An Analysis of the Impacts That Temperature and pH Have on the Relationship Between Oysters and Eelgrass in the Gulf of Maine

Eban Charles, 2023

As eelgrass beds in the state of Maine are continuing to disappear at an alarming rate, Maine's oyster aquaculture industry is expanding significantly. In fact, oyster aquaculture in the Gulf of Maine is currently worth $10 million annually, and landings are predicted to triple by the year 2030. A portion of this money could be allocated towards eelgrass bed restoration if oysters were found to grow faster in the presence of eelgrass both in present-day and future seawater conditions. To incentivise this funding from oyster aquaculture businesses, I collaborated with other Bowdoin students, professors, and the Quahog Bay Conservancy (QBC) to conduct a large-scale mesocosm experiment.

Oysters provided by the QBC were super glued to PVC plates and placed in 7-gallon buckets that either contained planted eelgrass shoots (Figure 1) or no eelgrass at all. Both of these bucket types were then continuously filled via a PVC piping system with either seawater of futuristic conditions (higher temperature and lower pH, header tank #1), seawater that was only treated to have a lower pH (header tank #2), seawater that was only treated to have a higher temperature (header tank #3), or seawater with a present-day temperature and pH level (header tank #4). To examine oyster growth across all of these conditions, each oyster was photographed and traced for the difference in its surface area before and after the experiment. According to preliminary statistical analysis of this data, the mean size (surface area) of oysters was relatively the same across the four seawater treatments (Figure 2) at the beginning of the experiment, indicating that any trends later observed in oyster growth across treatments may be caused by the seawater treatment and not by variance in the initial size of oysters. Further statistical analysis will be conducted during the Fall semester, and our research team hopes to publish our final results in a peer-reviewed research paper in the near future.

Figure 1. An oyster plate placed in a 7-gallon bucket containing 15 planted eelgrass shoots from a cove southwest of Dog's Head Island in Harpswell, Maine.

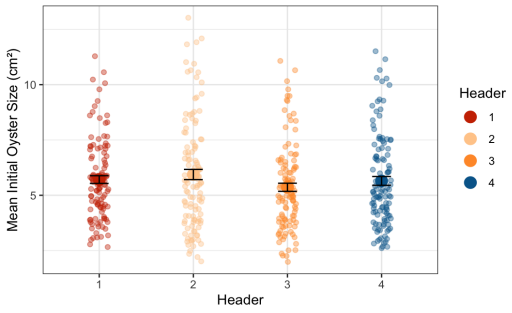

Figure 2. The mean initial size (cm²) of the oysters in each of four different seawater treatments (each seawater treatment is labeled as its respective storage header tank). There was no significant difference (p-value of $0.23 > 0.05$) in the mean size of oysters across different seawater treatments before the experiment began.

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