

## OVERVIEW OF QUEEN CONCH *STROMBUS GIGAS* RESTORATION EFFORTS

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The queen conch, *Strombus gigas*, is classified as a commercially threatened fisheries species by IUCN and the Convention of International Trade of Endangered Species (CITES). This large gastropod mollusk is an important keystone herbivore, which is found in shallow seagrass and sand habitats in the Florida Keys, Caribbean region, and Central and South America. Because this species has a planktonic larva that drifts for 2-6 weeks in the warm waters of the Caribbean, fishery managers often discuss the necessity of a pan-Caribbean management plan for this species. There are several restoration efforts used today to help ease fisheries pressure, and they include: regulations and closures, translocation of adult conch, marine protected areas, and aquaculture for stock enhancement and ranching.

### **Regulations, Translocations, and Marine Protected Areas**

Fisheries regulations throughout the Caribbean focus on size at catch (e.g., flared lip is necessary), bag limits, complete closure such as in Florida and Bermuda, and export closures from the Caribbean to the United States by CITES. The success of these regulations for maintaining steady populations for fishing or recovery of the species will depend on enforcement efforts, optimal habitat and water quality, and whether the spawning aggregations are dense enough to ensure internal fertilization by an adequate number of mating pairs.

Recovery of the queen conch in the Florida Keys has been slow (estimated 35,000 adults in 2003) even though the commercial fishery was closed in 1975 and the recreational fishery followed suit in 1985. The Florida Fish and Wildlife Conservation Commission (FWC), who have a long term queen conch program in the Florida Keys, have recognized the need to boost reproductive output as an effective restoration strategy. They adopted a translocation approach based upon research that demonstrated that non-reproductive conch inhabiting nearshore areas began reproducing when translocated into the offshore spawning aggregations. To date, FWC have translocated approximately 2,500 conch into offshore aggregations. To maximize the contribution these conch make to the recovery of the local stock, they have been translocated into areas where the larvae will have a high probability of being retained in the Keys based on a drift vial study and plankton tows.

There are several marine protected areas in Florida and through the Caribbean region. Some of these protected areas are large enough to adequately protect spawning populations (i.e., Exuma Land and Sea Park in the Bahamas). However, in the Florida Keys, most Sanctuary Preservation Areas (SPAs) are too small to protect spawning aggregations if a recreational fishery reopens; additionally, most aggregations are located outside of SPA boundaries. A successful management strategy for queen conch restoration is one that combines translocations with hydrodynamics and spawning stock protection.

## **Aquaculture for Stock Enhancement and Ranching**

Aquaculture of the queen conch began in the 1970's as a means to replenish overfished habitats and to produce conch meat for the market. In 1984, the first commercial conch farm – the Caicos Conch Farm - opened in the Turks and Caicos Islands. Large scale techniques to culture conch from the egg stage through growout to market are now well established. Conch egg masses are collected in the summer breeding season from adults (>3 years old) that are located in an underwater “egg farm”. Each female lays approximately 500,000 eggs in one mass and she lays an average of 9 egg masses per season. Four days later veligers hatch from the incubated egg mass. These planktotrophic veligers have a three-week larval stage. The conch metamorphose when exposed to a red seaweed extract cue and grow to a 7 cm shell length juvenile in approximately one year.

In the 1990's several laboratories evaluated the feasibility of using hatchery-reared juvenile conch to supplement the wild spawning stock. FWC showed that conch should be released at 10 cm (approximately 4 inches) in the fall months on upcoming full moons. Studies conducted in the Bahamas by the Caribbean Marine Research Center (CMRC) concluded that husbandry techniques were critical to the success of stock enhancement. Improving shell strength, shell morphology such as spine length (CMRC), and burying behavior along with predator conditioning will improve survival after release (FWC). Harbor Branch Oceanographic Institution's research with husbandry techniques has shown that density (75 conch/m<sup>2</sup>) and substrate (coarse aragonite) improve shell strength for juvenile conch. FWC determined that the cost per outplant based on 20,000 conch (10 cm) surviving to 15 cm would be approximately \$9.00 per individual. Based on the high cost of restocking it is recommended that stock replenishment should be used in areas where reproductive stocks have been fished to critically low levels and this is one of the only alternatives to bringing back the stocks.

Conch ranching in large sea pens (21 m; 70 ft diameter) has been developed at the Caicos Conch Farm as an economical method to grow 7 cm conch to 15 cm market size. These mesh pens are located in shallow water (1 – 1.5 m; 3 – 4 ft deep) and the top of the pen is above the high tide mark. Stocking density is 5,000 conch per pen (14 conch/m<sup>2</sup>). Since this density is substantially higher than conch found in conch nurseries (1 – 2 conch/m<sup>2</sup>), the conch in the pen are supplemented with formulated feeds several times per week. Ranching conch in ocean pens provides a successful method for grow out of conch and the technology can be transferred to other islands as an alternative livelihood for fishers.

## **Summary**

With queen conch fisheries catches declining and prices rising, there is an urgent need to continue to develop and implement replenishment strategies such as translocations, marine parks, stock enhancement, and ranching to ensure the survival of this species for future generations.