Enterococci Levels in Sediment and Water from Bayside and Oceanside Water Areas

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Introduction

Water is important to human beings for both recreation and survival; such as drinking, swimming, fishing, kayaking, snorkeling, scuba diving, jet skiing, surfing and etc. Therefore, great emphasis is placed on the cleanliness of recreational and drinking water sites to prevent detrimental health effects.

Different methods are used to determine this including testing for the acidity (pH), dissolved oxygen, and harmful bacteria in the water. Concerning bacteria in water, the abundance, as well as, certain bacteria that act as indicators of fecal contamination is studied. Two of the most commonly known fecal bacteria indicators are *Escherichia coli* (*E. coli*) and *Enterococcus faecalis* (enterococci). However, EPA recommends enterococci for marine/seawater because of its higher survival rate as opposed to *E. coli*.

The objective of this project was to understand the presence of enterococci and other bacteria in Jamaica Bay, as it serves as a popular recreational site. We broadened this curiosity to understanding whether levels of bacteria in sediment correlated with levels of bacteria in water. As well as, whether direct human interaction also played a role, due to the observation that the amount of people that were in direct contact with the bay was significantly less than in another recreational site such as Rockaway Beach.

Question:
- How does the bacteria level in sediment compare to the bacteria level in water in Jamaica Bay?
- How does direct human interaction, such as walking running, swimming, etc. in Rockaway Beach affect the levels of bacteria in sediment compared to the bacteria in water?

Hypothesis:
Sediment will contain the highest level of enterococci compared to water. Additionally, since Rockaway Beach has more direct interaction, the ratio of enterococci of water to sediment will be greater than in Jamaica Bay.

Method
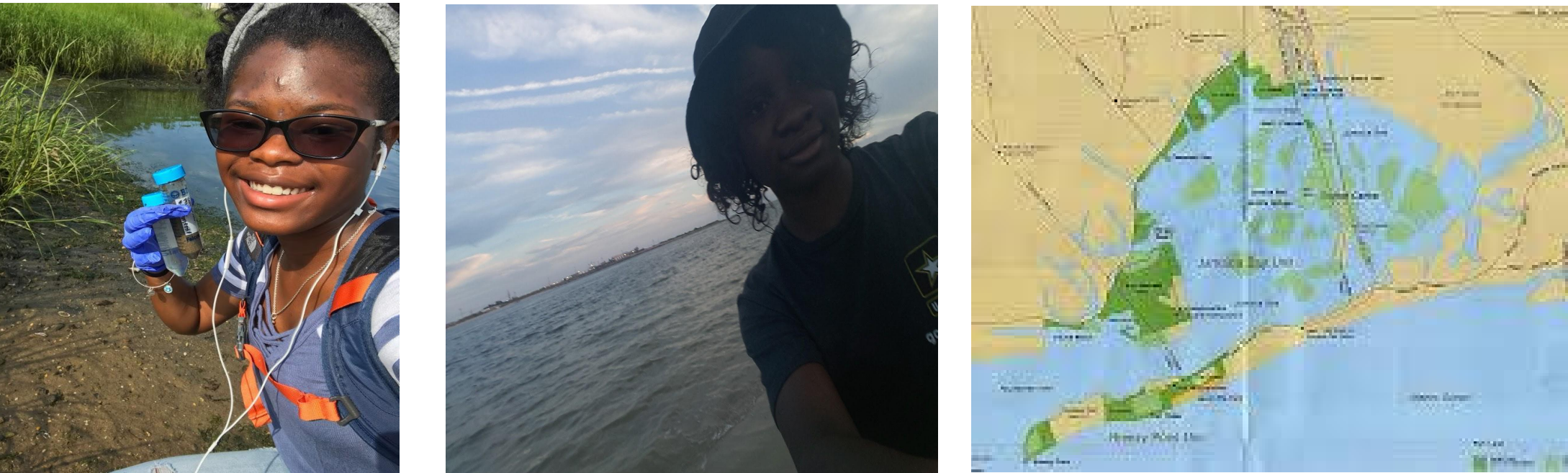
Samples were processed with IDEXX
- The water sample was diluted 1:10 with sterile DI water (10mL sample, 90 mL DI H_2O).
- For the sediment sample, 10 mL of distilled water was measured, poured into the sample tube, and vortexed. Then 10 mL of the water was added to 90 mL of DI water.
- Enterolert media was added to all diluted samples then combined mixture was poured into IDEXX Quantitrays
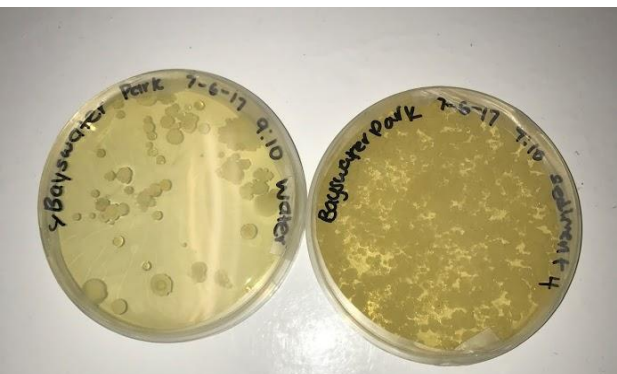- Incubated at 41°C overnight.

Samples were plated
- A gram of sediment from samples is placed a small tube, diluted with 100 µL of DI water, then mixed thoroughly.
- A pipette was used to take out the 100 µL and/or 10 µL of the water and spread all over plates containing media.
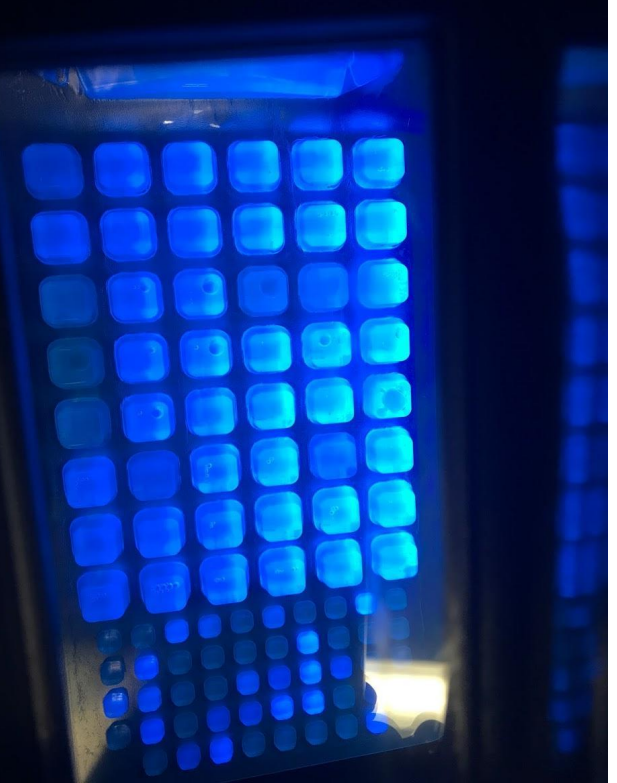- 100 µL from the water samples, place them into plates using pipettes and spread all over plates.
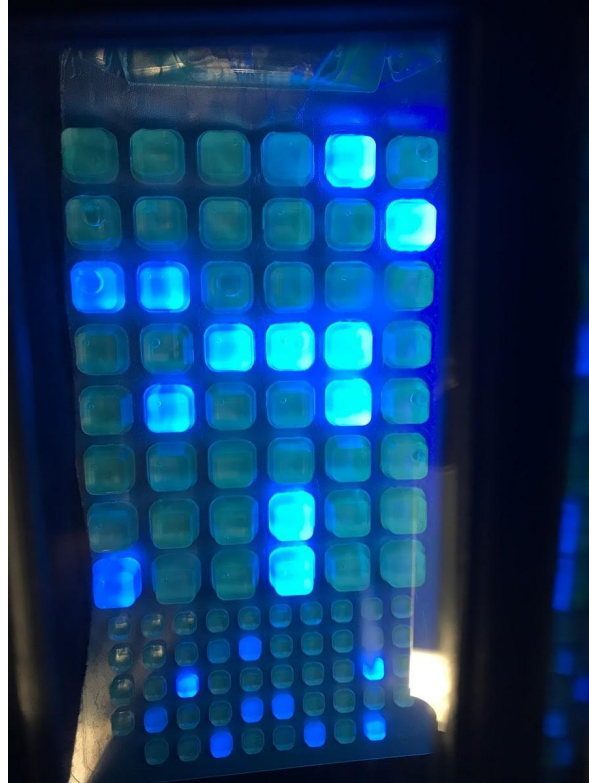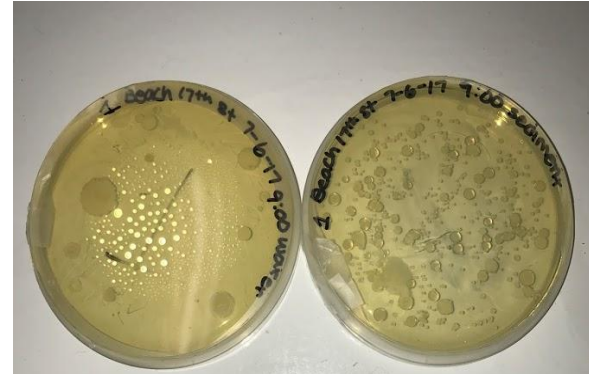
Results
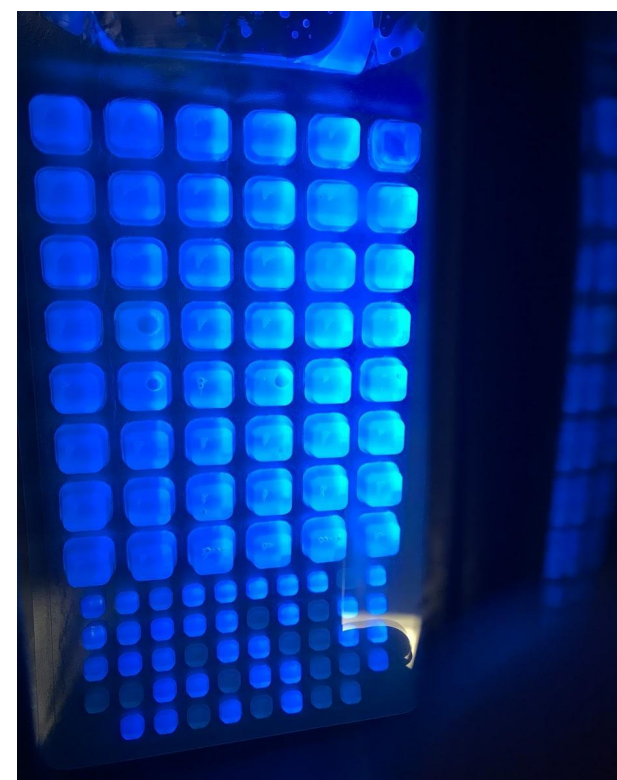
Bayswater Sediment

Canarsie Sediment

Beach 17th Sediment

Bayswater Water

Canarsie Water

Beach 17th Water

- More sediment found in sediment than water

Enterococci Levels in Sediment and Water from Bayswater Park

Approximate Bacteria Colonies in Bayswater Park

Enterococci Levels in Sediment and Water from Beach 17th St.

Approximate Bacteria Colonies in Beach 17th St.

Enterococci Levels in Sediment and Water from Canarsie Pier

Approximate Bacteria Colonies in Canarsie Pier
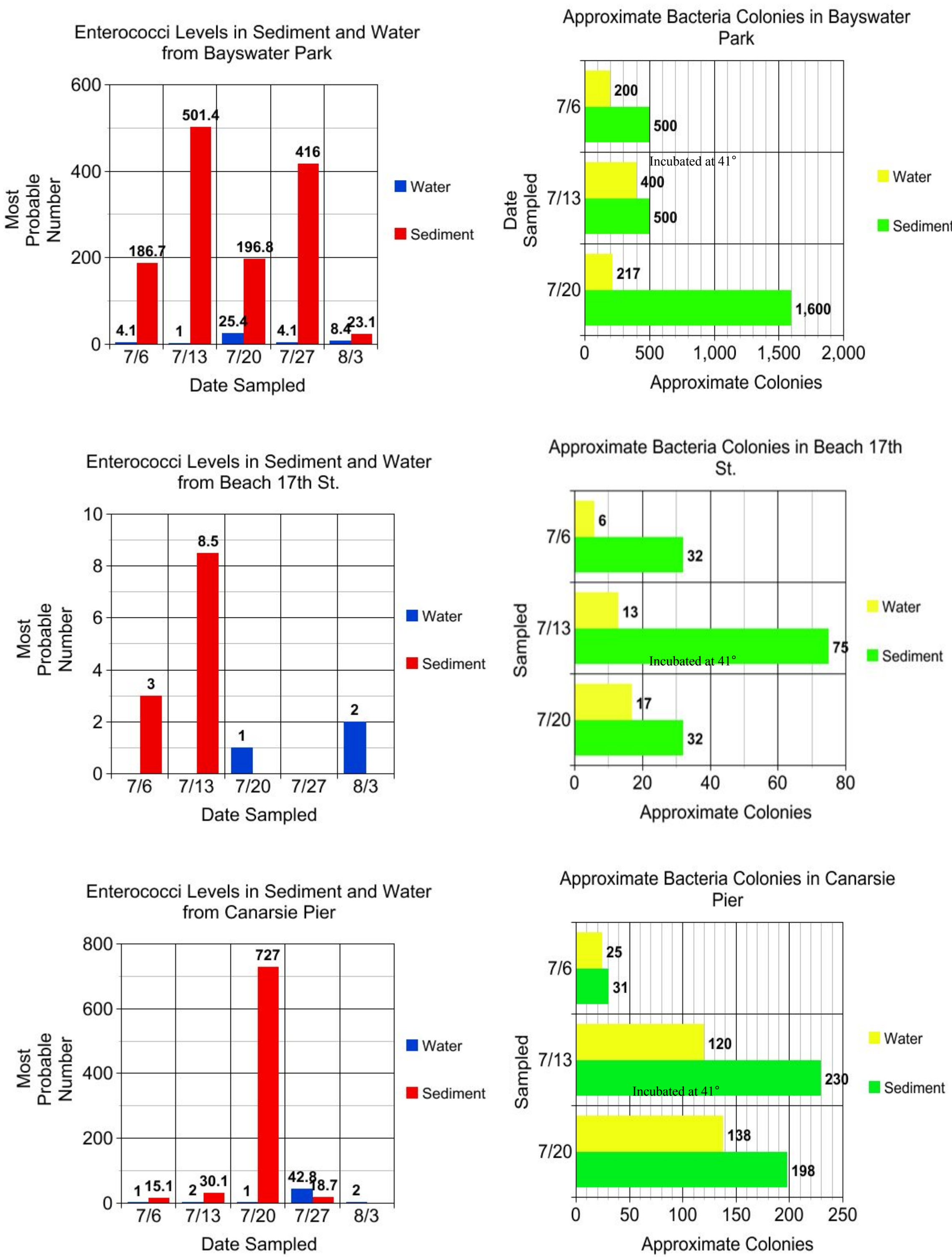
- Bayside areas had higher bacteria levels

Discussion

Consistent with our hypothesis, the amount of enterococci in sediment samples were larger than the levels in water. This may be due to a collection of reasons: sediment provides a surface for bacteria to grow on, sediment is stable, underwater sunlight does not reach sediment. It is likely that a beach with increased use would have given more substantial results to compare direct us with the bay.

Regarding the petri dishes, the amount of bacterial cultures on the first day of testing was smaller than the other two days. This is likely due to the fact that the first petri dishes were incubated at body temperature. We can conclude that the colonies survive either because they adapt to extensive conditions or because of animal contamination. To further this study, the following should be taken into consideration: range of water sampling areas, wind speeds and weather as there could exist contaminants in the rainwater that affects the data.

Conclusion
- Bacteria that could potentially harm humans is generally higher in sediment than in water.
- Jamaica Bay has higher enterococci levels than Rockaway Beach
- This may be so in Jamaica Bay because of Combined Sewage Systems in which when it rains more than an inch, the sewage and the rain all disperse in the Bay,

Broader Impacts
- We will continue to further spread awareness through this project to others since in taking care of our environment, we are taking care of ourselves.
- Keeping our water sites clean of human contamination by appropriately disposing of trash, may also help to lower contamination levels.

References

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