

IRA Report

CSU Channel Islands Tall Ship Research Project:
Spatial Variability of Marine Ecosystems in the Santa Barbara Channel

Dr. Christopher Cogan

May 2013

(1) PROVIDE A DESCRIPTION OF THE ACTIVITY

The “Research at Sea” course is designed as a capstone level experiential learning activity using ship-based oceanographic and ecological research methods. The research was carried out as a UNIV 391 1-unit class with student fees. The course theme is “marine and coastal ecosystems” with a focus on the quantification of spatial heterogeneity in ocean productivity. Target students were graduating seniors in science majors.

Students conducted research on temporal, spatial, and thematic scales for coastal and marine systems, while gaining hands-on experience with scientific methods. Combining skills from the fields of oceanography, ecology, environmental science, chemistry, and geography, the students integrated their data using Geographic Information Systems (GIS) to measure and map marine ecosystems in the Santa Barbara Channel. During the course, the students attended three 2-hour evening class lectures and experienced two days and one night aboard the tall-ship schooner *Bill of Rights*.

Accompanying lectures and discussions were also held in the evening while at anchorage. At Santa Cruz Island, research students participated in an ongoing marine debris mapping project developed by Dr. Cogan in cooperation with the Environmental Protection Agency.

While at sea, the student research experience began with teamwork to set-sail and quickly progressed to data collection and analysis. The experience was designed to let students discover that field science is hard work, not always predictable, but at the same time includes the excitement of hands-on learning. The learning pace is accelerated - running from dawn into the evening, then up early the second day. Emotionally, the combinations of teamwork and close-quarters on the ship, the transition to a very different living and working environment, and the lack of cell-phone or texting access translate to an in-depth science-team experience and a sense of accomplishment and academic empowerment.

(2) HOW DID THE ACTIVITY RELATE TO A COURSE(S) AND/OR LEARNING OBJECTIVES?

Most of the ESRM courses as well as other science programs in Chemistry and Biology are strongly connected to the “Research at Sea” experience. Field research with an emphasis on scientific methods, critical thinking, data gathering, data analysis, and spatial literacy represent core elements of CI’s science programs.

(3) WHAT DO YOU SEE AS THE STRENGTHS OF THE ACTIVITY?

The research class provided an atmosphere of exploration and challenge for students from multiple academic programs. We found that our preparation for the class paid off, allowing synergies between the students to promote learning. The students were challenged to learn, to teach, and to expand their interdisciplinarity. The classroom lecture and discussion hours were critical; however the real benefit to the students came with the work at sea, and in the somewhat unfamiliar surroundings of the Channel Islands.

(4) WHAT WOULD YOU SAY ARE/WERE THE ACTIVITY'S WEAKNESSES?

Research and learning at sea can occur at many levels and we have accomplished much with very little funding. That said, even the combined resources of three programs are somewhat lacking when it comes to oceanographic equipment. We were able to make the best of a difficult situation, however compared to other coastal campuses we lack much of the equipment normally associated with instruction on coastal and marine research techniques.

(5) HOW WOULD YOU IMPROVE THIS ACTIVITY FOR NEXT TIME?

We had some unanticipated conflicts with our evening sessions, resulting in some students attending other field classes and missing some of our evening class sessions before the main trip. Working across multiple programs we will always face this challenge, however future classes will benefit from consultation with multiple program Chairs as to scheduling.

(6) WHAT DID YOU LEARN FROM THE PROCESS?

Every class is a learning experience for both teacher and student. This class and activity was no different. One aspect of the class that stood out was the way the students were able to rise to a new level of field research expertise. The combination of preparatory classroom lectures and student-to-student mentorship was an effective mix to foster an atmosphere of self-learning. As instructors we worked hard to achieve this and the results were rewarding. We could not ask for a better team of students.

Attached:

- 1) Student Roster
- 2) Charter Invoice
- 3) Press Release Style Course Description
- 4) Sample Student Ratings of Teaching
- 5) Poster developed by students and presented at the SAGE 5th Annual Faculty Student Research Forum on 11 May 2013



American Tall Ship Institute

3600 Harbor Blvd #56
Oxnard, CA 93035
805-901-0585

Invoice

Date
03/27/21013

Bill To
Chris Cogan CSU Channel Islands 805-437-3319 805-445-1201

Description	Amount
04/04/13-04/05/13 Two-day Charter	\$5400.00
<i>Thank You for Your Support!</i> ATSI is a 501(c)3 non-profit Tax ID # 20-8860766	Total \$5400.00

The mission of the American Tall Ship Institute (ATSI) is to encourage positive youth and community development through environmentally aware, hands on, ocean based programs aboard tall ships, and in our boat building shop.

Balance	\$5400.00
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Writing Sample:

Based on shipboard discussions on writing to a public audience via the media

Crossing the Channel, Testing the Waters

student research at sea

April 2013

The Bill of Rights graces the Oxnard waterfront and Santa Barbara Channel with the charm and character that only a tall ship can give. She brings our imagination back to the history of our state, when schooners and square riggers filled the harbors with a world eager to find the fortune of California. Today, every visitor to the waterfront benefits from the sight of a tall ship going out to sea or returning from her voyage, in many ways forging the connection between our history and our modern lives today.

In the first week of April, nineteen students from California State University Channel Islands joined the schooner *The Bill of Rights* on a two-day mission to Santa Cruz Island and back, sampling the waters of the Channel along the way. Led by Professors Christopher Cogan and Blake Gillespie of CSUCI, and Professor Uta Passow of UC Santa Barbara, they were learning to read the story told by the chemistry, biology, and physical characteristics of our oceans. At sea, their impromptu ocean laboratory is the deck of the schooner, where they have stowed bins of equipment—including carefully calibrated instruments for examining water samples, and rugged laptop computers for collecting and analyzing data. A large microscope is lashed to a table below. Students are climbing down steep ladders, stowing their gear in assigned sailor bunks in shared cabins under the heavy wooden beams. The authentic, traditional construction of this ship is a fantastic backdrop for modern scientific research.

Sample Student Ratings of Teaching from a similar class held in 2012:

-	This was a great experience and we are very lucky to have the opportunity do this.
-	This was a great learning experience. "learning to sail was a bonus to collecting data as we traveled. "The different data collection stations let us see how things are connected outside the class room. Being able to hike Santa Cruz was a nice change after being on the ship for a full day.
-	I enjoyed every minute of this class! I feel I obtained more from this than I have in any other typical course. It was awesome to have real experience in the field I want to continue in. I am very grateful to have had this opportunity!



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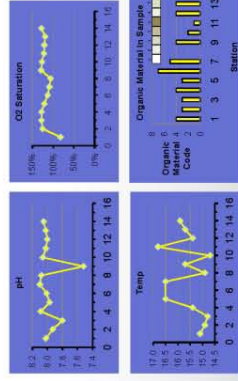
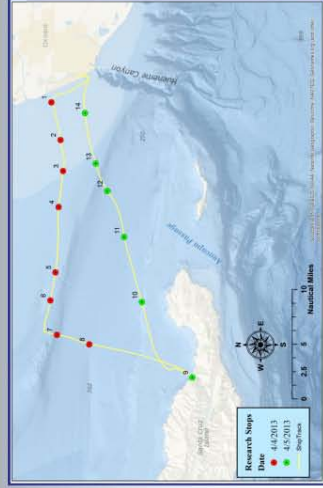
Professors Christopher Cogan, Blake Gillespie, and Christa Choi, with Lauren Boross, Jayson Garcia, Stefan Gohring, James Grundy, Les Hanson, Andrew Healy, Brett Heater, Russell Johnston, Colin Jonason, Daniel Judd, Evan Lashly, Katia Nava, Kyle O'Malley, Theodore Peterson, Keith Posekian, Wyatt Rovera, Daniel Teran, Peter Vegas, and Brittany Webber

This research project incorporated ship-based oceanographic and geographic methods to measure and map marine ecosystems in the Santa Barbara Channel.

Crossing the Channel, Testing the Waters student research at sea April 2013

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Photosynthesis by marine algae led to oxygen super saturation and a relatively high pH. The low phytoplankton concentrations measured as fluorescence (F1 values < 35) suggest that the recent bloom was grazed by zooplankton. Remaining is dead organic matter. Temperature and salinity are key indicators of changing water masses. Each of these parameters varied spatially across the Santa Barbara Channel.



Marine Debris Transect, Prisoners Harbor, Santa Cruz Island
Green track lines indicate transect path, red circles mark stations with debris. Tracklines and station plots are used to calculate area for quantitative analysis using Geographic Information Systems (GIS). This data was collected as part of a joint project with the Environmental Protection Agency.



About the Bill of Rights
Around Entry
Thursday, April 4, 13:45
I poured ocean water from a five gallon bucket through a 350um mesh filter that I hold in both hands. Phytoplankton and zooplankton are trapped in the net as the brackish water flows through. The boat is heeled over to port and an occasional wave crashes against the bow sending light ocean foam over our heads. Winds estimated at 20kts, boat speed, moving fast at 12kts.
The equipment reads a sample of ocean water in a small clear vial. This apparatus flashes uneven lights at the plankton, measuring their fluorescence (F1). I scribble 90F1 on my data sheet for sample #1. Combined with pH data, fluorescence, and water temp, we determine that a large phytoplankton bloom is present. The bloom is a mix of diatoms and other algae. The water has the low number of phytoplankton and higher number of zooplankton found 100 yards off the starboard bow.

