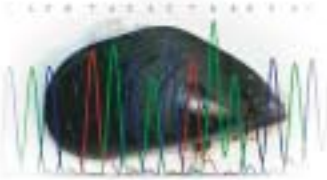

Marine Biotechnology and Bioinformatics *for Teachers*

Mussel Beach Lesson Plan

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Introduction

This project began as an assignment, a part of the Biotechnology/Bioinformatics Summer Institute at CSU Monterey Bay and Moss Landing Laboratories in conjunction with San Jose State University. Our teacher group project was to research where and how to collect mytilus mussels at various sites in Moss Landing. The mussels were brought back to CSU to extract the DNA, sequence it, and then compare/contrast it to known sequences. With this information we were able to determine if the DNA was of a native, invasive or hybrid species.

From this project emerged our student project with Upward Bound students and other at-risk students from local school systems. After their experience I decided to create the "Mussel Beach" lesson for my classroom.

It is a general introduction to mollusca with a focus on bivalves and in particular to the mytilus species. My thought was to compare various bivalves, learn the gross anatomy, the life cycle of the mytilus mussel and its place in ancient ecology and current California ecology.

Instructional Goal

The goal of this entire lesson is basically to get students to appreciate our seashore and coastal environment. Many of my students have never been to the seashore and are not aware of the importance of preserving the California coastal ecology.

To accomplish this my students will learn about the gross anatomy, life cycle and niche of mytilus in California coastal ecology.

They will also compare mytilus to ancient mollusca as part of my Earth Science unit this year.

Instructional Objectives

- Students will learn the differences in various mollusca
- Students will learn the gross anatomy and specific characteristics of the mytilus mussel
- Students will learn how to extract or "spool" DNA from the mytilus samples obtained.

Method

The start for such a lesson is to have a source of mussels such as a nearby beach or dock pilings access. Otherwise it is advisable to obtain them through mail order or even a local market or restaurant.

- Present the background information on the project as a whole including information on the mytilus species.
- Students collect or gather mussels after introduction
- Students study and learn the gross anatomy of mytilus.
- Students research predators and toxins in biome.
- Students dissect mytilus to look for interior structures.
- Students use mytilus flesh to extract or spool DNA.

Students from the Upward Bound and at-risk classes from the area meet the Moss Landing Beach area in preparation for mussel specimen collection. Beach ecology was also part of the instruction. Students helped clean up the beach by collecting the rubbish and debris found on the beach.

Students are at the rock jetty near Moss Beach State Park and are in search of the elusive mytilus Californianus. This blue mussel is a large ocean resident of mytilus and was our mussel for the study.

The introduction to the project by Dr. Simona Barti and then the follow-up presentation to the Moss Beach Team. From L: Rick, Laura, Beth and Michael.

Learning Standards

GRADES NINE THROUGH TWELVE—BIOLOGY/LIFE SCIENCES Ecology

6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:
a. Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.
b. Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.
c. Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.

National Standards: This biology and ecology based learning activity fulfills the following National Science Standards:
• Standard A: Develop abilities and understanding in field of scientific inquiry
Standard C: Expand understanding of life sciences
Standard F: Explore an important aspect of biomes.

Students prepare for the "Big Dip" which is a high tech form of mussel removal at Moss Beach during the pilings. Note the 2 students who are entering the water because Taylor is their stringer.

Students come up with the prize, the "Big Catch". After weighing, students take notes on location, temperature of air and water, time and color for their marine samples.

Results/Learning Outcomes

The students will collect or obtain mussels using random sampling techniques and use them in a later dissection and DNA extraction lesson. Students will be introduced to the mussel food web and draw conclusions on the affect humans are having on the mussel food chain. Through observations either at a dock, coastal beach or research from mussel farming sources, the students will be able to visualize the interconnectedness of organisms and develop an understanding of the importance of biodiversity and the effects of pollution on an ecosystem. In the field, students will fill out a field guide and use this to help them with their final projects. In the classroom, the teacher will give a visual presentation of mussel anatomy, mussel ecology, and local environmental pressures to build background information.

Conclusion/Lessons Learned

The students will have a better understanding of the niche in which blue mussels survive and thrive as well as the impact humans have on this species. Specifically, the role and impact an invasive species has upon a native species and the possible consequences this may have (either measurable or projected). Students had fun with this project yet learned much about how complex and important our environment is. The lab is a little messy but provides a great hands on experience and allows students to become more physically involved in such research.

Contact:

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