A Survey of Maine's Intertidal to Ascertain the Potential Impact of the Disappearance of the Blue Mussel (*Mytilus edulis*)

Sam Neirink, Class of 2022

Summary: The Blue Mussel (*Mytilus edulis*) is of great importance to the rocky intertidal ecosystems in which it is found across the world. It is a foundational species, and when present has great impacts on the biodiversity and productivity around it (Sorte et al 2016). Unfortunately, recent decades have seen a severe decline in the populations of *M. edulis* living on the coasts of Maine. Sorte et al. (2016) reported that intertidal Blue Mussels have shown a 60% decline at the site level since 2017. Given the importance of these bivalves, their decline could be of great consequence to Maine's intertidal ecosystems.

This potential consequence was the impetus for our study. We were attempting to ascertain what impact a decrease in the numbers of *M. edulis* would have on the biodiversity of the sites at which the mussels were found. We predicted that biodiversity and species richness – our chosen measures of ecosystem health – would increase with increasing Blue Mussel cover. Additionally, we were attempting to understand what role the invasive European Green Crab (*Carcinus maenas*) might play in contributing to the disappearance of Blue Mussels. My partner in this study, Liam Healy, concentrated on this issue while I concentrated on the aforementioned ecosystem effects of the disappearance of *M. edulis.*

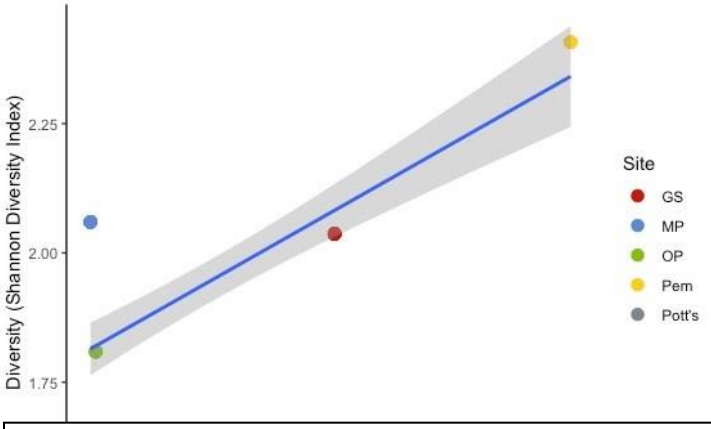

Fig. 1: The diversity of the 5 sites, as measured using the Shannon Diversity Index, vs. the average percent cover of Blue Mussels (*M. edulis*) at those sites. Greater percent cover of mussels led to greater diversity (p = 6.13e-13 R^2 = 0.5341).

To answer this latter question, we conducted transect-and-quadrat surveys of 5 different coastal sites across midcoast Maine. These sites were Giant's Stairs in Harpswell, Maine; Pott's Point in Harpswell, Maine; Ocean Point in Boothbay Harbor, Maine; Pemaquid Point in Bristol, Maine; and Marshall Point in Port Clyde, Maine. These sites were chosen mainly due to their having the presence of both Green Crabs and Blue Mussels and being accessible for a day of work from the Bowdoin Schiller Coastal Studies Center out of which we were based.

We found that species diversity – as measured by the Shannon diversity index – increased with increasing mussel cover (fig. 1, p = 6.13e-13 R^2 = 0.5341). Species richness also increased with increasing mussel cover, showing a trend very similar to that of species diversity (p = 4.28e-11, R^2 = 0.472). We were not able to ascertain to what extent this relationship is causal but will be continuing to delve deeper into the complexity of the relationship between Blue Mussels and the species that live around them during the coming semester.

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Sources Cited:

Sorte, Cascade J., et al. "Long-Term Declines in an Intertidal Foundation Species Parallel Shifts in Community Composition." *Global Change Biology*, vol. 23, no. 1, 2016, pp. 341–352.