Identifying transitions from diatoms to dinoflagellates in Harpswell Sound as an early detection of Paralytic Shellfish Poisoning-inducing *Alexandrium fundyense* blooms

Margaret Lindeman, 2015

Phytoplankton populations in the Gulf of Maine go through yearly cycles, with a major bloom occurring each spring. These blooms are characterized by a succession of species groups, beginning with diatoms and then transitioning to dinoflagellates, which include the toxic species *Alexandrium fundyense*. Certain pigments act as taxonomic markers for these species groups, and because pigments absorb light in distinct wavebands, absorption spectra can be used as indicators of pigment composition. The goal of my ongoing project is to determine the effectiveness of absorption as a proxy for taxon distribution through a comparison with three other potential proxies: cell counts, pigment analysis, and fluorescence.

We sampled eleven stations throughout Harpswell Sound, Middle Bay, and Quahog Bay during seven weekly research cruises between May 31st and July 5th. My data was collected using an AC9+ profiler package, which included two WET Labs in-situ spectrophotometers (an AC9 and an ACS) and two fluorometers. Two casts were performed at each location, first with a 0.2 micron filter and then with a 10 micron net, allowing us to separate absorption by particles in three size fractions (>10 microns, 2-10 microns, and <2 microns). These instruments provide us with continuous depth profiles of absorption at certain wavelengths, including those that we would like to focus on in identifying *Alexandrium* blooms. Specifically, diatoms contain fucoxanthin, which has an absorption peak around 532nm, and dinoflagellates contain peridinin, with a peak around 470nm. The relative abundance of each species group can thus be determined by calculating ratios of fucoxanthin to peridinin absorption.

The data that we have collected provide us the unique opportunity to make comparisons between the three water bodies through time. Along with species group abundance, we can look at overall absorption as a proxy for phytoplankton concentration. Looking at the largest size fraction relative to the total will indicate *Alexandrium*’s contribution to the total phytoplankton biomass.

We will continue to work on this project throughout the coming year to further develop these proxies and evaluate their application in the Gulf of Maine. Further sampling trips and continuous measurements from moored oceanographic buoys, including the Bowdoin buoy in Harpswell Sound, will allow us to monitor relative taxon composition through time and help us to understand the hydrographic factors affecting the blooms’ progression.

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