

ISLAND ECOLOGY SAFARI EDUCATIONAL PROGRAMS AT CATALINA ISLAND

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ABSTRACT

Catalina Island is an ideal field site to study island ecosystems. The history of Catalina Island is well documented and offers insight into the past cultures and uses. The Orange County Marine Institute's Island Ecology Safari Program offers students the opportunity to explore this unique island system and participate in the Catalina Island Conservancy's restoration program. Students explore Catalina Island through the sampling and analysis of different offshore animals and investigations of terrestrial plant and animal adaptations. The program incorporates earth science concepts as students look at geological evidence in the San Pedro Channel and on Catalina Island to determine how the island was formed. Students snorkel to explore subtidal communities in the shallow protected waters of the island. Night program activities include a "Science Fiction And The Sea" lab, flying fish and squid observation. The Island Ecology Safari Program curriculum was originally developed in alignment with the California Science Framework published in 1990. The California State Proposed Science Standards (in press) will set new guidelines against which schools align their science curriculum. It will be important for the Orange County Marine Institute to continue developing activities for the Island Ecology Safari Program that meet the California Science Standards.

Keywords: Catalina Island, biogeography, California State Proposed Science Standards, Island Ecology Safari, ecosystem.

INTRODUCTION

Imagine yourself, back when you were twelve years old, getting permission to miss two days of school and taking off to a remote island paradise to snorkel, fish, and hike. Imagine, also, spending the night aboard a boat, anchored off a serene cove, amidst schools of squid, sea lions, flying fish, and bioluminescent plankton.

For the past eight years, the Orange County Marine Institute, a non-profit educational organization located in Dana Point Harbor, has been doing just that - providing elementary and middle school students the chance to go on a safari to an island paradise off southern California. But don't

be fooled by the mirage of what this imagery may suggest - this popular residential program is really an intensive field science program in disguise.

The Marine Institute's Island Ecology Safari Program takes students across the San Pedro Channel, aboard a U.S. Coast Guard-certified sport fishing vessel, to Catalina Island; one of two Southern Channel Islands visible from Dana Point on a clear day. This two-day adventure offers students a unique opportunity to investigate the Island's fragile ecosystems, both terrestrial and marine, through a series of activities that focus on the careful examination of plants and animals that are part of them.

The Orange County Marine Institute serves as a field trip destination site for over 100,000 students per year, drawn from the highly-populated and ethnically-diverse, southern California region. The Orange County Marine Institute is located in the southernmost region of Orange County, sixty miles south of Los Angeles and ninety miles north of San Diego. Although southern California is bordered by the Pacific Ocean, many students who visit the Marine Institute have never been to the ocean before, let alone to an island.

Catalina Island is an ideal field site for students to study aspects of the theory of island biogeography (McArthur and Wilson 1965), effects of human impacts both past and present, and efforts toward restoration. The island is unique in its blend of tourism and conservation. It is the only Channel Island that has an established town that caters to open tourism complete with an airport, dock facilities, a ranch, and numerous yacht club facilities. Likewise the Santa Catalina Island Conservancy is dedicated to restoring the natural ecological processes to the island as much as possible by eliminating or reducing the populations of non-native plants and animals who have the greatest impact on the native plant and animal assemblages.

This dual approach in managing an island resource, by blending recreation with conservation, offers a unique opportunity for educators and students to address current dilemmas facing managers of ecologically sensitive systems that also serve as public recreational areas.

The Island Ecology Safari Program is designed to blend together recreational activities popular at Catalina

Island with a rigorous science curriculum that incorporates concepts in earth, life, and physical sciences. Students look at the geological evidence in the channel and on the island to determine how Catalina Island was formed. An introductory course on snorkeling and catch-and-release fishing allows students to explore the inhabitants of rocky reef and kelp forest communities in the shallow protected waters of the island. Investigations of the plant communities at Isthmus Campground are conducted through a series of hikes. The mud flats at Catalina Harbor, another hiking destination, offers a plethora of decomposing plants, animals, and trash for students to uncover, identify, and dispose of (trash only). Night program activities include a “Science Fiction And The Sea” lab, plankton lab, and flying fish and squid observation.

Addressing the Crisis in Science Education

Scientific advances and subsequent medical and technological advances are among the many strengths the people of California offer to the nation and the world. Unfortunately the level of science education for California’s students is below that of other students in many other states and in many other countries. Today low expectations, low quality, and low priority science education are putting many California students at risk of being shortchanged (State of California Academic Standards Commission July 1, 1998). Too often science education is reduced to memorizing facts and isolated concepts. The enthusiasm and curiosity required to stimulate scientific thinking is frequently confined to learning scientific vocabulary and reading descriptions of past experiments with a question and answer section at the end of each chapter (Smith 1993). The Los Angeles Times reports that America’s high school seniors ranked in the lower third among twenty-one nations in tests measuring their knowledge of math and science (Schultz and Colvin 1998). Eighth grade students in the state of California rank 39th among forty-four groups that took a tough new national test measuring science knowledge. They earned the equivalent of a “D” - worse than 65% of the eighth grade students in the rest of the country (Woo 1997).

In order to understand and contribute to new developments in science-related disciplines, future generations of Americans need to acquire the necessary knowledge and understanding of basic science and the scientific process to effectively compete in world markets. Students should have the opportunity to build connections that link the core content of science learned in the classroom to technology, community health, population, natural resources, environmental quality, and global challenges (State of California Academic Standards Commission 1998). The next generation will soon be making decisions about public policy, as it relates to natural resources and ecosystem management, and therefore it is important that they are scientifically literate.

The Orange County Marine Institute is concerned about recent reports on the decline of science literacy and is a partner with educators in creating solutions that promote scientific literacy of southland students by providing field

science experiences that align to the Proposed Science Standards (July 1, 1998) being defined for the classroom curriculum. Students’ interest, enthusiasm, and proficiency in the sciences will improve if they are offered opportunities to understand the interdependence between science, technology and their environment.

The Island Ecology Safari Program at Catalina Island is one of more than 60 field science educational experiences offered through the Orange County Marine Institute. This comprehensive field science program provides students with an important link to their environment - for not only do they learn about the fragile ecological relationships that exist between various terrestrial and marine communities on Catalina Island, but also they are exposed to the notion of stewardship, to the role of conservation and their responsibility towards it. Each educational activity developed for the Island Ecology Safari Program itinerary is supported by a preparatory classroom activity that introduces students to the background of a particular program focus, the sampling equipment used to collect data or examine individuals of a particular community and a classroom activity that familiarizes students to that program focus. The preparatory activities include keywords and additional references to related background information.

METHODS

A Closer Look at the Island Ecology Safari Program Curriculum

The Proposed Science Standards (July 1, 1998), emphasize that scientific progress is made by asking meaningful questions and conducting careful investigations. Each activity developed for the Island Ecology Safari Program is designed to facilitate student learning by having them plan and conduct a simple investigation based on a question they have developed and to record data and draw conclusions based on scientific evidence observed or collected during that activity. We have included three program activities that are a part of the Island Ecology Safari Program to illustrate this approach below:

A Geological Perspective

It is important for students to understand that the ecological systems of islands usually differ from their mainland counterparts because the ocean acts as a natural barrier, preventing many mainland species from colonizing. Therefore, the first task at hand is for students to determine how Catalina Island was formed by looking at the geological evidence in the channel and at the island. Three possible scenarios are presented to students: 1) Catalina was once part of the mainland, 2) Catalina formed from oceanic volcanoes like the Hawaiian Islands, or 3) Catalina formed from earthquake faulting and uplifting. For each scenario, specific underwater topographical features and rock samples would have to be present to support it. For example, if Catalina was formed from an oceanic volcano, then rock samples collected at the

island would predominantly consist of oceanic basalt. (It is important to note that the geology of Catalina Island is very complex with many different rock types being present. There are still theories being developed as to why certain rock types are present on Catalina Island. The main goal of this activity is to get elementary and middle school students to focus on looking at the kinds of evidence that a geologist would use to make determinations about how an island forms).

During the channel crossing to the island, students use the equipment on the bridge to determine the boat's current position and depth and plot this information on a bathymetric contour map. Readings are made every 30 minutes during the crossing. From this information, students can determine how much longer it will take to get there (the number one asked question) and underwater features like the Lasuen's seamount as the boat passes over them. This is also a good time to introduce the concept that ecological systems are dynamic; climate varies over decades and centuries and ice ages last 120,000 years. Ocean heights vary as ice caps wax and wane, with different climatic cycles, so underwater features, like the Lasuen's seamount, were once islands.

Once students arrive to Catalina Island, the quest to figure out the likely scenario continues. Students hike out along the road to Isthmus Cove from the Wrigley Marine Science Center and search for rock evidence to finally determine how Catalina Island formed.

Island Ecological Interactions

Since Catalina Island was never part of the mainland, the next task is for students to figure out which plant and animal species were able to colonize on Catalina Island by natural mechanisms and which plants and animals were introduced to the island by humans. In keeping with the theme that ecosystems are constantly dynamic, it is important for students to identify differences between natural variations in plant and animal populations and those that are due to human actions, like the introduction of non-native species or disruptive recreational activities.

Within the last 1,000 years there have been significant climatic shifts in southern California that have affected the composition of plants and animals on the island, and their ecological relationships (Bushing 1997). About 1,000 AD the climate was warmer lasting until about 1,300 AD. At that time a cooler moister period known as the Little Ice Age began, lasting until nearly 1,900 AD. These climatic changes, occurring at the time European explorers first visited the island, certainly influenced the species composition and ecological processes that are present on the island (Bushing 1997). Most evidence of climatic shifts are readily seen in the plant communities. There exists a relic population of the Catalina Ironwood, of which a planting exists in front of the old Civil War Barracks for students to see, a tree better suited to the moister, tropical climate of southern California 600 years ago!

The history of Catalina Island is well documented and offers insight into the various cultures and uses over time. The Two Harbors area can be likened to a time capsule with

evidence of past and present human use found throughout the surrounding coves and hillsides. Evidence of Native Americans and their cultural artifacts are found in a midden over by Isthmus Beach. Although students can't access the midden, the charred earth that defines the midden is visible from the trail and shell fragments of wavy top turbans and abalone are often exposed.

The earliest European visitors to Catalina Island were the Spanish explorers and missionaries. Their primary interests were gold, trade routes, and religious conversion rather than natural history. The early Europeans who visited Catalina recorded little of its natural history, so not much is known about what the island was like before the European's arrived (Bushing 1997). There is abundant evidence, however, of the European presence in non-native wild mustard, wild oat, and sweet fennel plants. And on rare occasions, students may catch a glimpse of the wild boar or goats, non-native animals introduced by European settlers.

Hollywood has impacted the Two Harbors area as well. The cove was transformed to appear as a tropical island setting complete with palm trees and Polynesian architecture to form the backdrop for a movie. To put to rest the illusion that Catalina Island is a tropical paradise, students conduct a series of physical factor measurements on soil moisture, humidity, air temperature, and wind speed. The results illustrate that the island is really more like a semi-arid desert than a tropical island!

Students also participate in a plant scavenger hunt designed to help identify different endemic, native, and non-native plants found at Isthmus Campground. Most of these plants are well adapted to the moisture-deprived, wind-swept landscape characteristic of the west end of the island. References to cultural uses of plants are also made to correlate presence of certain plants with various human influences including the arrival of European and Hollywood settlers.

Sampling Fish from the Rocky Reefs

The reef and kelp forest communities surrounding Catalina Island are teeming with fish adapted to living in the water column and in the nooks and crannies of the rocks. There are two types of fish populations found in reef and kelp forest communities: residents and transients. The resident populations (sheephead, Garibaldi, and kelp bass) are territorial and have specialized feeding adaptations to obtain their food from the reef and kelp plants. The transient populations (mackerel, yellowtail, and bonita) swim through the reef community searching for food and shelter.

Through the snorkeling activity, students observe and identify rocky reef fish in their natural environment using waterproof keys. The catch and release fishing activity gives students an opportunity to get a better look at the distinguishing characteristics of different fish of the rocky reef and kelp forest community. Sport fishing of the rocky reef fish communities has always appealed to the public as a recreational pastime. The continual overfishing of the same reef and kelp forest communities disrupts the overall balance of the ecosystem. The catch-and-release program identifies the

ocean resources as being finite. Students learn how to properly catch, handle, identify, and release different fish caught using barbless hooks as outlined by the National Marine Fisheries Service.

The activity focuses on building a rocky reef and kelp forest community based on the kinds of fish students catch and the depth they were caught. Students record fish entries, including size and depth, on a specially designed data sheet. The data is then plotted onto a graph that converts the number of fish line winds to depth (this represents the water column). If all goes well (and the fish are biting), students successfully build a rocky reef and kelp forest community complete with calico bass, blacksmith, mackerel, sheephead, halfmoons, and even señoritas! All fish are released back into the ocean at the conclusion of the activity.

DISCUSSION

Future Directions for the Island Ecology Safari Program

The success of the Island Ecology Safari Program is measured by the high repeatability rate with participating schools. This year the Orange County Marine Institute is scheduled to run over 40 Island Ecology Safari Programs. Ninety percent of the schools scheduled for the 1998 to 1999 school year are returning from last year. Eighty percent of the schools have been participating in this program for more than two years. There are over twenty new schools on the waiting list for this program. Therefore, future directions might involve the expansion of facility and the procuring of a new vessel. Teachers often comment that the most valuable aspects of the programs are how all of the field activities relate to the classroom curricula and stimulate higher order thinking skills. One teacher, from Lobo Elementary, who participated in an Island Ecology Safari Program last March commented on her evaluation form that "All pre-trip activities and program activities at Catalina were aligned with the State framework. Oceanography is an area of study for 5th grade."

The Island Ecology Safari Program curriculum was originally developed in alignment with the California Science Framework published in 1990. The new California State Proposed Science Standards (July 1, 1998) are expected to set new guidelines that schools are expected align their science curriculum against. The main difference between the Proposed Science Standards and the California Science Framework is that the science standards outline testable criteria for each grade level to measure core scientific

concepts. Instead of the integrated approach to teaching science that predominates throughout each grade level in the California Science Framework, the Proposed Science Standards have students starting in the sixth grade, focus on earth science; in the seventh grade, focus on life science; and in the eighth grade, focus on physical science. The "investigation and experimentation" strand is the only theme that appears for each grade level and provides the link for students to apply the core scientific concepts taught in the classroom to the real world.

It will be important for the Orange County Marine Institute to continue to develop activities within the Island Ecology Safari Program that align with the investigation and experimentation strands for grades 5 through 8. Some new directions are to develop activities that tie in current issues and increase appreciation of science methodology. Any of the current controversies or dilemmas on Catalina Island will provide enhanced opportunities for teaching to the new Science Standards. The Catalina Island Conservancy's restoration projects that involve removal of non-native plant species and re-plantings of native plant species offer some new opportunities to get students involved in collecting data, and more importantly, helping an ecosystem to recover.

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