

Queen Conch Ranching and Educational Outreach as Part of the Seaflower Biosphere Reserve, Colombia

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ABSTRACT

The queen conch is the second most valuable fishery species across the Caribbean region including Colombia. Colombian production comes primarily from the San Andres, Providence and Santa Catalina archipelago, where has been highly exploited for more than three decades. Queen conch meat landings from Colombia ranks in the top 10 countries in total global exports despite its CITES country quota, which has been diminishing with time. A total closure of the fishery within the archipelago occurred from June 2004 through November 2006, and currently a significant increase in its natural population, particularly from Serrana reef, is expected. Contrary to the spiny lobster, the queen conch has also been an important species for locals and indeed is one of the species most represented in cultural traditions. Traditional fishers in the archipelago earn less than US \$1.00 per hour or US \$2-3.00 per pound of conch, and many of them have large families to sustain. The recently declared Seaflower MPA setup under CORALINA leadership, with no-take-zones provides perfect opportunities to recover this key species in the reefs where natural recovery is not yet taken place. To enhance this natural process the authors are looking for innovative approaches to allow traditional fishers a better quality of life, while actively participating in queen conch protection and recovery. The main goal of this project is to introduce methods that include conservation education, conch ranching, and restocking marine protected areas with reproductive stock. Harbor Branch Oceanographic Institute (HBOI) scientists are working with Blue Dream, Ltd., Secretaria de Agricultura y Pesca, CORALINA, local fishers, teachers, students and the San Andres and Old Providence communities. In October 2006, juvenile queen conch were collected from Serrana Reef and placed into two 19.3 m dia cages. The conch were separated into two size classes (under and over 12 cm total length) and stocked at a density of 1.6 conch per m² for the over 12 cm group, and 2.3 conch per m² for the under 12 cm group. The cages were constructed by visiting scientists, local fishers, biologists, and technicians and replicated the cages currently operated at the Caicos Conch Farm, Turks and Caicos Islands. Each cage was placed in a shallow near-shore site on Saint Catalina Island within a Seaflower Biosphere Reserve no-take zone. The conch ranching study will last approximately seven months, after which time, half of the conch will be released into artisanal fishing sites, and the remaining conch will be released into a no-take zone. CORALINA personnel and other partners will translate HBOI's *Conch in the Classroom* curriculum, and teacher training workshops will be held in spring 2007 in Old Providence and San Andres. This project incorporates fisheries management, education, and natural recovery together as an effective strategy to help conserve queen conch, minimize fisheries pressure in the archipelago, and positively contribute to the socio-economics of this developing region in Colombia.

KEY WORDS: natural recovery, conch, education, ranching

Pastoreo del Caracol Pala y Programas de Extensión Educativa Como Parte de la Implementación De La Reserva De Biosfera Seaflower, Colombia

El caracol de pala es la segunda pesquería en toda la región del Caribe, incluyendo Colombia. La producción Colombiana proviene principalmente del Archipiélago de San Andrés, Providencia y Santa Catalina archipiélago, donde ha sido explotada durante más de tres décadas. Los desembarcos de carne de caracol de Colombia están entre los 10 países exportadores a pesar de la continua reducción de la cuota de CITES para el país. Un cierre total de la pesquería en el archipiélago ocurrió entre Junio 2004 y Noviembre 2006, y actualmente un incremento significativo de sus poblaciones naturales es esperado, especialmente en el arrecife de Serrana. Al contrario de la langosta espinosa, el caracol de pala es una de las especies más representada en las tradiciones culturales. Los pescadores tradicionales en el archipiélago ganan menos de \$US1 por hora o \$US2-3 por libra de caracol, y muchos de ellos tienen familias grandes que sostener. La recién declarada AMP Seaflower establecida bajo el liderazgo de CORALINA, determinando áreas de no extracción ofrecen una excelente oportunidad para recuperar esta especie en los arrecifes donde la recuperación natural aun no se ha dado. Para fortalecer este proceso natural los autores están buscando respuestas innovativas para alcanzar una mejor calidad de vida a los pescadores, a la vez que con su activa participación se protege y recupera el caracol de pala. El objetivo principal de este proyecto es el de introducir métodos que incluyan la conservación, educación, levante y repoblación del stock reproductivo. Científicos de Harbor Branch Oceanographic Institute (HBOI) están trabajando coordinadamente con Blue Dream Ltd, Secretaria de Agricultura y Pesca, CORALINA, pescadores locales, maestros, estudiantes y la comunidad de Old Providence y Santa

Catalina. En Octubre 2006, juveniles de caracol de pala colectados en el arrecife de Serrana fueron colocados en dos jaulas de 19.3 m en diámetro. Los caracoles fueron separados en dos tamaños (por debajo y por encima de 12 cm longitud total de concha). Las jaulas fueron construidas por los científicos visitantes, biólogos y técnicos, y replicaron el modelo utilizado en la granja de caracoles de Turcos y Caicos. Las jaulas fueron instaladas en un área somera cerca de la isla de Santa Catalina en una zona de no extracción de la AMP Seaflower. El estudio del levante de caracol durara aproximadamente siete meses, tiempo al cual, la mitad de los caracoles serán liberados en zonas de pesca artesanal y la otra mitad en áreas de conservación. Personal de CORALINA y otros participantes ayudaran a la traducción del currículo sobre CARACOL que ha elaborado HBOI y tendrán talleres en las islas de Old Providence y San Andrés. Este proyecto incorpora el manejo pesquero, conservación, educación y recuperación natural juntas como una estrategia efectiva para ayudar a la preservación del caracol de pala, minimizar la presión pesquera en el Archipiélago y contribuir positivamente en el desarrollo socio-económico de esta región de Colombia.

PALABRAS CLAVES: recuperación natural, caracol de pala, educación, levante

INTRODUCTION

The queen conch, *Strombus gigas*, is the largest molluscan gastropod (18 - 23 cm, 7 - 9 in shell length) of the six conch species found in the shallow seagrass beds of Florida and at least 36 countries and dependent territories in the Caribbean region. Queen conch is considered one of the most important benthic fisheries, second only to spiny lobsters, but the increased demand for conch has severely depleted many of the wild queen conch populations (Appeldoorn, 1994). In 1992 as a response to overharvesting, queen conch was listed in CITES Appendix II (Convention for the International Trade of Endangered Species of Wild Fauna and Flora) and became the first large-scale fisheries to be regulated by CITES. Marine protected areas have also been established across the Caribbean to provide a refuge for spawning populations of queen conch (Chiappone and Sullivan Sealey, 2000; Glazer and Delgado, 2003; Glazer et al., 2003). As an example, the Seaflower Biosphere Reserve was established in 2005 as a means to conserve biological and cultural diversity and includes the Colombian archipelago of San Andres, Old Providence, and Saint Catalina. It covers around 300,000 km², of which 1600 km² is dedicated to conservation, 73,900 km² is set aside for low-impact sustainable use projects, and the remaining 224,500 km² is delegated for the development of cooperative environmental management activities that gives rise to an alternative ecologically sustainable development model.

In Colombia, the queen conch is a very valuable fisheries species; however, it has been highly exploited for more than three decades. The majority of the queen conch fishery exists within the archipelago of San Andres, Old Providence, and Saint Catalina located east of Nicaragua in the south western Caribbean Sea. Colombia has a national agency (INCODER) that defines policies and all aspects of the fisheries management for Colombia. Within the archipelago there is a local committee (Junta Departamental de Pesca) doing a similar job, as well as handling licensing and certain aspects of enforcement. Colombia ranks in the top 10 countries in total global exports of queen conch meat (a total of 1.1 million kg over 12 years) and may contribute to neighboring countries' landings based on sus-

pected high levels of illegal fishing in their outer banks. Regulations for conch fishing in Colombia include an established country quota (203 tons in 1997 reduced to 90 tons in 2001, and to 83 tons in 2006), closed seasons, marine protected areas, ban of scuba tanks, and minimum meat weight. However, even with these management regulations in place, a total closure of the commercial fishery within the archipelago occurred in 2005. Unfortunately, the remoteness of the archipelago has made enforcement difficult, which has resulted in illegal exploitation of the queen conch populations. Fishers are currently capturing juveniles and very old adults, which indicates a critical situation for the population structure and their rate of natural recovery.

Most traditional fishers in the archipelago earn less than US \$1.00 per hour or US \$2-3.00 per pound of conch, and many of them have large families to sustain. The unemployment rate is as high as 40%, causing many young people to associate with the trade of illegal substances rather than become a fisher. Aquaculture initiatives are emerging as one of the most promising alternatives to allow traditional fishers a better quality of life, while actively participating in queen conch protection and recovery. With the retail price of queen conch meat tripling to US \$15.00 or higher a pound (US \$33/kg) in the past two years, perhaps aquaculture can be a job incentive for displaced fishers to earn higher wages.

This study examines the feasibility of queen conch ranching in the archipelago of Colombia. Conch ranching will provide an alternative livelihood for fisheries and will also be a method to grow queen conch to reproductive age for stocking into marine protected areas, specifically the Seaflower Biosphere Reserve. This project incorporates fisheries management, conservation education, and aquaculture together as an effective strategy to help conserve queen conch, minimize fisheries pressure in the archipelago of Colombia and positively contribute to the socio-economics of a developing region.

MATERIALS AND METHODS

During the 2005 Gulf and Caribbean Fisheries Institution meeting in San Andres, Colombia, scientists from

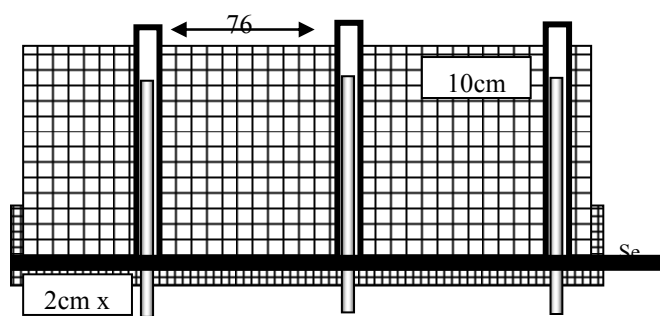


Figure 1. Schematic diagram of queen conch ranching cages built in Colombia. Each cage is 19.3 m dia.

HBOI, CORALINA, and the fisheries department had the opportunity to meet with 20 local fishers and discussed the potential for re-stocking and ranching programs in the archipelago as an alternative income for displaced conch fishers. With the total closure of the commercial conch fishery in the archipelago, the fishers expressed a great interest in queen conch ranching. In July 2006, Harbor Branch received funding from the Disney Wildlife Conservation Fund to conduct a small queen conch ranching project with Blue Dream Ltd, CORALINA, and the fisheries department, within the multiple-use zone of the Seaflower MPA.

For this study wild caught seed stock were used in the conch ranching cages, in order to ensure genetic stock and diversity. In October 2006, technicians from CORALINA and the Secretaria de Pesca along with local fishers and with the aid of the Colombian Navy, collected approximately 1100 juvenile conch (8 to 19 cm shell length (SL)) from six locations throughout the Serrana Reef, which is one of the areas with the highest conch densities within the Caribbean (Appeldoorn et al., unpubl.). Conch at this length are closer to the harvestable size, (Márquez and Dávila 1994, Ospina et al. 1997, Chiquillo et al 1997), and are also readily available along the Serrana Reef approximately 150 miles from San Andres. Conch smaller than this tend to bury, which would have made collection of this size juvenile very time consuming. The conch were held in two temporary underwater cages for three days at Saint Catalina until stocked in the experimental ranching cages.

With the aid of the Caicos Conch Farm, ranching cages were designed similarly to the growout cages used at the commercial farm. The materials for the cage structures were obtained locally or shipped to Colombia from the United States. There are two circular cages 1.5 m (5 ft) high and 19.3 m (64 ft) in diameter, each with a surface area of 293 m². The primary material of the cage is plastic coated wire mesh with openings of 10 cm x 10 cm (4 in x 4 in), and the support posts are rebar stakes sleeved with 1" PVC. A plastic mesh skirt (30 cm, 12 in high; 3/4" open-

ings) was attached to bottom of wire mesh to prevent conch escaping (Figure 1). The cages were placed in two shallow near-shore sites (approx. 0.5m – 1.5m deep) within the reef lagoon of Saint Catalina shelf within a Seaflower no-take zone (Figure 2). The cages are located within a seagrass covered cove. This site was chosen for several reasons including the following: 1) historical or current juvenile conch populations; 2) current up to 0.5 knot; 3) moderate seagrass density (600-900 shoots/m²); 4) non-silty bottom; and 5) it is located in an area near the channel used daily by the fishermen. Prior to stocking, the cages were thoroughly examined for predators (*Murex* and octopus), and the mesh was firmly located on the ground (or slightly buried) to prevent escape routes.

On October 12, 2006, the cages were stocked with the juvenile queen conch. The conch were separated into two size classes: under 12 cm and over 12 cm, and a subsample of 120 conch for each cage was measured. The first cage was stocked with the 645 smaller animals (11.2 ± 1.0 cm

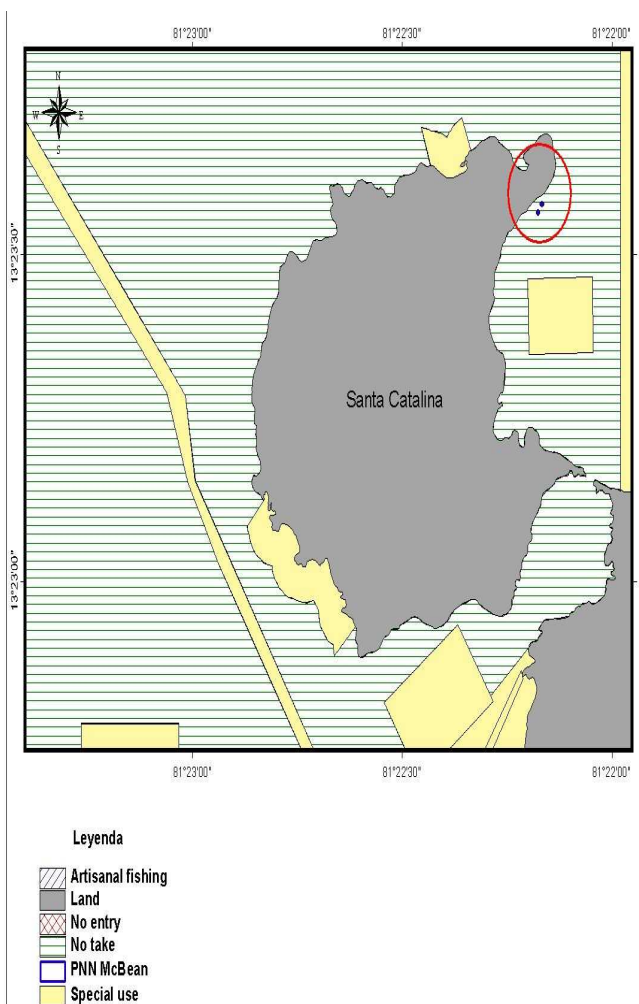


Figure 2. Location of the queen conch ranching cages in Saint Catalina, Colombia within the no-take zone of the Seaflower Biosphere Reserve.

SL) for a stocking density of 2.3 conch per m². The second cage was stocked with 445 larger animals (15.7 ± 1.4 cm SL) for a stocking density of 1.6 conch per m². This stocking density is similar to the density in which conch populations are found in the natural environment throughout the Colombian Caribbean (Ballesteros et al., in press) and the Bahamas (Stoner and Davis, 1994). The conch will not receive supplemental feed; therefore, it was important to mimic natural stocking densities. The cages will be monitored from October 2006 – May 2007. Two local fishers from the Old Providence Fishing Co-Op hired for this project are responsible for daily cage maintenance, which includes checking the cages for holes, escaped conch, and predators, and for scrubbing the cages free of fouling. Once per month (beginning in November 2006), biologists from CORALINA, the fisheries department, and the local fishers will measure a subset of the population (18%) using a Hagloof Mantex Aluminum calipers (nearest mm shell length). This will provide seven growth measurements to assess growth rate at the different sites. To select the subsample of conch per cage to be measured, a transect line will be run through the center of the cage and conch located within 1 meter on either side of the transect line will be collected for measurements. To assess mortality rate, the total number of conch will be counted at the beginning and end of the experiment. A two-way analysis of variance will be used to determine the differences in growth and survivorship between the two cages. Two meetings were held in San Andres and Old Providence in October with local fishers to discuss the project and answer questions.

At the end of the study half of the conch will be released into “no-take areas” of the SEAFLOWER Biosphere Reserve, and the other half will be released into artisanal fishing sites. Suitable habitats and site locations for the release will be determined by CORALINA, the fisheries department, and Harbor Branch researchers. Of the 545 conch released into the protected areas, we estimate that 272 conch in this population (50%) will be females, which will produce nine egg masses per reproductive season (Davis 1994). By releasing the conch into protected areas, we are ensuring that approximately 1.2 trillion eggs will be released into the surrounding protected and fishing areas during the first reproductive season alone.

Biologists at CORALINA Old Providence will translate Harbor Branch’s *Conch in the Classroom* curriculum in Spring 2007. There are currently eight lesson plans, five educational modules, and a variety of activities used by primary and secondary schools throughout the United States and the Caribbean. CORALINA has experience with educational translation programs and has a number of staff members qualified to complete this project. In May 2007, collaborators on this project will host two teacher workshops (Old Providence and Saint Catalina) to introduce educators to the queen conch curriculum and to train them on how to incorporate the activities into their classrooms. Potential hands-on activities include snorkel trips

to the cage locations and maintaining classroom aquariums with queen conch. The queen conch curriculum (English) is currently available online at www.savetheconch.org, and the Spanish translations will be posted as well.

DISCUSSION

As queen conch populations continue to decline throughout the Caribbean, new sources of income and alternative job opportunities have become essential. With new cage growout technology now available from the Caicos Conch Farm in the Turks and Caicos Islands, it is feasible to begin conch ranching projects in the wider Caribbean region such as Colombia. This project could serve as a model for others to follow. There is not a queen conch hatchery in the archipelago of San Andres, however, a small research scale hatchery located near mainland Colombia in the archipelagos of Nuestra Señora del Rosario and San Bernardo may be able to provide seed stock queen conch (8 -10 cm) for conch ranching in the future.

The local fishing community of Old Providence is directly involved and partially responsible for this project and its success. Many national and international institutions have come together to support the queen conch ranching and education efforts presented here. The local fishers in San Andres are demanding a similar project to help the natural recovery on their fishing areas too, and most recently the Colombian CITES authority is interesting in provide additional funds to implement a similar project as requested.

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