Examining Oyster Presence and the Impact of Salinity on Oyster Survival on Randall's Island

Jalis McMyers[1] , WATERS Internship

Introduction

Oysters are filter feeders, filtering out potentially harmful particles from the water while they eat. They also remove excess nitrates from water by taking the compound into their tissues.

Oyster populations in New York City reached devastatingly low levels around a century ago, following many years of chronic overharvesting.

The ecology of Little Hell Gate Salt Marsh (LGHSM) is a prime location for the development of oyster colonies. Oysters have previously been found in this area. LHGSM contains brackish water, displaying qualities from both fresh and saltwater systems. A 2016 study on oysters in this region found many oysters but did not assess the environmental conditions that may have contributed to oyster presence.

Hypothesis

- Oyster survival will be the most abundant in the 20 ppt concentration tank. The highest salinity will be the most detrimental to their survival.

- Due to restoration efforts, a greater abundance of oysters will be found in the field now than there were in the 2016 study due to improved environmental conditions.

Methods

- Location: Little Hell Gate Salt Marsh (LHGSM).
- In the field, LHGSM was assessed for oyster populations across six 10 meter transects. Oysters were marked for status (alive or dead) and height from bill to umbo.
- In lab, three fish tanks were set up with ten oysters each to determine how the salinity content of the water may affect oyster survivability.
- For both lab and field, water quality was tested, which included: salinity, dissolved oxygen, temperature, nitrates, and phosphates
- Equipment used included: a bag seine net, two portable air pumps, YSI meter for dissolved oxygen (ppm) and water temperature (°C), a LaMotte nitrate and phosphate testing kit.
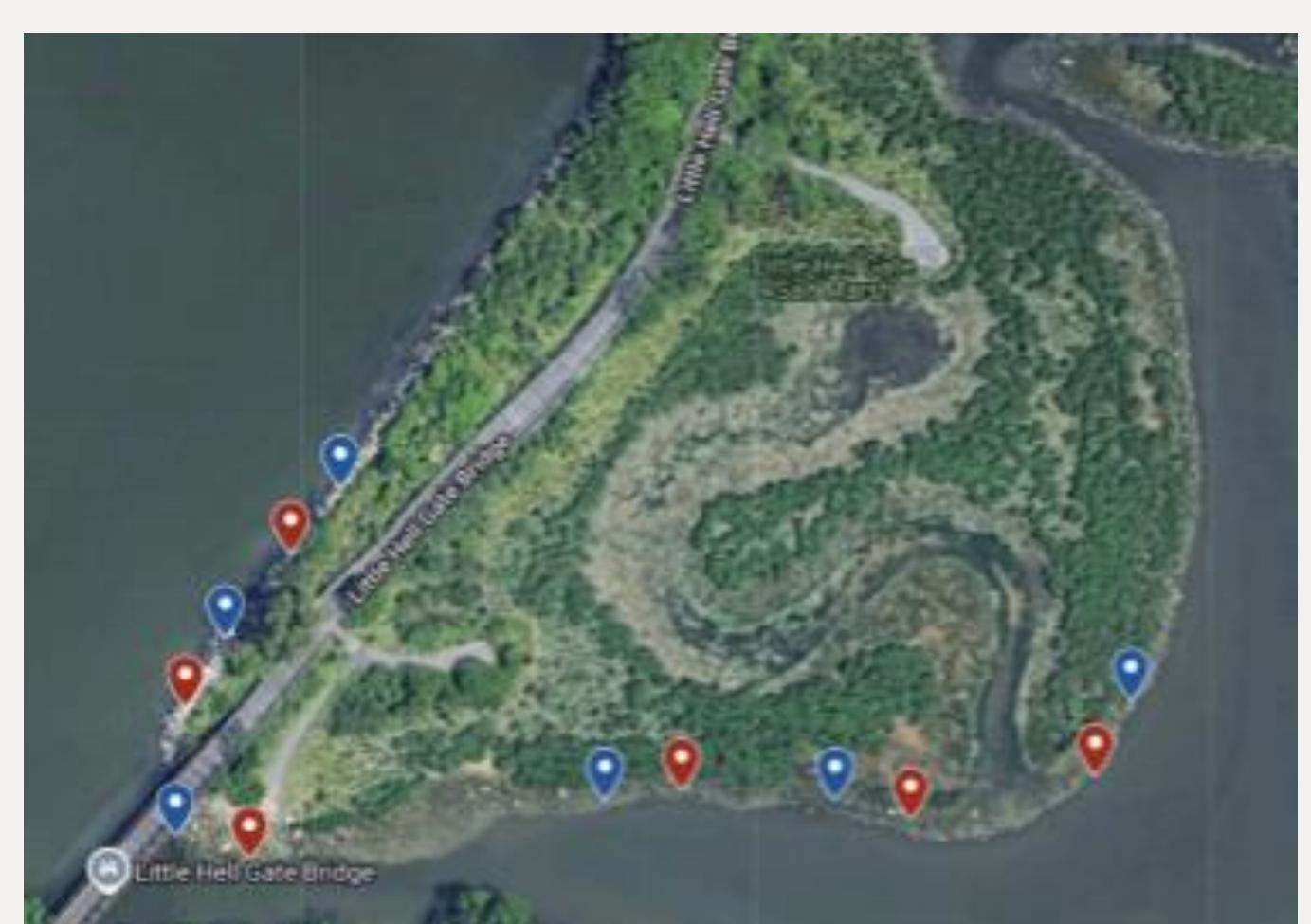
Figure 1. Left: Coordinates of sampled area in the LHGSM. Right: Picture of lab set-up with three different salinities. Each tank had 10 oysters per treatment level (n=10).

Results
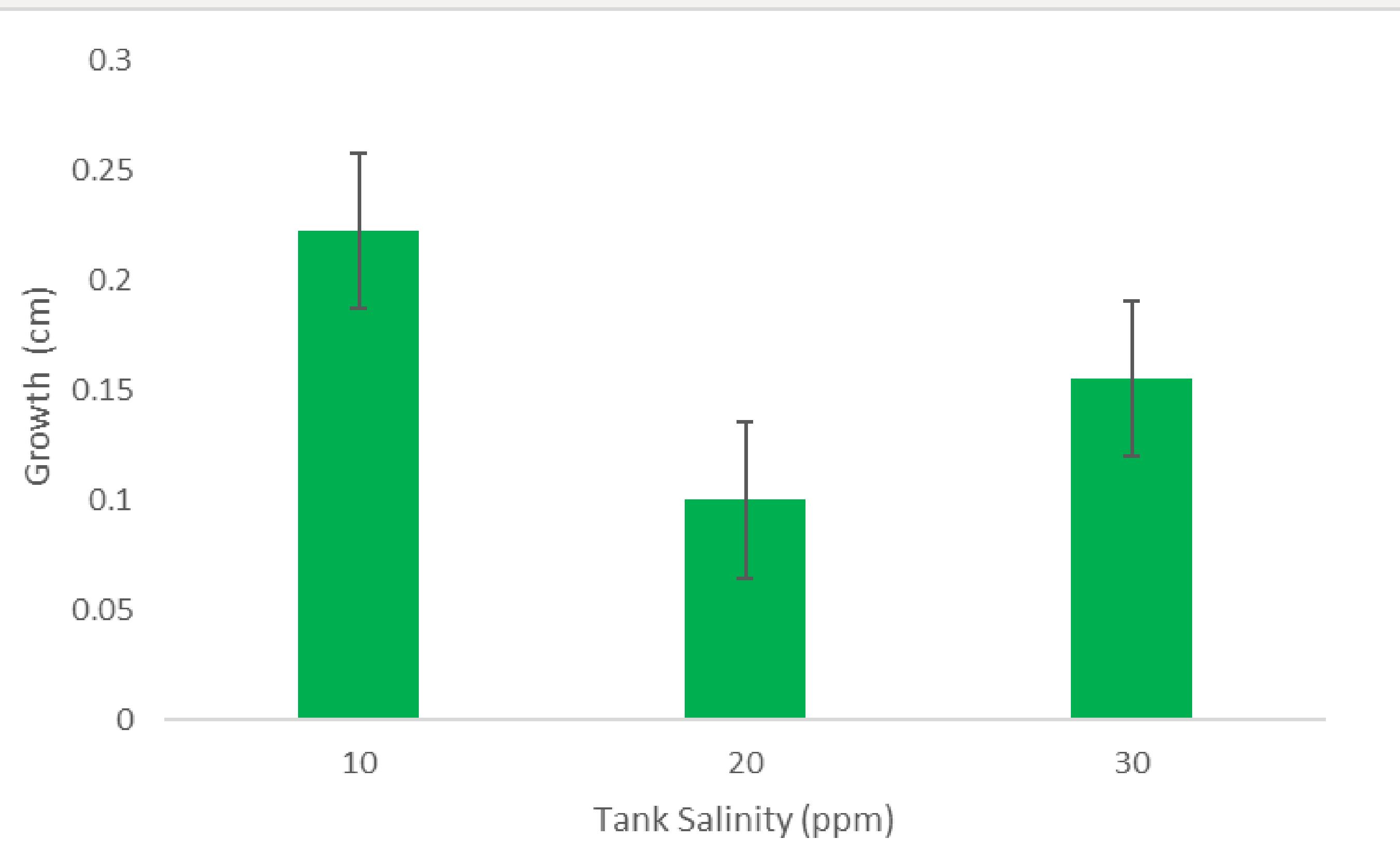
Figure 2. Average oyster growth across the three experimental tanks in centimeters (cm). The tank with 20 ppt salinity had the lowest average change in growth while the tank with 10 ppt salinity had the highest growth.
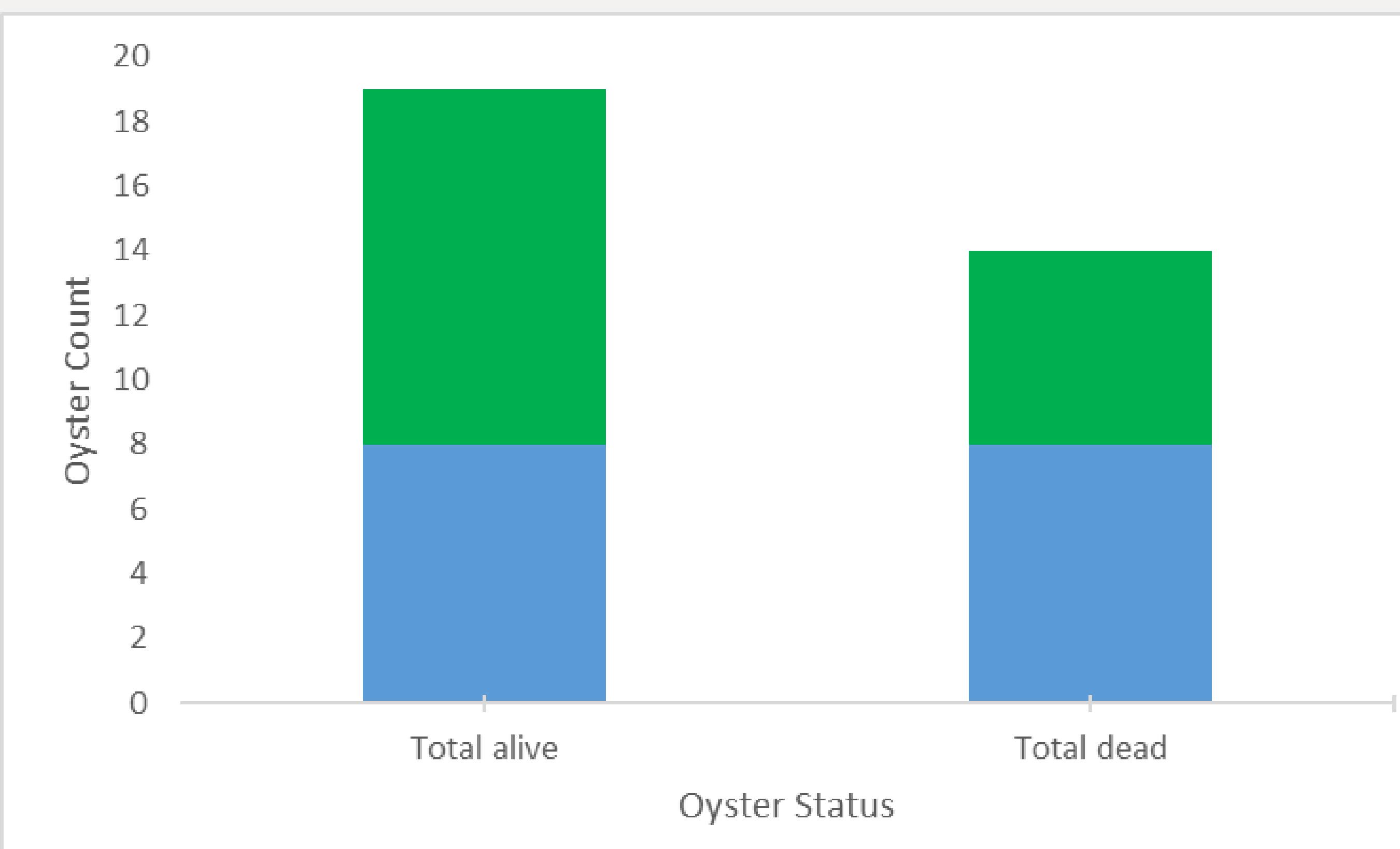

Figure 3. Comparison of alive and dead oysters in the salt marsh. Blue represents transect 3, which had the same number of oysters alive and dead. Green represents transect 4. Transects with oysters present were included.

Date	Salinity	Turbidity	DO	Temp	Nitrate	Phosphate
7/2/2025	15	58.5	5.44	22.9	0.6	1
7/10/2025	20	13.2	5.59	24.2	1	0.6

Table 1. Water quality data from Little Hell Gate Salt Marsh. Each was taken on the same day that oyster sampling was conducted

| Transect	Total alive	Total dead	Total oyster	Average size
1	0	0	0	0
2	0	0	0	0
3	8	8	16	7.125
4	11	6	17	5.047059
5	0	0	0	0
6	0	0	0	0
	19	14	33	6.086029

Table 2. Comparison of oysters found across each transect. The total amounts found dead and alive, and the average size of the oysters are shown

Discussion

- In comparison to the results of the 2016 study, there were considerably fewer oysters found in the LHGSM. While the locations were not the same, there were almost four times as many found in the salt marsh in 2016 (33 vs 119).
- In the field, accessibility was a factor in being able to find oysters in the salt marsh. This meant that data collection could only occur on certain days when the tide allowed for accessibility into the salt marsh.

Conclusion

- The Little Hell Gate Salt Marsh has the ability to sustain a population of oysters on Randall's Island.

- We saw higher growth of oysters in lower salinity in the lab setting.

- Next steps include seeding oyster spat to increase the wild oyster population.
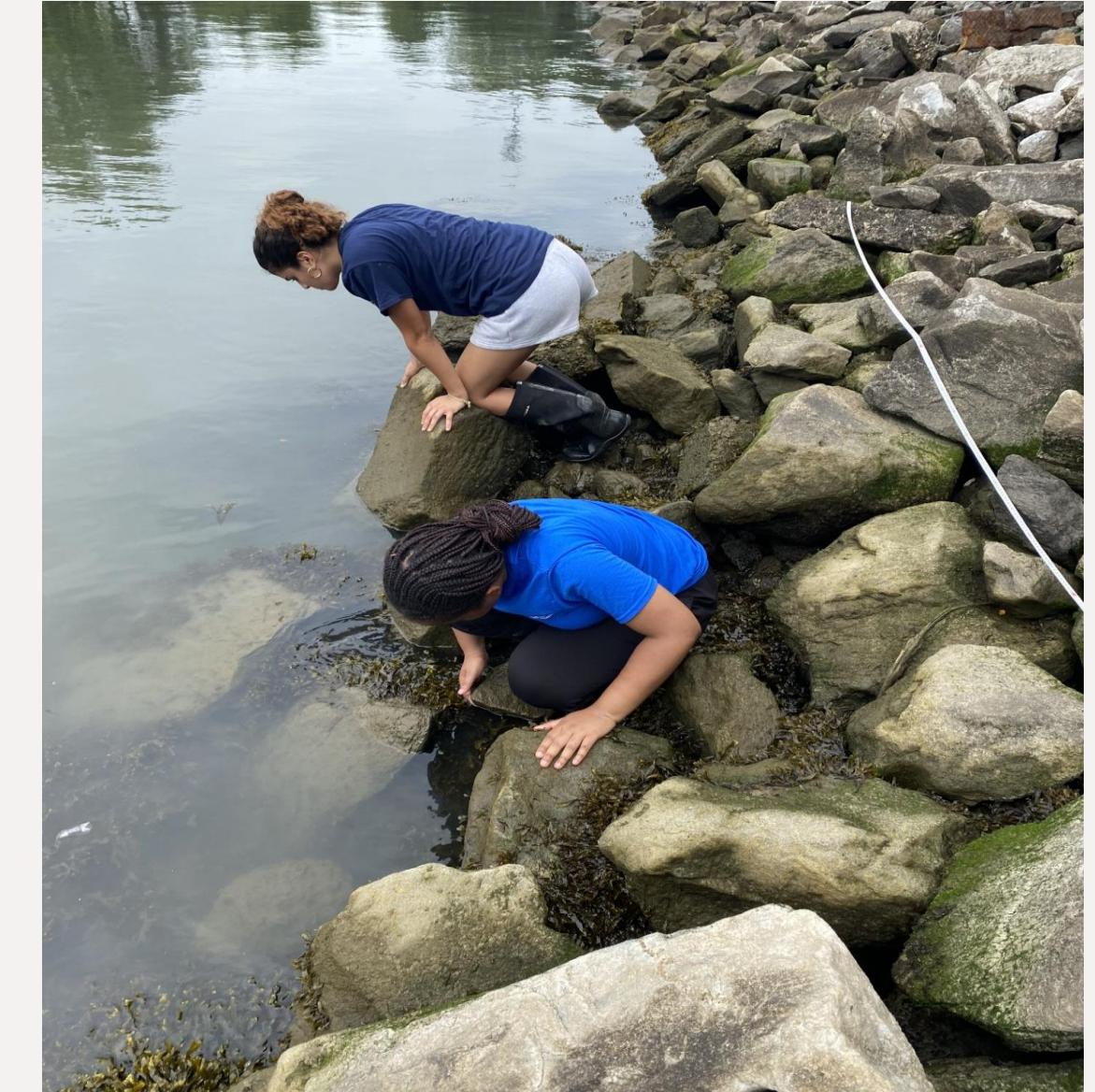
Acknowledgement

References

- Billion Oyster Project. (2025) Guide to Keeping an Oyster Research Tank.
- Chann, T. (2016). Oyster Substrate Identification in the Little Hell Gate Bridge Shoreline. Randall's Island Park Alliance.
- McFarland, K., & Hare, M. P. (2018). Restoring oysters to urban estuaries: Redefining habitat quality for eastern oyster performance near New York City. PLOS ONE, 13(11), .e0207368. https://doi.org/10.1371/journal.pone.0207368
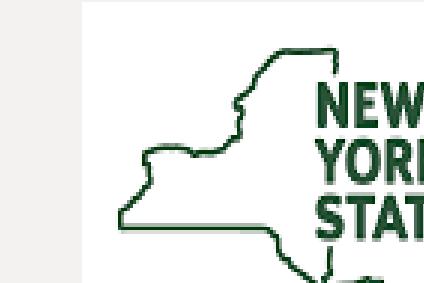
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