

Quantifying Microfibers Across Ventura and Los Angeles County

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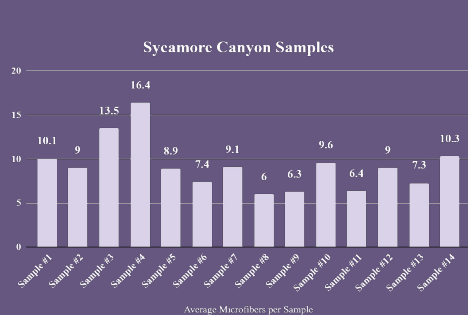
Abstract

Microfibers are a fast-growing concern in environmental issues; they are a pollutant that are quickly accumulating in and affecting ocean ecosystems, and are present in most of the Earth's watersheds, especially the U.S. Microfibers are a form of microplastics shed by synthetic materials such as fleece when washed. Watersheds, particularly Ventura watershed, is an area flooded with microfibers. Ventura county, like most watersheds surrounding urban areas, leads off into the ocean through different rivers. Although microfiber research has begun to pick up speed over the past decade, little to nothing has been done in Ventura county. We have decided to take various sediment samples across the Ventura watershed and it's various zones, as well as comparing them to similar areas in the Los Angeles County watershed zones. Sediment is then placed into 500 mL beakers and mixed with seawater. Once settled, the seawater is then poured into a Buchner Funnel filtration system with a filter paper. Each sample was mixed and filtered 3 times, in the hopes to clear the sample of microfibers. Finally, the filter paper will then be analyzed underneath a microscope to count the amount of microfibers present on the filter paper. In each of the areas chosen to be analyzed, it is expected that microfibers will be at every location sampled. From this data, we hope to conclude that there is a significant difference among the various watershed zones, so that variables that contribute to microplastic pollution can be further analyzed.

Introduction

A pollutant that is quickly accumulating and affecting ocean ecosystems around the world are microfibers. Microfibers are a form of microplastics shed by synthetic materials such as fleece when washed. Microfibers enter the ocean through several different strategies, one of them being from washing machines; filtering water into the ocean, and with it are the microfibers from clothing. Microfibers are unable to break down on their own, and they often carry harmful chemicals when traveling into the ocean. This point is highlighted in the study "Synthetic microfibers in the marine environment: A review on their occurrence in seawater and sediments" by J. Gago, in the quote, "The widespread distribution and accumulation of microfibers in the marine environment raises concerns regarding the interaction and potential effects of MFs on marine biota. As microfibers interact with plankton and sediments, both suspension and deposit feeders may accidentally or selectively ingest microfibers. When MFs are ingested, the leaching of adsorbed pollutants and additives could be a source of toxic substances influencing the organisms and entering into the food web leading all the way to humans.". In summer of 2019, I looked at comparing microfiber levels among two different watershed zones in Ventura County: Santa Clara and Ventura River. In both of these areas I was able to see fibers at every location sampled, and for the most part, the average amount of microfibers were about the same, with the exception of the midpoint of Santa Clara. From this data, it is difficult to conclude that there is a significant difference, and part of the reason may be that both of these watershed zones fall into the same county; by studying locations in varying watersheds, I can further look into any significant differences. Once we can look at possible causes for microfiber levels among various points across Ventura and Los Angeles County, we can speculate solutions to lower output.

Results



Methods

Samples are collected from various spots around Ventura County and Los Angeles County, such as Sycamore Canyon and Malibu Lagoon. From each spot, there will be three locations to pick up 300mL of sediment from the surface, and 300mL from approximately one foot down. Each sample is placed in its own container. Following the collection of samples, the sediment must be dried; each sample will be left out to dry for approximately one day. Sediment will then be placed into 500 mL beakers (200 mL of seawater to every 100 mL of sediment) and mixed so that microfibers are suspended in the seawater. This will be done until all possible viable samples, meaning beakers with 100mL, have been set up. Once the sediment in each sample has settled, the seawater is then poured into Buchner Funnel filtration system, switching out the filter paper every 100mL of seawater; leading to two filter papers used per beaker set out. Each sample will be mixed and filtered 5 times, in the hopes to clear the sample of microfibers. Each filter paper will be analyzed underneath a microscope to count the amount of microfibers.

Importance of Results

Since there is little to no research on microfibers in the general area of Ventura County, collecting data on microfibers will be necessary information for future research on the matter, whether done by myself or another. Several studies done on microfibers claim that this microplastic is the second most abundant plastic in the ocean, such as "Quantification of microfibre levels in South Africa's beach sediments, and evaluation of spatial and temporal variability from 2016-2017" by S. de Villiers. This study also highlights important issues that South Africa faces when it comes to water quality, which is an extra step I feel is necessary for the still growing Ventura County. By conducting this research, I am able to improve upon not only last year's data, but the realm of microfiber research as a whole. Also, by putting out this data to the public, local residents and companies can take this information into consideration in future practices to help lower their pollutant footprint in the world.

References and Acknowledgements

- Thank you to ALLIES in STEM for awarding me the grant used for conducting this research
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- Thank you to Dr. Andrea Huvard for being my professional supervisor for this project
- Thank you to my lab mates, Team Microfiber, for being a huge support in the process, as well as providing useful references
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