Naguabo Queen Conch Hatchery & Nursery

Development of a Fisher Operated Pilot-Scale Queen Conch (Lobatus gigas) Hatchery and Nursery Facility for Sustainable Seafood Supply and Restoration of Wild Populations in Puerto Rico.

S-K NOAA Award NA10NMF4270029
Partners

Megan Davis: Research Professor
FAU Harbor Branch

Raimundo Espinoza: Executive Director
Conservación ConCiencia

Carlos Velasquez: President
Naguabo Fishing Association

NAGUABO COMMERCIAL FISHING ASSOCIATION
Combining Expertise

PI: Megan Davis, PhD

Co-PI: Raimundo Espinoza
Combining Expertise

Collaborating Partner: Carlos Velasquez
**Goal:** to assist with restoration of queen conch fisheries in Puerto Rico by producing queen conch in a fishers-operated aquaculture facility

<table>
<thead>
<tr>
<th>Build and Operate</th>
<th>Build and operate a pilot-scale conch hatchery and nursery facility at the Puerto Rico Naguabo Commercial Fishing Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open to Others</td>
<td>Open the facility for others to learn about queen conch aquaculture, biology, conservation and fisheries</td>
</tr>
<tr>
<td>Release</td>
<td>Release hatchery-reared juvenile conch for restoration purposes</td>
</tr>
<tr>
<td>Produce a Plan</td>
<td>Produce a plan that recommends other areas in Puerto Rico for conch hatcheries and potential grow-out areas</td>
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Plight of The Conch
Why Puerto Rico?

- U.S. Caribbean
- The Queen Conch Resources Fishery Management Plan (CFMC)
- Majority of the conch fished are consumed locally ($6 – $9 / lb)
- Disruption of conch habitats from hurricane Maria severely impacted fisheries and fishing communities
- Previous conch hatchery and nursery at UPR in 1980s (Ballentine & Appeldoorn)

Economic Impacts of Hurricane Maria in Naguabo, PR

November 2016
- $60,000 in Conch Sales
- $48,000 Fisher Income

November 2017
- $3,000 in Conch Sales
- $2,400 Fisher Income
Kickoff Meeting!
(September 2019)

- With fishers at Naguabo Commercial Fishing Association
- Students at the University of Puerto Rico (Humacao) Marine Science program
Design Planning & Renovating (December 2019 – January 2020)
Installation (In Progress)

- Shipments delayed due to COVID19
- Finally arrived on Friday (June 19, 2020)!
1. Recolección de Huevos

The first step to culturing (farming) conch in a hatchery, is to collect sections of egg masses from the wild. A full egg mass has 500,000 eggs - much more than what we need! This is why we only collect 1/4 or less of the total egg mass:

FIELD KIT

To collect egg mass sections, you will need to bring a Field Kit with you containing the following:
- Data sheet with clipboard
- 5 gallon bucket with lid
- Snorkeling gear
- Pencil with eraser, and sharpener
- Refractometer (to measure salinity*)
- Thermometer (to measure temperature)
- Ziploc bags (Quart size and freecable) labelled 1-6.

* salinity is measured by parts per thousands

PASO 1:
During breeding season (June-November), look for egg masses under females. Newly laid egg masses look like these are stronger for transport than masses found on the sand without a female.

PASO 2:
Once located, use your hands to gently break off 1/4 or less of the egg mass. Place it in a Ziploc bag with seawater. Make sure you only have one egg mass section per Ziploc bag.

PASO 3:
Back on the boat, carefully place your Ziploc bag into the bucket which filled with seawater, and close the lid. Keep the bucket out of the sun and gently refill every 2 hours, always keeping it 3/4 full.

PASO 4:
Fill out the Egg Mass Collection Data Sheet after EACH egg mass section collected. This is very important! Repeat the process until you have the desired amount of egg mass sections (up to 6 per month).
Life Cycle & Reproduction Overview

1. Egg Stage
2. Newly Hatched Veliger
3. 4-Lober Veliger
4. 6-Lober Veliger
5. Pelagic Stages
6. Benthic Stages
7. Adult
8. Egg Groove

Veliger Stage
Metamorphosis Stage
Juvenile Stage
Egg Stage
Collection of Egg Masses
EGG DEVELOPMENT STAGES

Stage 1
The eggs look round & smooth.

Stage 2
The eggs look round & bumpy.

Stage 3
The shell & lobes of the embryo become visible.

Stage 4
The black eyes & orange foot become visible. The edge of the lobes darken. Embryos begin to slowly rotate.

Stage 5
The edge of the lobes become thicker & darker. The rotation is obvious.
Growing Microalgae

*Chaetoceros gracilis*

*Isochrysis galbana*

~5 micron

~7 micron
VELIGER DEVELOPMENT

STAGE 1: 2 lobes
STAGE 2: 4 lobes
STAGE 3: 6 lobes
STAGE 4: 6 elongated lobes
STAGE 5: Shell length is 1-1.2 mm

1.5 whorls  2 whorls  2.5 whorls  3 whorls  4 whorls
Newly metamorphosed conch grazing on flocculated algae.
The hatchery is where conch are cultured (farmed) from egg to metamorphosis, and includes the microalgae area.
The nursery is where the small juvenile conch are grown until they are large enough to be released into the wild.
Production Schedule (2020-2021)

- Target for grant: 2,000 juveniles for release.

<table>
<thead>
<tr>
<th>Stage</th>
<th>No.</th>
<th>Time</th>
<th>Size (SL)</th>
<th>Stocking Density</th>
<th>Survival</th>
<th>No. of Tanks</th>
<th>Size of Ea. Tank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg Mass</td>
<td>36</td>
<td>3-4 d until hatch</td>
<td></td>
<td>1 per container</td>
<td></td>
<td>1 tank with 10 containers</td>
<td>75 L</td>
</tr>
<tr>
<td>Larval Culture</td>
<td>14,400</td>
<td>3 weeks</td>
<td>300-1200 microns</td>
<td>Start 100/L; 10/L by meta</td>
<td></td>
<td>5 conical tanks</td>
<td>68 L</td>
</tr>
<tr>
<td>Metamorphosis</td>
<td>7,200</td>
<td>3 weeks</td>
<td>1.0–4.5 mm</td>
<td>3,500/m²</td>
<td>50%</td>
<td>2 rectangular tanks</td>
<td>0.5 m²</td>
</tr>
<tr>
<td>Nursery</td>
<td>5,400</td>
<td>10 months</td>
<td>70 mm</td>
<td>1700/m²; reduce to 600 or less/m²</td>
<td>75%</td>
<td>6 rectangular tanks</td>
<td>1.5 m²</td>
</tr>
</tbody>
</table>
Stock Enhancement Considerations

- Shell size (7-9 cm)
- Shell strength
- Morphology (with spines)
- Time of Day and Year (Fall)
- Lunar Phase
- Density (1-5/m²)
- Conditioning
- Habitat
- Conch Movement
Project Significance

- Serves as a model to transfer technology to other fishing communities in Puerto Rico and elsewhere
- Provides diversified incomes for fishing community
- Provides training and career opportunities for students
- Assists with a stock enhancement strategy for the conch population
- Provides partnership integration
QUESTIONS?

For more information:
Fau.edu/hboi
Conchaquaculture.org
Conservacionconciencia.org

Social media:
@harborbranch
@queenconch2020
@conservacionconciencia