Developing Aquaculture Techniques to Conserve Common Snook in Florida

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Overview on the Snook Aquaculture Project:

From 2005 through 2007, Mote Marine Laboratory (MML) received three installments ($25,000 per year) on the $125,000 grant award from Mosaic to develop sustainable aquaculture technology to produce common snook to restore Florida’s declining snook populations. We have made substantial progress in developing culture methods to produce snook over the past three years. This report summarizes some of the key project accomplishments and research areas that are being addressed. The snook aquaculture project is a collaborative research effort between Mosaic, the Science Consortium for Ocean Replenishment and Enhancement (SCORE), Florida Fish and Wildlife Conservation Commission (FWC), NOAA Marine Aquaculture Initiative, and two of MML’s research centers:

- Center for Aquaculture Research and Development
- Center for Fisheries Enhancement

The support provided by Mosaic in 2005, 2006 and 2007 provided bridge funding to MML’s Center for Aquaculture Research and Development to support our captive breeding and larval rearing research at the Mote Aquaculture Park (MAP) in Sarasota, Florida. The Mosaic grant award was instrumental in our ability to obtain matching support for snook aquaculture for a new, highly competitive grant award that MML received from the Department of Commerce/NOAA Marine Aquaculture Initiative to develop hatchery technology for common snook. In 2007, the Center for Fisheries Enhancement (CFE) was able to release snook that were born and raised at Mote Aquaculture Park in 2007. This was the first time that any organization has matured and spawned common snook in captivity, reared them and then released them. The Mosaic funds are a critical piece of the funding required to move snook aquaculture to a new level. We thank you for your continued support of this important work.
Milestones Achieved in Snook Aquaculture

2005 – 2007

Snook Aquaculture Challenges

There are three key areas of research that need to be resolved in order to successfully produce large numbers of snook to enhance coastal fisheries:

Maturation and Spawning – although strip spawning has been successful in the past, it is not a reliable or dependable way to obtain large numbers of eggs for rearing. Our research over the past 3 years has focused on developing new captive spawning methods for snook. We have been successful in maturing and spawning the fish in captivity, but we have unanswered questions about egg and sperm quality that must be resolved. Research is underway 1) to evaluate diets for broodfish and determine the dietary components that provide the best nutrition to produce high-quality eggs, 2) investigating hormone induction methods to stimulate spawning in captivity and 3) to determine the environmental cues required for maturation and spawning.

Larval rearing – there is poor larval survival from both wild and captive spawns. Research is focused on 1) determining the best live food and microdiets for the early larval stages and 2) determining the best culture environment to ensure optimal survival.

Nursery stages – another problem area for survival is in the nursery stage. This is the culture period from metamorphosis (change from larval stage fish into a nursery-stage fish) up to the appropriate size fish required for restocking. The two primary causes of poor survival are cannibalism and lordosis (bent-back syndrome). Research is underway to determine the best methods to reduce both of these impacts.

Maturation & Spawning Research

Environmental Spawning Cues - The goal of our research is to determine the cues required to induce maturation and spawning in captivity. Our efforts have been directed toward providing the cues that the fish experience in nature. Large culture tanks and sustainable recirculating filtration systems have been designed and constructed to provide a rearing environment that will accommodate a large number of broodfish. The photoperiod (light conditions) for spawning has been artificially set to mimic the natural lighting for Sarasota during May through August. Spawning temperatures have been maintained at 30 ± 1.0°C; salinity has been set to 35 ± 1 parts per thousand; and a lunar light cycle has been provided in the rooms to mimic the natural lunar cycle for current outdoor conditions.

Diet Enrichment Research – The goal of our research is to evaluate diets for broodfish and determine what diet provides the best nutrition to produce high-quality eggs.
Captive broodfish are fed a fresh diet consisting of 50% shrimp, 25% herring, and 25% squid. We have tried several enrichment techniques over the past 3 years and our current technique includes the addition of gelatin encapsulated vitamins in fresh diet. We are half-way through a two-year study to compare the effect of gelatin encapsulated vitamins with and without ARA (a key fatty acid) enrichment on egg and larval quality.

**Hormone Induction Methods** – Although captive snook will mature in captivity, they require a hormone (GnRHa) cue to get them to release eggs and sperm into the water. We have been investigating the use of both regular release and slow release GnRHa implants and have determined that slow release give us the greatest number of spawning events per sampling. We have also sampled the fish every month and every 6 weeks during spawning season and have determined that 6 weeks between sampling is required to allow the fish to recover after a spawning event.

**Larval Snook Research**
Our initial efforts were concentrated on defining the basic parameters required for larval rearing. Snook eggs hatch after 15 hrs at 28°C and the eggs and resulting larvae are extremely small. These larvae require several types of live food and after about 35-50 days, larvae can be weaned onto a commercial diet. Juvenile snook cannot be handled or exposed to any turbulent conditions until they are fully scaled (35-45 days after hatching). Our current research has looked at whether changes in morphology as snook larvae grow reflects a change in feeding performance. This research revealed that common snook do not select traditional food items that are provided in the hatchery, first feeding is constrained by a poorly developed feeding apparatus and prey capture performance is highly influenced by the state of development of the feeding mechanism.

**Fisheries Enhancement Research**
In 2007, the Center for Fisheries Enhancement (CFE) was able to release snook that were born and raised at Mote Aquaculture Park in 2007. This was the first time that any
organization has matured and spawned common snook in captivity, reared them and then released them. The release, in collaboration with the FWC took place in October 2007. MML’s CFE-Stock Enhancement Program is researching release strategies with snook to determine the best methods for marine fish stocking programs. Understanding what happens when fish are released into larger oceanic settings is key to understanding whether humans can help replenish depleted marine resources. This work is important because recreational fishing brings an estimated $5.4 billion a year into Florida’s economy and snook populations have declined because of loss of habitat and fishing pressures. These studies seek to help rebuild wild populations.