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Center for Environmental Research Education
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Asiatic Shore Crab (*Hemigrapsus Sanguineus*) Program (PIER) Introduced and Invasive Species Coastal Education Program

Final Report
2005



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1. Program description

The main objective of the PIER program was to provide high school teachers and students with the following environmental education tools:

- A hand-on introduction to Coastal Ecology
- An experiential field opportunity in environmental research
- An introduction to exotic invasive species
- An opportunity to gather environmental data
- An opportunity to analyze environmental data
- An opportunity to help the DEP by working in the field and collecting data

The PIER program started in the spring of 2003 and was completed in the fall of 2005. During this time we completed some preliminary classes, try a number of methods and materials to be used in the future, developed a complete curriculum, conducted a large number of in the classroom presentations, brought the students to specific sites along the Connecticut Shore to gather data, conducted one Summer SEARCH camp for 4 weeks and presented a final education workshop and report at the National Science Teachers Education Conference in Hartford, Connecticut. on October 20, 2005. In addition Anna Jalowska and myself will continue collecting data with the objective of preparing a scientific paper to be published within the next two years in a scientific journal.

2. Program Review

In the spring of 2003 we completed a small number of program trials working with several schools, some from inner cities and some from suburbia towns to develop sound research methods and materials that can be applied in the future for this program. At this time we also completed a literature search in the subject to become acquainted with the latest development in the research. During that time we also developed materials for the teachers and students.

In the fall of 2003 and during the fall and spring of 2004 we completed the first 2 years of research. During that time we conducted in-school lectures and field investigations.

In the summer of 2004 we completed a Summer SEARCH camp dedicated at collecting data on a regular daily bases during the whole month of July. The Summer SEARCH program is a High School program dedicated at providing high school students with opportunities to do research. (See Summer SEARCH brochure in appendix G.)

During the fall of 2005 we have completed a number of additional programs, we have presented a workshop at the National Science Teachers Association Conference in Hartford and we have also completed this Final Report.

During the past two years we have completed three of the goals and objectives stated in the original proposal:

- Establish baseline information across Connecticut shores and provide scientists with specific data regarding inventories of species, substrate preferences and preferred location within the intertidal zone for intertidal organisms.
- Train high school teachers to complete these inventories with their students during the spring of 2003.
- Have high school students expand their knowledge of Long Island Sound's rocky habitats by actively studying research, monitoring and inventorying techniques, while collecting and identifying organisms and analyzing data.

Some of the Research goals and objectives stated in our original proposal:

- Supplying a process to carry out on-going research on the intertidal rocky beach communities along the LIS and establishing a baseline of measurement for population change and quality;
- Providing the CT DEP and other interested agencies with information on the changes in invasive organisms and the possible effects these organisms have on the health of the beach community;

Will be completed during the next two years, as we require additional time to have a better understanding of the life cycle of *Hemigrapsus Sanguineus*. Not all the methods used during the past two years will provide us with some of the information we need to complete this project, therefore new methods will have to be developed to continue this research.

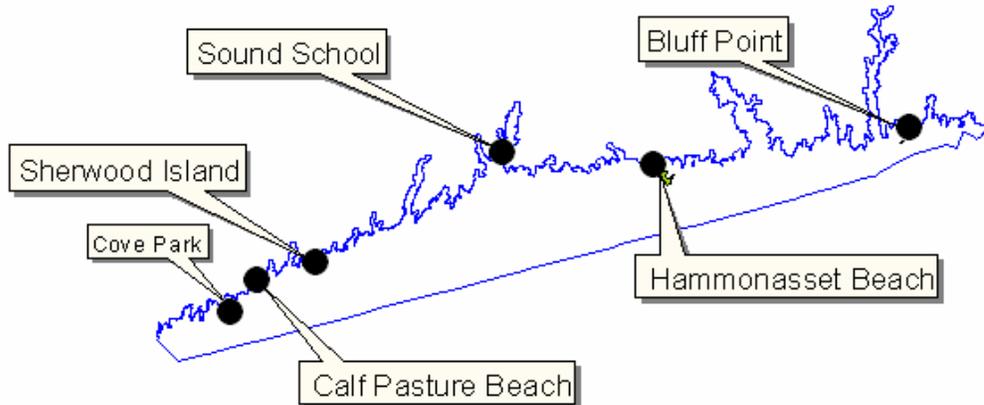
3. Program Evaluation and Teacher workshop

Most of the schools were provided with pre-tests. Data collected on a number of them show that the majority of students in the 10th grade were not very knowledgeable of many concepts in coastal ecology. Ninety percent of the students got less than 50 % right on the test.

We eliminated the Post-test, as most teachers had a problem with that test, but teachers spent considerable time with their students going over the collections and analyzing the data we provided them on a CD or via e-mail. We feel that the time spent on the field was crucial to the better understanding of Coastal Ecology and the issue of invasive species. In the spring of 2003 we offer a teacher workshop but because we had not recruited most of the schools we had very poor registration. To overcome that problem each teacher was trained individually and at the same time we trained the students

4. RESEARCH LOCATIONS

We reduced the number of sites, as we found impossible to collect a reasonable amount of data from that many sites. We concentrated on the following locations:



Hemigrapsus Sanguineus does not behave in the same way at everyone of these sites. The behaviors of *H. Sanguineus* is dependent on substrate type and shape of rocks, location of the site, availability of prey and much more. More research will be needed to understand this problem.

5. Program Statistics

These numbers reflect the effort done in this program. We surpass the number of schools and teachers and students proposed in the original proposal.

Proposed numbers:

Item		Number
Schools targeted and provided for through this grant		8
• Teachers trained through this grant schools	2/school x 8	16
Class size involved in research project (average)	30/school x	240 students

8 schools =	
Participants informed of this project via Water Quality and Water Resources Symposium	Approximately 100 students

Program accomplishments

Item	Number
In the Classroom presentations	35
School Field Research Trips to various Coastal Sites	31
Number of students who have participated in the program	620
Number of Teachers (2 teachers per school)	21
Number of Summer SEARCH Camp sessions	4
Number Students participating in the S. SEARCH Camp	42

6. Data Collected

The data collected was used and distributed to the schools before the programs. This data was used by the teachers to evaluate the results of all the field trips.

The data is contained in a CD that accompany this report.

Considerable amount of analyses can be completed by using the data. One of the major problems in today's science education is that when students complete experiments, the amount of data collected is very small and statistically insignificant. The data collected on the PIER program is statistically significant and can be used by teachers to teach statistical analyses.

7. Scientific Findings

Extensive research has been completed by state agencies and universities on the possible impact of *Hemigrapsus Sanguineus* in New England. Most of the research completed deals with the abundance at specific sites and laboratory studies conducted on the feeding habits of the crab.

Our research showed that some of the reproductive conclusions from other research papers do not apply to Hammonasset Beach State Park. We also observed a pronounce decline of females after July and we believe that this brachyuran crab may be involved in cannibalism of females after deposition of larvae.

In addition we believe that there is a crab migrations during the winter months, especially in large males. Collections done below the intertidal zone show that *H. Sanguineus* is sharing habitat with *Carcinous Maenas* (Green Crabs).

H. Sanguineus is found clump in coastal areas and population studies using quadrants may not be suitable for that research. Crabs are capable of sustaining very cold temperatures in a state of stasis and resume rapid activity if they are warmed up. To complete the life cycle study of H. Sanguineus will require more time and different methods and materials than the ones used in this study. Inventories of other species were completed at each one of the sites, but at the moment we are also looking for other less conspicuous species found at these locations that would have been skipped by high school students.