D. Abstract

1. Research Category (ECOHAB: Ecology and Oceanography of Harmful Algal Blooms) and Funding Opportunity Number: EPA-G2006-STAR- B1

2. Title: Relation Between Grazer Toxin Dynamics and Resistance to Toxic Dinoflagellates

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5. Project Period: 9/1/2006-8/31/2009

6. Project Cost: $ 520,117

7. Project Summary: Harmful algal blooms (HAB) pose a serious threat to public health, aquaculture and fisheries. However, the ecological and evolutionary consequences of HAB to grazers, the ramifying effects on food web structure and function, and on the transfer of toxins are not well understood. Toxic dinoflagellates of the genus *Alexandrium* bloom along eastern Canada and New England. In previous work, we have demonstrated local adaptation **(resistance**) to toxic *Alexandrium* in one species of copepod, *Acartia hudsonica*. This new information is the first documented case of resistance in marine pelagic grazers, and has helped explain disparate and sometimes contradictory results from other previously published studies. Resistance has two important consequences in food-web dynamics: 1) Potential bloom control, and 2) Potentially higher toxin transfer to upper trophic levels. Here, we propose to expand our studies to examine how resistance affects grazer toxin dynamics.
a) Objectives: To determine whether there are differences in toxin accumulation, retention, depuration, and biotransformation between resistant and nonresistant phenotypes of *Acartia hudsonica* to toxic *Alexandrium*. We will test the null hypothesis that there is no difference in the ability of resistant and nonresistant phenotype to deal with toxins.
b) Approach: We will continue our comparative studies and expose individuals of resistant and nonresistant phenotypes to diets containing toxic *Alexandrium* for sufficiently-long periods of time to achieve steady state in toxin accumulation. In both kinds of phenotypes, we will measure time-dependent toxin ingestion rates, accumulation, retention, and depuration and toxin profile in the grazers relative to the food source.
c) Expected results: We expect to see differences in all or some of the processes mentioned above involved in toxin dynamics between resistant and nonresistant phenotypes. This new information is directly relevant to two of the ECOHAB study areas: trophic transfer of toxins, and impacts on higher trophic levels. An immediate outcome of this project will be to answer the question of whether resistant grazer phenotypes enhance toxin transfer up the food web. Such information will be useful in constructing more accurate models of food web dynamics, and in predicting the impact of HAB for higher trophic levels.

8. Supplemental Keywords: Marine, estuary, exposure, ecological effects, organism, population, genetic polymorphism, chemicals, toxics, life-cycle analysis, marine science, ecology, modeling, Northeast.