The Filtration Potential of Oysters to Purify NYC Waterways

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INTRODUCTION

- For a long time in Harlem, the Hudson River had a large population of oysters cleaning the water. The creatures dubbed “ecosystem engineers” had been filtering out harmful pollutants and clearing up muddy waters until the 1900s when the over-harvesting and overconsumption of oysters in local restaurants depleted the population.
- This nearly wiped out the colony of oysters in the Hudson River. Most people didn’t realized the significance of the problem until they saw a change in the rivers.
- Although oysters are a good meal for dinner, they are also mother nature’s own Brita filter. Without them, natural waterways would be filled with dirt and organic and inorganic particles.
- Over the course of five months we’ve been conducting experiments, testing pH, nitrate, hardness and turbidity levels to allow us to research oysters and the effects they have on river water.
- We collaborated with NYU lab physicist David Grier and his colleagues using their optica technology to assess the size of the particles in our water samples. With their technology we wanted to see if the samples treated with oysters have fewer particles and bacteria compared to the samples with no oysters.

QUESTION

How well do oysters filter bacteria and microparticles from the Hudson River?

HYPOTHESIS

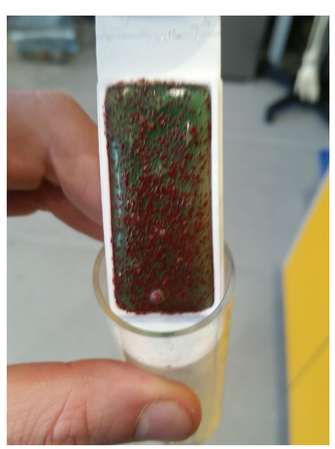
We believe that oysters will serve as an effective way to filter out bacteria and microparticles due to the filtration mechanisms within their body.

METHODS

- We collected the Hudson River water
- We measured and recorded the temperature, nitrate, hardness and the ph levels
- We compared the amount of bacteria in the river water with the Brita filter and with and without oysters.
- We compared the amount of microparticles (which we introduced) with and without oysters.
- Growing bacteria for this experiment we used the paddles and the broth in tubes. We placed paddles into a sample of river water then put them in the incubator to grow. The paddles have two side: a brownish-pink color side (MacConkey Agar (MAC)) that shows fecal bacteria; and a light yellow side (Nutrient-TTC Agar (NUT)) shows a wide range of organisms. The more the microorganisms grow the pH changes from an acidic level to alkaline level (pH 7.0 or higher) turning the agar light green, The agar pH is normally 6.0, Bacterial colonies appear as red dots on otherwise yellow medium.
- With the tubes we added in tiny samples of river water and left that inside the incubator allowing it to grow. The tubes had an EC Broth with MUG that detec E. coli in food and water using fluorescence.
- We collaborated with an NYU lab to use their Spheryx holographic microscope help measure the bacteria and to collect preliminary measurements

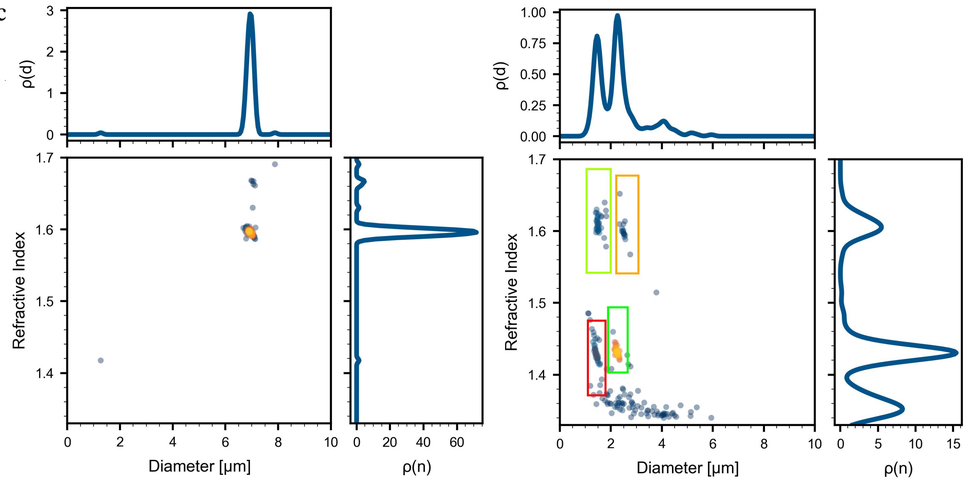
PRELIMINARY RESULTS

- We were unable to complete our experiments or start on the research we intended to, but we did create a platform to test whether oysters are effective filters for plastics or bacteria.
- We can answer this question with the techniques we identified, but it requires more time and experiments. This technology allows us to identify specific sizes and materials in our samples. The data shows how well we can identify 7 micrometer polystyrene particles. We still believe oysters will have an effect based on preliminary data.
- This data also shows how we can identify and quantify many different things mixed in one sample. We can identify specific types of bacteria with our culture tests (vials and paddles).



FUTURE DIRECTIONS

- We hope to answer our question.
- Using two tanks containing particles, one with oysters and the other without, assess the particle quantities. This way you can see how well the oysters filter out the particles and if they are effective or not.
- Using the biopaddles we can quantify how much bacteria is removed by the oysters. After a few hours bacteria, if any, will start to grow on the paddles. You can use the identification chart to find the species..
- We will continue to measure the pH, nitrate and hardness for each tank and record, in order to see the change between conditions.
- Eventually we can compare the effectiveness of oysters for filtering different species of bacteria and different types and sizes of plastics.



Spheryx Readouts (above): The Spheryx analysis can quantify the amount, diameter, and refractive index of microparticles in water: plastic particles (left) and a mixture of bacteria, sand, and plastic (right).

Bacterial Paddles (left): The differential paddle media suggests the species *Pseudomonas aeruginosa* and *Escherichia Coli* as possible species in Hudson River samples.

Works Cited & Acknowledgements

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- David Grier Lab, NYU
- Billion Oyster Project
- Marymount Manhattan College, Microbiology Lab