

Assessing Suitability for Oyster Reef Establishment in a Maine Basin
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This summer, I contributed to a multi-year study in collaboration with The Basin Oyster Project, an initiative exploring the possibility of oyster reef introduction in The Basin. The project focuses specifically on the Eastern Oyster, which has not been native to Maine for the last two thousand years. However, increasing ocean surface temperatures have made the Gulf of Maine a nascent, potentially viable habitat for the species. Oyster reefs provide many ecosystem services, including water purification and shore protection from wave action, incentivizing research into their introduction.

Our research aimed to answer multiple questions: Are carbonate chemistry conditions in our sample areas ideal for oysters? What changes occur seasonally and annually, and why? What do emerging trends mean for aquatic ecosystems and coastal communities? Is oyster reef restoration feasible in this location? To answer these questions, we contributed to a multi-year dataset, taking weekly trips to Schiller Coastal Studies Center and biweekly cruises out to The Basin to collect water samples and take real-time measurements of temperature, salinity, dissolved oxygen saturation, and pH. Back in the lab, we analyzed the samples for Dissolved Inorganic Carbon and Total Alkalinity, which we used to calculate the aragonite saturate state (Ω_a) of the water sample. (Ω_a is a measurement of the availability of carbonate in the water, which oysters rely on to build their shells.) We compared the values we found in The Basin to studies on optimal conditions for Eastern Oysters to assess the suitability of the prospective habitat. We used R and Ocean Data View to visualize the data temporally and spatially to detect complex patterns and analyzed relationships between variables to identify the processes likely driving changes in certain parameters to predict seasonal trends.

Some of our research questions require a longer term dataset to answer; we are unable to declare with certainty if The Basin will provide a suitable site for oyster reef introduction with only two summers of data. However, we can make preliminary observations of the conditions from what we have measured so far. Based on the data we have, it seems that The Basin has promise as an oyster reef habitat. While temperatures are generally lower than Eastern Oysters prefer for the majority of the year, they did reach 20°C the past two summers, roughly coinciding with the oyster spawning season. As 20°C has been identified as a threshold for successful spawning, we are optimistic that despite the typically frigid temperatures, The Basin warms just enough at the right time to potentially support reproduction (Lowe et al. 2017). Ω_a values are also promising. Siedlecki et al. identified an Ω_a value of 1.5 as a critical threshold for oyster shell growth (2021). In The Basin, Ω_a remained above this threshold throughout the growing season. While Ω_a dipped below 1.5 in the late fall, winter, and early spring, oysters tend to be dormant during this period, so they would likely be unaffected by the temporarily suboptimal conditions. However, salinity in The Basin was higher than optimal throughout the dataset, and more data is necessary to determine how detrimental this may be to Eastern Oysters.

In summary, the data collected thus far suggests it is possible that an oyster reef could be introduced and sustained in The Basin. However, a much larger dataset is necessary to draw more concrete conclusions based on longer-term trends. I hope to continue working with Professor LaVigne as this project unfolds.

Faculty Mentor: Professor Michèle LaVigne
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References

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