conclusions



- Based on the data collected the hypothesis was rejected. The area with the most microplastics was the eastern area of the lake.
- A possible reason for the eastern area of the lake having more microplastic was that the eastern sampling site was in a cove.
- By observing the environmental parameters, it is seen that they did not significantly change in each site.
- Overall, in each of the plant samples taken there were high amounts of microplastics found indicating that the microplastics are interacting with the plants.
- Sites along the shore were compared to sites in the middle of the lake and indicate no significant differences between the two (t-test, 0.190>0.05).
- When comparing the Manta Trawl and Whole Water samples, the ANOVA test indicates that there is no substantial difference between the two methods (3.704<4.3512).

This study was the first sampling of Lake Hopatcong for microplastics, and the study revealed that there were more microfibers and microfilaments found in the lake than any other microplastic. Future research would be to sample down Lake Musconetcong (where Lake Hopatcong drains into).

Acknowledgements/References

I greatly appreciate the grants that make this research possible:
US Education Department Title III Part F HSI-STEM Grant # P031C160155 and US Education Department Title V DHSI Grant # P031S200124

Special thanks to the Lake Hopatcong Foundation for their help and support throughout this project. Thank you to Lola's Waterfront Tex-Mex Restaurant, Stone Water at 3 Peaks Marina, Windlass Restaurant & Marina, Lee's County Park Marina, Lake's End Marina, and Johnny's Marina for site access.

Alfonso, M. B. *et al.* First evidence of microplastics in nine lakes across Patagonia (South America). *Science of The Total Environment* **733,** 139385 (2020).
Smith, C. Lake Hopatcong Fisheries Management Plan. (2015). Available at: https://www.njfishandwildlife.com/pdf/fwfisheries/lakeplan_hopatcong.pdf. (Accessed: 4th June 2021)