

Is Bait on the Plate? Diet Analysis of Green Crabs in the Gulf of Maine
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This summer I worked in the Kingston and Carlon Labs continuing a long-term study on European Green Crabs (*Carcinus maenas*) in the Gulf of Maine. Green Crabs are an invasive species that originated in Europe, but have spread all over the world, including both U.S. coasts. Their resilience in different water temperatures allows their populations to boom, meaning these crabs have the potential to dramatically alter the ecosystems they invade. Green Crabs have been blamed for destroying habitats and affecting fisheries, including Maine's own soft-shell clam industry.

Over the past few years, our efforts have focused on tracking population dynamics of these crabs to better understand how they might interact with the local ecosystem. We have tracked four sites in Harpswell Sound since 2014, using two eelgrass sites and two soft sediment sites. Notably, every year crab populations seem to spike in early summer; however, past analysis revealed that this spike was not related to water temperature. Anecdotal evidence suggests that the population increase occurs coincident with the beginning of lobstering season, when fishermen begin to put their traps out in Harpswell Sound. This led to the question—is the lobstering industry affecting the Green Crab populations? Each lobster trap contains about a pound of lobster bait, and the thousands of lobster traps in Harpswell Sound mean that thousands of pounds of bait are entering the ecosystem every day during the lobstering season. This incredible amount of outside energy could potentially be subsidizing the crab populations. On the other hand, the removal of lobsters, an important Green Crab predator, could also have a top-down effect on the number of crabs.

To test this theory, we will be analyzing the contents of the stomachs of three species: European Green Crabs, the native Atlantic Rock Crabs (*Cancer irroratus*), and American Lobsters (*Homarus Americanus*). The diet analysis involves two parts: DNA sequencing, to reveal the species the predators are eating, and Carbon-Specific Stable Isotope Analysis, to reveal the amounts of relevant prey. This summer my work focused on the first part, DNA work, as well as crab collections. Every week I went out to the Coastal Studies Center to set our eight crab traps and one lobster trap, and 24 hours later I returned to haul the traps and collect any crabs or lobsters we had caught. I dissected up to 40 crabs from each site, and used a soil/fecal DNA extraction kit to get DNA from 5 of those stomachs. I also began testing primers for Polymerase Chain Reactions, or PCR, which will allow us to amplify the DNA we previously extracted.

Future work on this project includes continuing PCR and eventually sending our DNA off to get sequenced. Using the information we gather about the contents of the species' stomachs, we will move on to Compound-Specific Stable Isotope Analysis, which will demonstrate how much of each species the crabs and lobsters are eating. This work will eventually provide a better understanding of the role these important species play in Harpswell Sound and the Gulf of Maine.

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