Partnering in Scientific Inquiry:

Smith College & Easthampton High School Use Field Work to Inform & Inspire about Environmental Science

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Introduction

We engaged in a collaborative learning project between students in Smith College's Marine Ecology course and Easthampton High School's AP Environmental Sciences course. This project 1) allowed students to ask questions related to critical functions of our coastal environmental in the context of historical, present and future use by humans, 2) empowered students to take action in tackling environmental problems by arming them with necessary skills to succeed, 3) enabled college-level and high school groups to interact as teams in a field-based learning experience with follow-up analyses focused on the coastal environment, and 4) provided students with this learning opportunity in our coastal jewel, the Cape Cod National Seashore. Here, we highlight our approach and various activities.

In the classroom & at the center: preparation for field-based activities

To prepare for the trip to Cape Cod, Easthampton High and Smith College students each researched an organism found in the salt marsh and "became" the organism in the classroom for answering questions about themselves in a "speed-dating game". Smith students also prepared a self-guided tour of the actual marsh; research for this tour allowed Smith students to become "experts" on the trip, sharing with their partners and taking a leadership role. At the Wellfleet Audubon Nature Center, Smith College and Easthampton High students partnered for a "treasure hunt" to answer questions about the Center and the marsh habitat.

Smith College and Easthampton High students are partnered for "treasure hunt" at Wellfleet Nature Center (upper). A Wellfleet naturalist provides an orientation to the marsh and students begin with a tour of the habitat (below).

Students are challenged to design a field experiment

Smith and Easthampton High students collaborated on a design of an experiment to investigate the habitat preference of fiddler crabs. They studied several areas in and around the marsh where crab burrows were evident. The groups reconvened for a larger discussion about their findings, which included details of marsh zonation, observation methods, and experimental design. Students considered advantages and disadvantages for crabs of living within vegetated vs. bare sand, and how these characteristics might affect habitat preference.

Table 1. Salinity and dissolved oxygen values at low, mid, and high channel sites at Wellfleet marsh.

	salinity (ppt)	oxygen (mg/L)
Low channel	30.3	7.8
Mid channel	30.4	6.9
High channel	31.1	5.6

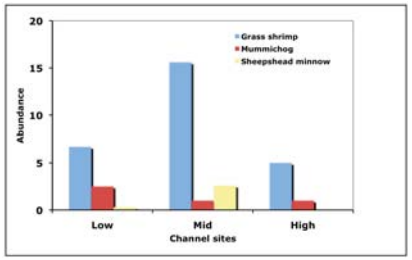

Fig. 1. Mean abundance of shrimp and fish at three channel sites.

Students dip-net sampling the channel (l) and seining an open water site (r).

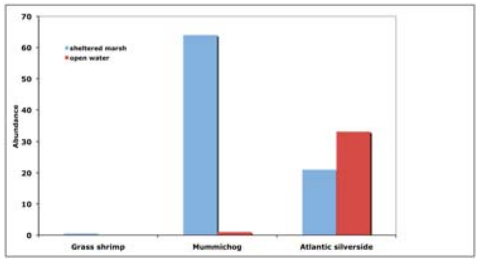

Fig. 2. Mean abundance of common fish and shrimp in seine samples (n=3) at sheltered marsh and open water sites.

Field Results & Follow-up Activities

In the "Channel study", students measured salinity and dissolved oxygen concentrations in high-, mid- and low channel areas, and collected organisms found in the channels with dip nets. Salinity and oxygen levels varied among channel sites (Table 1) and these differences were reflected in abundance patterns of shrimp and fishes (Fig. 1). For example, lowest dissolved oxygen was found at the high channel site; this area had lowest densities of grass shrimp and mummichog, and Sheepshead minnows were not collected there. These results emphasize the importance of higher dissolved oxygen concentrations for active swimmers in the marsh.

The students used seines to sample fishes and other active swimmers at two low marsh sites: sheltered marsh and open water habitats. Samples from these two areas revealed clear habitat preference by mummichog and Atlantic silversides (Fig. 2). While Atlantic silversides were greatest numbers at the open water site, mummichogs were abundant only at the sheltered marsh site.

Following the field work at Cape Cod, Smith students again partnered with Easthampton High students to teach them how to analyze the data taken while in the marsh habitat, and how to present results in Table and Figure format. This follow-up workshop focused on developing quantitative and computer skills, enabling Smith students to teach skills they had recently acquired in the laboratory to Easthampton High students. Such a pedagogic approach enhances learning and self-confidence for both Smith College and Easthampton High students.

Conclusion

This partnership between the Smith College Marine Ecology course and Easthampton High AP Environmental Sciences class provided all students with hands-on field experiences in sampling and experimental design in a pristine salt marsh habitat at Wellfleet Audubon Sanctuary. Preparatory and follow-up activities enhanced communication (verbal, written, and graphical) and problem-solving skills. The collaboration provided Smith College students with an opportunity to build critical leadership skills in an interdisciplinary setting. Our approach enabled students to conduct scientific inquiry through authentic fieldwork and to collaborate in the scientific process. Such teamwork gave students confidence in their ability to understand, critically discuss, and present to their peers as well as to the wider audience. Each group brought their own expertise and experiences regarding the coastal habitats, and all students gained important skills from working together as a team in the field and classroom.

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