

Incorporating Water-Quality Measurements into Coral Reef Ecology Courses with the Roatan Coral Reef Water-Quality Monitoring Partnership

A Proposal to the Curriculum and Faculty Development – Community Partnerships, Environmental Justice, Service Learning Grants Program of the Associated Colleges of the South Environmental Initiative

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Introduction

Goals - For the last decade Birmingham-Southern College students have gone to the Institute for Marine Sciences (RIMS), in Roatan, Honduras to study Coral Reef Ecology biennially. Over the same time span, students from Rhodes College have participated in a similar course at the same site on an annual basis. We propose to add water quality monitoring exercises carried out in partnership with two local non-profit organizations to both courses. With ACS Environmental Programs funding we will be able to buy the necessary equipment to add water chemistry lab exercises to our courses. Our students will first learn how to use the equipment and to analyze the data obtained, after which they will train marine park staff in its use. As the data base of water quality measurements accumulates over the long term, it will be used in teaching both courses and by the local non-profits in their conservation role.

Justification - The reefs around Roatan are part of the second longest barrier reef system in the world and currently include some of the healthiest reefs in the Caribbean. Our students have benefited from their observations and ecological measurements on this high-quality reef system as it has survived the impact of Hurricane Mitch and a global coral bleaching event. Students have studied almost every aspect of the reef and the nearby, interrelated, mangrove and seagrass ecosystems, but there has been little coverage of water quality issues in either course. A recent surge in development on the island has created concern for the long term health of the Roatan barrier reefs. Major threats to the reef system noted at the International Coral Reef Action Network Mesoamerican Reef Alliance (ICRAN MAR) sponsored workshop “Conservation in Action: Joining Forces to Put Standards into Practice” held in Roatan June, 2006 included improper septic systems, coastal development, deforestation (of mangroves), etc. The magnitude of these threats can be assessed by measuring changes in water quality. The non-profit Sandy Bay and West End Marine Park (SBWEMP) staff have begun a water quality monitoring program but they are resource-limited. We have agreed to form a partnership between the SBWEMP, the Roatan Institute for Marine Science (RIMS), and two Associated Colleges of the South institutions, Rhodes College and Birmingham-Southern College, to establish a water quality monitoring program.

Match with Listed Priorities - This partnership between two ACS institutions and two local non-profit environmental organizations matches several of the ACS Environmental Initiative

CFD Alliance funding priorities. We are requesting funding under the Community Partnership, Environmental Justice and Service Learning Grants subprogram, because the main intent of the proposal is to create a partnership between two ACS institutions and two local nonprofits for monitoring water quality in a marine park. This international partnership deeply involves environmental justice because wealthy landowners and corporations (many foreign) profit from the development in Roatan yet may be damaging the reefs that impoverished islanders such as artisanal fishermen need to survive. Currently Honduran governmental agencies (CODEFOR and SERNA) are unable or unwilling to conduct water quality measurements necessary to ensure that degradation of the water is not occurring. This partnership between the ACS and local nonprofits that represent all of the people of Roatan, will allow continuous long-term assessment of the health of the reef ecosystem water. For the ACS students, working with and training islanders to measure water quality will be an off-campus service learning opportunity. We also hope that as this partnership progresses we are able to find more and different ways in which the students can participate in service-learning exercises such as reef clean-ups with the RIMS and SBWEMP staff.

Project Description

Activities

We are asking the ACS CFD Community Partnership, Environmental Justice and Service Learning subprogram for funds to purchase the necessary water quality monitoring equipment. When students from either Rhodes or BSC are in Roatan, they will use the equipment to make measurements of water quality as part of their coursework and the students will train the Marine Park staff to use the equipment. For most of the year, when our students are not in Roatan, the equipment will be housed at the RIMS and used by the Marine Park staff to continue the monthly water quality monitoring program. The accumulated water quality data will be used in continuing lab exercises by the college courses and by the RIMS and SBWEMP in their ongoing programs to protect and conserve the unique and highly diverse Roatan coral reef ecosystem.

Timetable

The proposed project will begin with Rhodes students and Rhodes and Birmingham-Southern faculty meeting with RIMS and SBWEMP staff in Roatan as part of the Rhodes College Coral Reef Ecology course in early June 2007 to plan the sampling protocol so that water quality will be monitored on a monthly basis in areas where it is expected to be heavily impacted by development and areas that are thought to be more pristine. The students will be trained to use the water quality monitoring equipment first and they will conduct the June sampling survey while showing the SBWEMP staff how to use it. In subsequent months in the first week of each month, SBWEMP and RIMS staff will use the equipment to carry out monthly sampling. When Rhodes students return every June and BSC students every other January, they will participate in the monthly sampling survey. They will also use the data collected by the Hondurans to study long term trends in water quality.

Important negative factors that could impact the reef originating within the community are increased levels of such nutrients as phosphate, nitrate, nitrite, ammonia due to sewage contamination and runoff. These water chemistry parameters can be measured economically by undergraduate students and SBWEMP staff with minimal training. A Hach DR 850 Colorimeter will be purchased to make these measurements. This battery-operated, waterproof, multifunction

base unit can measure up to 70 water chemistry parameters if appropriate reagents are purchased. We have selected the above parameters as the most likely to be altered by the surge in development in Roatan. The costs for the DR 850 and enough reagents to make 500 measurements of each parameter are indicated in the table below.

Table 1. Equipment Needed for Monitoring Water Quality.

Item	Catalog #	range	sensitivity	methodology	Cost
Hach DR 850 Colorimeter	DR870 from Aquatic Ecosystem Inc.				\$897
batteries					\$10
Nitrogen Nitrate	Hach # 2429800	0-0.5 mg/L	.01 mg/L	Cadmium reduction	500 @ \$284
Nitrite	2107169	0-.300 mg/L	.002mg/L	Diazotization	500 @ \$131
Phosphorus	2106069	0-2.5mg/L	.05 mg/L	PhosVer 3 Ascorbic Acid	500 @ \$117
Nitrogen Ammonia	2668000 and 1479120 (standards)	0 to 0.50 mg/L NH ₃ -N	0.02 mg/L	Salicylate	500 @ \$490
Total					\$1929

Thus we are asking that the ACS Campus-Community Partnership Grants Program provide \$1929 for the purchase of the above equipment. Additional funds are being requested through the ACS Campus-Community Partnership Grants Program to measure water turbidity and fecal coliform contamination. The Roatan Institute for Marine Science will provide in kind matching funds by shipping the equipment to Roatan from the USA, and provide boats and fuel for the sampling survey with the students. Further matching funds will be provided by the Sandy Bay-West End Marine Park in the form of boats, fuel and manpower to the best of their ability for continued sampling after the students leave.

Evaluation and Dissemination

The data collected by both students and MP staff will be analyzed by the students (with faculty assistance) to create a report on the water quality of Roatan's coral reefs. The first year's sampling will serve as a baseline as development is only beginning to surge. Data from following years will be added annually and new reports generated. These reports will be shared with RIMS, the Marine Park and the Marine Parks other collaborators (Coral Reef Alliance, etc.) to use as necessary to maintain adequate water quality for the preservation of the reef ecosystems. The reports will also be shared with ACS institutions through the environmental fellows program and offered for display on the ACS Environmental Programs website.

Institutional Approval

For Birmingham-Southern College

Kathy Murray
Birmingham-Southern College Provost

For Rhodes College

Charlotte Borst
Rhodes College Provost

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Christopher Seaton
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Disclosure Statement

This proposal is being submitted jointly with a proposal to the Campus-Community Partnership Grants Program of the Associated Colleges of the South Environmental Initiative for monitoring the non-chemical component (water turbidity and Fecal coliform contamination) of water quality by the same partnership.