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## Loma Linda researchers educate Bahamian young people on ecology

For nearly a decade, two natural science professors at Loma Linda University have been traveling to the Bahamas to conduct research designed at saving an endangered species of rock iguanas.



A member of the species *Cyclura r. rileyi* poses for the camera on Green Cay. A series of three color-coded glass beads are threaded harmlessly through the nuchal crest, helping the researchers readily identify individuals.

With the support of the Disney Foundation, they added an educational component to their efforts in the Bahamas this past April.

William K. Hayes, PhD, associate professor of natural sciences, and Ronald L. Carter, PhD, chair of natural sciences, Graduate School, have been traveling to San Salvador Island and its surrounding cays for more than a decade.

“Bill was my graduate student some years back,” recalls Dr. Carter. “In 1993, he came to me and asked if I would be interested in helping him study and perhaps rescue a highly endangered species of rock iguana he had learned about in the Bahamas.”

Dr. Hayes, internationally known for his research on rattlesnake striking behavior, has had a lifelong interest in marine biology—particularly sea birds.

“I became interested in establishing scientifically why several species of Bahamian rock iguana were rapidly declining in numbers,” explains Dr. Hayes. “One species in particular—*Cyclura r. rileyi*—has been classified at the highest level of endangerment and is receiving the highest level of protection.”

There are less than 600 individual *Cyclura r. rileyi* iguanas still in existence. Until now, the two researchers have concentrated on population demography, which involves describing the population size, age structure, sex ratio, reproductive rate, mortality, genetic information (obtained through the collection of minute blood samples), and other characteristics.

A number of graduate students, some of them from the Caribbean, have helped carry out the research.

“In a recent grant proposal to Disney Foundation,” relates Dr. Carter, “we asked for funding for both habitat restoration and a local educational program.”

The Disney Foundation was more than willing to provide the funding needed. It wasn’t long until Drs. Carter and Hayes had developed an educational curriculum for Bahamian students from the middle school grades through high school, titled “Celebrating biodiversity.”

The fourth week of April, 2002, Drs. Carter and Hayes, together with three graduate students and Dr. Hayes’ fiancée, headed for San Salvador Island.

Midweek, they arrived at Gerace Research Center (formerly the Bahamian Field Station), a research facility operated by the College of the Bahamas and created from an abandoned U.S. military listening post. With its military-style barracks and officers’ quarters, the research center is an ideal location for university researchers and their students to study marine life.

The team immediately set about preparing for full-day sessions with three groups of students from the local elementary and high school.



With his camera in hand, Dr. Hayes carefully approaches the nest of a Brown Booby of White Cay, one of the islands just offshore from San Salvador Island in the Bahamas.

In the midst of their preparation, Dr. Hayes and his fiancée, Pat Barry, were married on North Point, which reaches out into the bay—thought by some to be the first point of land discovered by Christopher Columbus more than 700 years ago.

Dr. Carter, who is also an ordained minister, performed the ceremony.

On April 29, about 60 students and their teachers arrived at Gerace Research Center. The middle school students piled off the bus and into a classroom for an orientation session.

Drs. Carter and Hayes explained what the day would entail, and gave the young people some background information about the ecosystems of San Salvador Island, which include the marine, intertidal, dry forest, inland lake, mangrove, and various other ecosystems.

The larger group was divided into three smaller groups, which rotated through each of the three hands-on activities during the day.

The first subgroup made its way to the boat landing, where the students boarded and headed for Green Cay, a tiny island with the greatest concentration of *Cyclura r. rileyi* iguanas.

Disembarking on the tiny cay was a challenge, but aside from a few pairs of wet sneakers, the young people safely scrambled onto the ragged shoreline.

As they began a short ascent to the high point of the island where the actual research camp was situated, iguanas were visible all over the island. Some came running toward the young people, probably anticipating a fruity handout.

Other iguanas headed for cover, slipping into rocky crevices and various hiding places.

Because the boat ride each direction took quite a while, the young people were only able to spend a short time on Green Cay.

Soon the boat approached and they scrambled onboard for the ride back to the landing.

The second subgroup headed for iguana camp, a replica of a working research camp situated on the campus of Gerace Research Center.

Many of the tools used in real-life iguana and sea-bird research were discussed and demonstrated.

The group then took part in a tracking exercise, using an antenna and radio to find a plastic iguana fitted with a radio transmitter.

The third and final activity for group two involved learning about the nesting habits of female iguanas. The researchers had prepared two iguana nests—one for demonstrating a scope fitted with a tiny video camera that could be lowered into the burrow to observe the mother iguana and her eggs, and a second hole designed to illustrate the importance of where one steps.

Female iguanas dig their burrows at an angle until they come to a flat rock below the surface. At that point, they typically dig under the flat rock, where the nest is created.

When stepping on a sandy area, one might actually be treading on an iguana nest. The weight could cause the tunnel and/or nest to collapse and perhaps crush the eggs.

The second fictitious nest was placed where the group would

undoubtedly stand. It was “suddenly” discovered and obviously trampled, to the chagrin of both teacher and pupils.

When the second nest was excavated, a flat rock was lifted to reveal crushed eggs. The young people were genuinely concerned until they were told that the eggs were, in fact, chicken eggs from the kitchen.

The third subgroup was given the opportunity to learn about various tools used for research—some as simple as a tape recorder and others as sophisticated as a laser thermometer, which senses temperature at a specific point.

Following their introduction to some of the tools used for research, they spent time visiting the Gerace Research Center’s field museum, where they examined plant and invertebrate specimens.

Next, the group was taken to a hillside covered with land crab holes and overlaid with a grid where they were asked to count the number of holes in each section of the grid. Known as a transect study, this activity acquainted them with a real-life application of a technique used in scientific investigation.

Their experience concluded with a visit to the “wet lab,” where marine specimens from the surrounding waters are kept for short periods of observation before being returned to their natural habitat. Actual water from the bay is piped into and circulated through the wet lab holding tanks.

For three days, the researchers worked with the Bahamian young people to familiarize them with the amazing ecosystems of their island.

“We stressed the diversity of wildlife,” points out Dr. Carter, “and we made it clear that we were guests on San Salvador Island, and that they were the caretakers.”

All too soon, the day was over for each group and the young people boarded the bus for the return trip less than a mile up the road.

“Their enthusiasm was contagious,” comments Dr. Hayes. “Their reactions to what we shared with them were genuine and heart-felt. I think we made a real impact.”

The habitats of the iguanas, sea birds, and other animals will continue to shrink without intervention by the government and citizens of San Salvador Island. In 1999, the storm surge from Hurricane Floyd, a level 5 hurricane packing winds of 155 miles per hour, devastated much of the vegetation and nesting habitat on Green Cay, and swept away many of the juvenile iguanas.

In the Bahamas, *Cyclura r. rileyi* survives on four offshore cays and on

two cays located in the waters of inland lakes. As part of the Disney grant, Drs. Carter and Hayes and their team of graduate students plan to restore portions of the habitat and observe whether their efforts actually help the iguana females in successful nesting.

Cacti plants on Green Cay, previously a mainstay of the iguana diet, have been nearly wiped out by an introduced moth. Rats have also invaded several cays, where they prey on iguana eggs and juveniles.

Sam Cyril, a graduate of Loma Linda University, led out in a successful rat eradication effort on Low Cay, located at the south end of San Salvador Island.

“By restoring the nesting sites and eradicating the rats, we hope to help turn around the declining numbers on Green Cay,” Dr. Hayes explains. “We plan to enlist the help of the local young people in the intense effort it will take to rebuild the habitat.”

Drs. Carter and Hayes hope that the young people—the leaders of tomorrow—will become stewards of the natural treasures, rather than mere consumers.

“We’re hoping that the next time one of these young people sees an iguana, he or she will observe it from a distance instead of taking it home as a pet or—worse yet—as dinner,” Dr. Carter concludes.

Two individuals who were particularly moved by the efforts of the Loma Linda researchers were Gerace Research Center director and caretaker Vince Voegeli and his wife, Sandy.

“To my knowledge,” says Mr. Voegeli, “this is the first time visiting researchers have taken a personal interest in the people who live on San Salvador Island.”

Typically, he continues, groups of researchers and university students come and go without any real contact with the local population.

“Ron Carter and Bill Hayes have made a lasting impression,” Mr. Voegeli continues. “We hope they will continue to include the Bahamian people in their efforts to preserve this island paradise.”



Dr. Carter shows off an example of the brightly colored T-shirt that will be given to each student at the end of the day. Emblazoned on the each T-shirt is a likeness of *Cyclura r. rileyi*.



Gerace Research Center, located on San Salvador Island, provides researchers and students with an ideal location for conducting training and marine research.



Graduate students Naomi Balduff and Tony Trimm prepare gear to transport to Green Cay, where they will spend two months documenting the behavior of *Cyclura r. rileyi*. Mr. Trimm will also study the nesting behaviors of Audubon's shearwaters, one of 13 sea-bird species which nest on San Salvador Island.