

Dear volunteers,

I hope this letter finds you well.

I wish to thank all of you for helping to make the first field season for the *Queen Conch of Belize* project such a success. We accomplished a lot. We sampled seven different aggregations (many previously unknown and all unsampled) and located, measured, and tagged 1,051 conch! This has led to a better understanding of the ecology and status of queen conch aggregations in the Sapodillas Cayes Marine Reserve. Without your help, only a fraction of the sites would have been sampled. And we would not have located nearly that many conch. We are already beginning to get a good idea of conch migration and connectivity in the SCMR. And we have a very good idea of population structure and density. All of this will help us achieve our goal of providing TASTE and the Belize Fisheries Department with solid information that can be used to manage queen conch in a sustainable way.

We will build on this next season by further monitoring the sites that were first monitored by all of you and by looking for new sites. We will continue our tag/recapture study to refine our understanding of conch migration and dispersal patterns and we will start a new phase of the project - sampling conch larvae - to begin answering the question, where do baby conch come from (from what location – from spawning aggregations in the reserve, adjacent to the reserve, further away, or from a combination of sites)? This information is vital for effective management.

Queen conch are in trouble. Populations are being fished unsustainably. But, there is hope. We can manage this fishery in a sustainable way. And your contribution to this project will help.

Thanks again. And I hope to see you in Belize again soon.

Sincerely,

John

## EARTHWATCH INSTITUTE FIELD REPORT 2006

**Project Title:** Queen Conch of Belize

**Principal Investigator:** John A. Cigliano, Ph.D.

**Position/Affiliations:** Department of Biological Sciences, Cedar Crest College, Allentown, PA  
USA

**Research Site:** Sapodilla Cayes Marine Reserve, Belize

**Local Management Status of the Research Site:** UNESCO World Heritage site

**Scientific names of primary species being studied:** *Strombus gigas*

### **Key Research Objectives:**

#### **Broad goals:**

- Determine the effectiveness of the Sapodilla Cayes Marine Reserve in protecting and replenishing queen conch (*Strombus gigas*) populations
- Provide information for adaptive management of the marine reserve
- Build capacity in all stakeholders to insure the long-term effectiveness of the reserve

#### **Specific objectives:**

- Map queen conch aggregations and habitat within the reserve and surrounding areas
- Conduct surveys as part of a long-term monitoring of queen conch populations and as part of a Before-After-Control-Impact (BACI) study to determine the effectiveness of the reserve in protecting queen conch populations
- Determine the extent of demographic connectivity of the reserve with surrounding areas through post-settlement migration (spillover effect) and larval dispersal (dispersal effect) and the overall level of self-recruitment of queen conch populations within the Sapodilla Cayes and Port Honduras region
- Develop a strong collaborative relationship with local stakeholders and the Fisheries Department to help build capacity in the community
- Conducting educational outreach activities with local stakeholders

## I. Data Collection and Results

- a) What progress have you made towards achieving your original research objectives and those of the field center?

The first phase of the project was conducted from January-August 2006. Sampling occurred during the months of January, March, July and August. The primary objectives were to: (1) locate significant queen conch aggregations in the various zones of the Sapodilla Cayes Marine Reserve (SCMR), (2) assess the current population abundance, density and population structure of queen conch aggregations, (3) tag juvenile and adult conch to determine dispersal and migration patterns, and (4) build collaborative relationships with local stakeholders.

All objectives were met. We have a solid, preliminary picture of the locations of shallow-water nursery and deep-water spawning aggregations, the population structure, abundance, and density of these aggregations, and the extent of seasonal migrations between shallow and deep-water habitats. The study was conducted in collaboration with the Toledo Association for Sustainable Tourism and Empowerment (TASTE), the Belize Fisheries Department, the University of Belize, local fishers, and ReefCI. We also had Belizean fellows on all three teams.

These objectives clearly support two of the objectives of the Belize field center: (1) building local capacity and (2) promoting sustainable fisheries.

- b) Give a concise summary of the data you have collected during the past field season.

*Shallow-water conch aggregations:* We located shallow-water queen conch aggregations at the reef cuts between Franks Caye and Nicholas Caye and Franks Caye and Northeast Caye, and in shallow water behind the cayes of Tom Owens, Hunting, Ragged, Franks and Seal.

A total of 1,051 conch were sampled. The mean siphonal (total) length was 149.2 mm ( $\pm 1.1$  mm) and mean lip thickness was 0.73 mm ( $\pm 0.1$  mm). The proportion of juvenile conch (lip thickness  $\leq 4$  mm) in each aggregation averaged 0.84 ( $\pm 0.04$ ) (range 0.50-1.00). Thus, all aggregations are considered crèches (nurseries). Average depth of the aggregation was 1.46 m ( $\pm 0.03$  m). Habitat consisted of seagrass meadows.

*Deep-water conch aggregations:* In collaboration with ReefCI, we located deep-water ( $> 10$  m) aggregations at Nicholas Cut (outside reef cut between Nicholas Caye and Hunting Caye) and "Northeast Stadium." A total of 332 conch were sampled (176 were measured) in Nicholas Cut (N=72) and Northeast Stadium (N=260). Average siphonal length was 255.5 mm ( $\pm 1.5$  mm) and average lip thickness was ( $\pm 0.04$  mm). The average proportion of old adult conch (lip thickness  $> 5$  mm, worn spines, moderate to heavy effects of bioerosion) was 0.99 ( $\pm 0.002$ ). Fourteen matings (Northeast Stadium: 5, Nicholas Cut: 9) and one egg-laying event (Nicholas Cut) were observed. Thus Nicholas Cut and Northeast Stadium are considered spawning aggregations. Average depth was 18.7 m ( $\pm 0.3$  m) and habitat was primarily sand.

*Tagging:* Earthwatch teams tagged conch in all sampled shallow-water aggregations. In total, 673 conch were tagged. Of these, 102 were "recaptures" (91 harvested by fishers and 11 resightings). An additional 51 conch were tagged by ReefCI. One of these was resighted and three were harvested. Seventy-four of the harvested conch were captured in deep water ( $> 15$  m) in or near Nicholas Cut during September and October 2006. This suggests that the conch use Nicholas Cut for seasonal migrations between shallow (spring-summer) and deep (fall-winter) sites.

Three hundred and forty four conch were tagged in *deep-water* by ReefCI. Fifty-nine of these conch were harvested and 85 were resighted. Preliminary analysis suggests that adult conch from deep-water aggregations do not migrate/disperse from these sites.

## II. Significance of Research

a) What is the significance or benefit of your research at the following levels?

- Local: The Sapodilla Cayes Marine Reserve (SCMR) was established in 1996. But there has been no ecological study of the area to determine the overall status of the marine resources and habitats in the reserve. This project will contribute needed information on the current status of queen conch populations. This will be used as a baseline against which we can judge the effectiveness of the reserve, once the reserve management plan is enacted.
- National: The queen conch is the second largest fisheries export of Belize, and, thus, a significant part of the country's economy. This study will provide information that can be used for the effective management of queen conch in the SCMR and other areas of Belize.
- International: The queen conch is also the second largest fishery in the Caribbean and is overexploited throughout its range. Because of this, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) considers queen conch to be of "possible" or "urgent" concern. The information from our study will be applicable to the management of queen conch throughout its range.

b) How do your findings contribute to issues of sustainability?

Effective management of any resource is based on the idea of sustainability. Therefore, effective management of queen conch in the SCMR, and elsewhere, implies sustainable harvesting. Currently, queen conch are considered overexploited and thus they are being harvested in an unsustainable manner. Our study will provide information on the ecology and behaviour of queen conch that can be used to inform management plans in a way that can lead to sustainable harvesting. For example, we do not know where new queen conch recruit from. Is it the deep-water aggregations in the reserve or from distant, unprotected areas? The answer has significant management implications.

c) How do your findings contribute to the overall field center goals?

These objectives clearly support two of the objectives of the Belize Field Center: (1) Building local capacity and (2) promoting sustainable fisheries. Our collaborations with local stakeholders contribute to capacity building. And the research goals and objectives have been developed to promote the sustainable harvesting of queen conch.

## III. Dissemination of Results

- We submitted a report on our findings to the Belize Fisheries Department
- An abstract on our work has been submitted to the Ecological Society of America for presentation at its annual meeting in August 2007.

- We will present our findings to the local community at a community meeting in August 2007

#### **IV. Volunteer Tasks and Accomplishments**

- a) How did the volunteers contribute ideas, skills, expertise and motivations beyond that which you anticipated?

The volunteers contributed as I expected. This is not to minimize their contribution. My previous experience with Earthwatch volunteers set the bar pretty high.

- b) How have volunteers helped you to achieve your research or educational objectives?

Most of the volunteers were enthusiastic and extremely dedicated to the project. They contributed fully to the study; volunteers collected all the data from the shallow water aggregations. This equates to 1,051 conch sampled over seven sites.

#### **V. Partnerships**

- a) List partnerships or collaborations with other organizations that you have developed or maintained.

TASTE, Belize Fisheries Department, University of Belize, Conservation International, ReefCI

- b) How have these organizations contributed to your project objectives and field center goals?

TASTE co-manages the SCMR and is intimately involved in the project; the Fisheries Department offered advice and provided research permits; ReefCI provided logistical help with the deep-water aggregations; and Conservation International provided additional funding to support laboratory work. The University of Belize and Cedar Crest College have signed an MOU to develop a joint field course to be taught at the new Living Reef Center that is being developed by Earthwatch and UB in the SCMR at Hunting Caye. I hope that this is the beginning of a long and close relationship between us.

- c) How do you anticipate these organizations will use the results generated by the project, and in what timeframes?

TASTE and the Fisheries Department should be able to use the results generated from this project within 1-3 years as part of their management plan for the SCMR. Within the same timeframe, Conservation International will be able to apply the results from this project and our study on the genetic connectivity of queen conch populations to their Marine Management Area Science (MMAS) program [the genetic connectivity study is funded by CI through their MMAS program].

#### **VI. Outcomes of Engagement**

Has your project:

- Helped lead to the completion of Masters' theses or other educational outcomes? No
- Led to new management plans or legislation? Not as yet
- Helped create activities from communities, organizations, fellows, or other individuals towards conservation and sustainability? Not yet, but the Belize Field Center is actively and vigorously pursuing community involvement and capacity building

- Led to other benefits (economic, social, or environmental) to the community and its environment? Unknown
- Contributed to reaching field center goals through engagement? Yes