

Microplastics in Diamondback Terrapins

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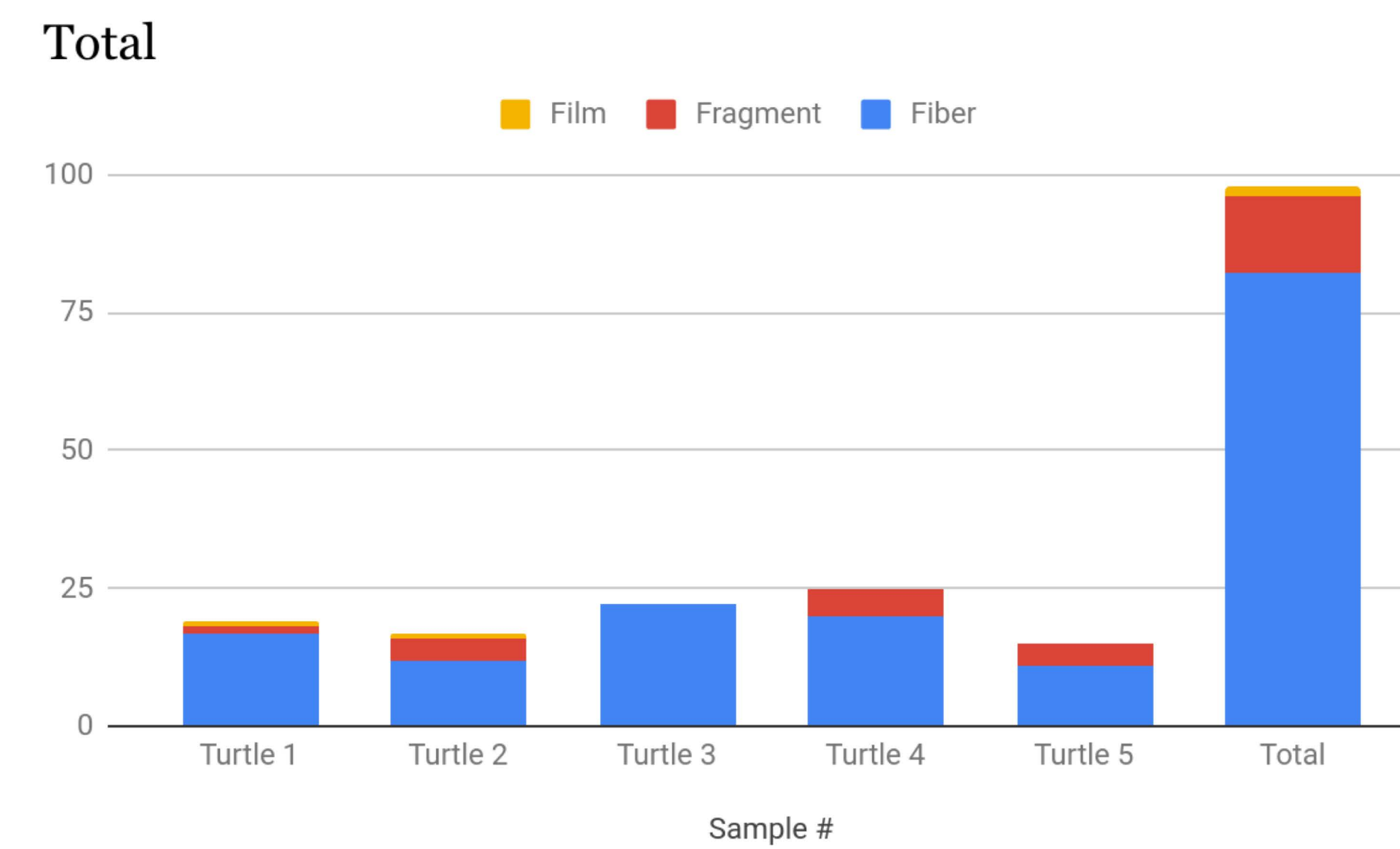
Abstract

Microplastics are plastic samples measuring less than 5mm. Microplastic concentration in the ocean has been quickly rising, in part due to increased industrialization. Microplastics pose a great threat to marine life such as the diamondback terrapin, *Malaclemys terrapin*, an important turtle species in Jamaica Bay. In this study, terrapin fecal samples were analyzed for microplastic presence. Out of nine samples from five different terrapins, nearly 100 microplastics were found. Microfibers were consumed most steadily with fragments and films consumed as a minority. This problem must be addressed to protect populations of marine life, especially in Jamaica Bay and other urban waterways where human impacts are most severe. Microfibers remain a large cause of the problem, being emitted from laundry and clothing.

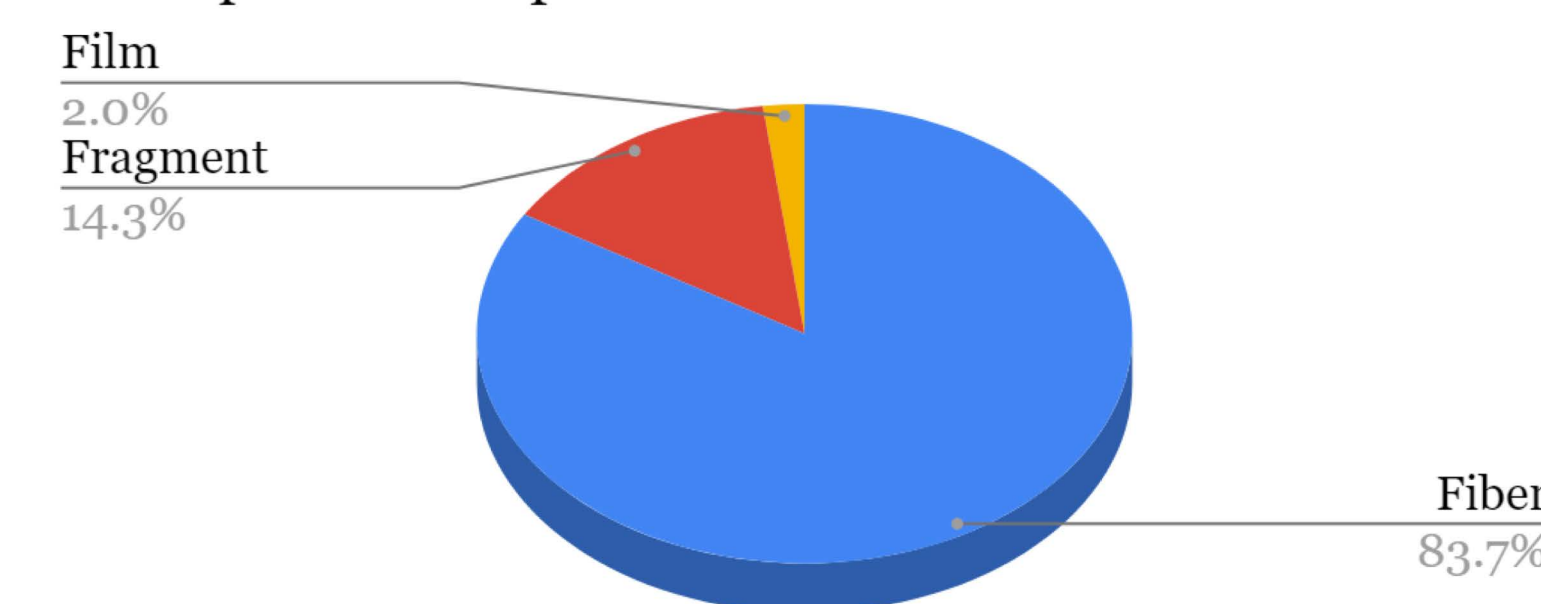
Introduction

Microplastic abundance in the ocean has risen for many years. Defined as particles under 5mm, between 15 and 51 trillion particles were suspected to be in the ocean by 2014 (Sebille et al). These increases pose danger to marine species and humans. Microplastics intoxicate oceans, and are consumed by species down food chains, spreading the toxicants in this process of biomagnification. Biomagnification is fueled by a rise in microplastics, as species commonly mistake the plastics for actual food, leading to extensive casualties. A recent study found the rate of mortality rose 50% after a sea turtle ingested plastic (Wilcox et al.). Microplastics enter the sea through primary and secondary sources stemming from human events. Primary sources of microplastic pollution include doing laundry, where microfibers from clothing make their way directly to open water, as they're too small to be filtered out in the wastewater treatment process. A secondary source of microplastics include larger plastic litter that enters into the environment and breaks down into many smaller pieces. Microplastic pollution affects the diamondback terrapin, a turtle species spread across the east coast of the US. The endangered diamondback terrapin is identified by a wiggly shell pattern and, through preying on salt marsh snails, ensures that cordgrass is not overgrazed. Overgrazed grass leads to a barren mudflat, and weakens marshes overall. This is significant as coastlines rely on healthy marshes to protect against storms. Microplastic ingestion weakens species that are vital to maintaining healthy marshes. In this study, we looked for the prevalence of microplastics in diamondback terrapins collected from the the Jamaica Bay Wildlife Refuge in Queens, NY. The sampled area is a vibrant marine ground severely affected by local infrastructure, which contributes to microplastic rise. In proximity to Jamaica Bay, for instance, houses a wastewater treatment plant, a primary source of emission. The process of finding microplastics involved analyzing fecal samples of five terrapins among nine samples, to see the amount of plastic ingested by them.

Tables And Charts



Microplastic Composition

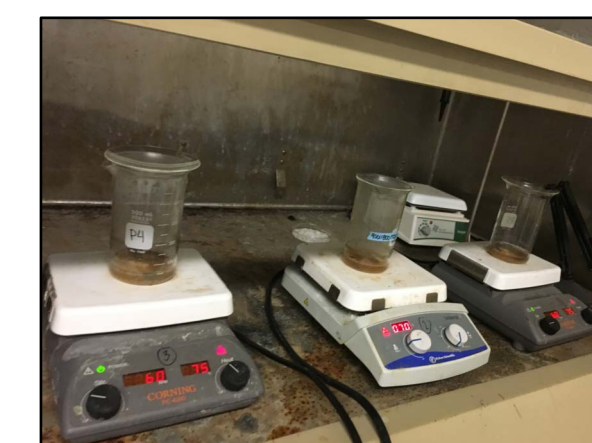


Sample #	Fiber	Fragment	Film
Turtle 1	17	1	1
Turtle 2	12	4	1
Turtle 3	22	0	0
Turtle 4	20	5	0
Turtle 5	11	4	0
Averaged	16.4	2.8	0.4
19.6 microplastics found per turtle			

Methods

- Samples were retrieved from the Jamaica Bay Wildlife Refuge on Cross Bay Blvd, Queens, NY
- Samples were sieved to isolate material smaller than 5mm
- Next samples were placed in an oven to dry at 150 degrees fahrenheit. Samples dried for multiple days depending on how much water was in the beaker
- When the samples were dry, a wet peroxide oxidation was performed on each of the samples in order to remove any leftover organic matter
- The density separation process followed. This involved separating any leftover waste from the final microplastics in the sample
- Examination

Wet Peroxide Oxidation



Density Separation

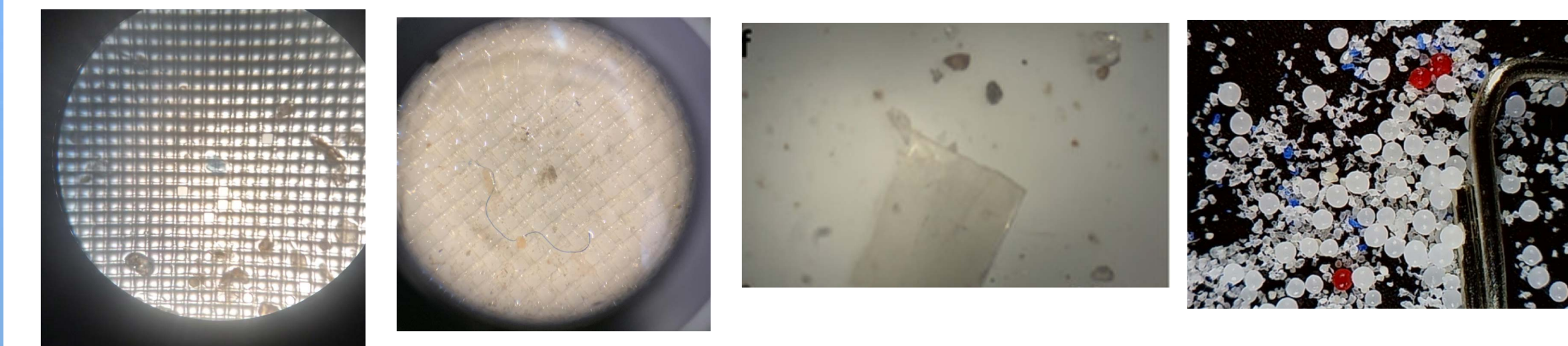


Results

Microplastics were, as expected, found to pose a great threat to the terrapins in the bay. All samples had high concentrations of them, averaging almost 20 per sample. Turtles one through five had 19,17,22, 25 and 15 plastics respectively. Nearly a 100 were found in total, and fibers made up over 80% of all plastics found. Fragments and film were also found as well in smaller quantities, making up around 16.3% of findings.

Discussion

Jamaica bay still needs to address its microplastics issue in order to ensure a better habitat for marine life ecosystems. Wastewater from laundry products like clothing enters sinks and pipes without proper filtering. This means fibers from these products end up in the ocean where terrapins eat them in mass. Lessening the number of fibers in the bay is a top priority. Limiting the consumption of fibers among diamondback terrapins would cut back the total number of microplastics consumed (from 98) to just 16. This could be done through a better filtration system in wastewater infrastructure and public spaces, one that would allow water to pass through, while blocking fibers altogether. It would be a costly endeavor on a global stage, but is certainly crucial to animal life in Jamaica Bay.



Pictured above (in increasing order), fragments, fibers, films and microbeads. Microbeads weren't located in this study, as there is currently a permanent ban against them in the US, Canada and other nations, as of 2017.

Literature Cited

- Sebille, et al. *A Global Inventory of Small Floating Plastic Debris*. IOPSCIENCE, 8 Dec. 2015, iopscience.iop.org/article/10.1088/1748-9326/10/12/124006;jsessionid=123F0E078E457FC6106D3ACEE956F209.c3.iopscience.cld.iop.org.
- Wilcox, Chris, et al. "A Quantitative Analysis Linking Sea Turtle Mortality and Plastic Debris Ingestion." *Nature News*, Nature Publishing Group, 13 Sept. 2018, www.nature.com/articles/s41598-018-30038-z#Bib1.

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