Florida Department of Agriculture and Consumer Services
Florida Aquaculture Review Council

Title: Aquaculture Education for Florida Teachers

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Summary of Accomplishments July 30, 2008 to June 15, 2009.

We developed an aquaculture curriculum which includes seven modules. This curriculum is distributed to the public through the website http://irrec.ifas.ufl.edu/teachaquaculture/ .
The materials which are part of the curriculum are outlined below:

I. Introduction to Aquaculture

a. PRESENTATIONS:
   i. What is Aquaculture
   ii. Aquariums in the Classroom
   iii. Career Opportunities in Aquaculture

b. HANDOUTS
   i. Introduction pre/post test

II. General Biology of Aquaculture Species (missing crustacean pieces)

a. ACTIVITIES:
   i. Anatomy of a Fish
   ii. Fish Eating Contest
   iii. Anatomy of a Clam
   iv. Anatomy of a Shrimp / Crawfish

b. PRESENTATIONS:
   i. Biology of Cultured Fish

ii. Overview of Finfish Aquaculture
iii. Tilapia Culture
iv. Tropical Ornamental Culture
v. Fish Eating Contest
vi. Molluscan Culture Overview

c. HANDOUTS
i. Tilapia: Life History and Biology (SRAC)
ii. Introduction to the Biology of Fish
iii. Fish External Anatomy
iv. Fish Internal Anatomy
v. Biology and Culture of the Hard Clam (SRAC)
vi. Introduction to the Biology of Molluscs
vii. Clam External Anatomy
viii. Clam Internal Anatomy
ix. Module Pre-Post- Test

d. VIDEOS
i. Hard Clam Spawning Procedures
ii. Oyster Settlement
iii. A Conch's Life Story (link to savetheconch.org)

III. Design and Operation of Growout Production Facilities

<u>Introduction</u>

a. HANDOUTS
i. Intro to Design and Operation of Aquaculture Production Systems

b. PRESENTATIONS:
i. Types of systems
ii. Site selection

<u>Ponds</u>

c. ACTIVITIES:
i. Volume of a Pond
ii. Algae (buckets, DO, sun)
iii. Soil permeability

d. PRESENTATIONS:
i. Ponds types
ii. Pond lecture

e. HANDOUTS
i. Calculating area handout
ii. DO SRAC

iii. Watershed SRAC
iv. Site selection SRAC
v. Pond fertilization SRAC
vi. Leaky ponds SRAC
vii. Levee ponds SRAC
viii. CO2 SRAC

Recirculating Aquaculture Systems

a. ACTIVITIES:
    i. Aquaculture Measurements Made Easy
    ii. Build Your Own RAS System (computer)
    iii. Air-Lift Pump and Flow Rate Demonstration

b. PRESENTATIONS:
    a. RAS Components

c. HANDOUTS

    ix. Exploring RAS
    x. A Simple and Inexpensive RAS for Classroom (SRAC)
    xi. Build Your Own RAS System (computer)

Open Ocean

a. ACTIVITIES: None

b. PRESENTATIONS:
    a. Open Ocean Net Pens

c. HANDOUTS
    a. Open ocean summary

IV. Broodstock Breeding and Hatchery

a. ACTIVITIES:
    i. Selective Breeding (popcorn game)
    ii. Clam Spawning (actual spawning of clams in class)
    iii. Brine Shrimp Hatching

b. PRESENTATIONS:
    i. Artemia
    ii. Domestication
    iii. Fish breeding

c. HANDOUTS
    i. Spawning and larval culture of bivalves

ii. Fish Reproduction and Hatchery
iii. Artemia SRAC

d. VIDEOS
   i. Hard Clam Spawning Procedures
   ii. Oyster Settlement

V. Water Quality

a. ACTIVITIES:
   i. How DO Changes with Salinity
   ii. Follow Nitrogen Cycle in Aquariums
   iii. Osmosis with Eggs
   iv. What is in that water: Bacteria and UV light

b. PRESENTATIONS:
   i. Principles of Water Quality

c. HANDOUTS
   i. Need to download SRAC pubs

VI. Nutrition

a. ACTIVITIES:
   i. Make Your Own Pellet
   ii. FCR (with and without animals in aquarium on feeding study)
   iii. Satiation vs. Fixed Feeding
   iv. Comparing Manufactured Feeds (characteristics, nutrition (vrs pellet), etc)

b. PRESENTATIONS:
   i. FCR
   ii. Fish nutrition

c. HANDOUTS
   i. Nutrition EDIS
   ii. Nutrition quiz
   iii. Catfish Nutrition – MSU
   iv. Decapsulating brine shrimp SRAC
   v. Catfish prices
   vi. Available fish food ingredients

VII. Harvesting, Processing, and Packaging

a. ACTIVITIES:

i. Country of Origin Labeling

b. PRESENTATIONS:
   i. None

c. HANDOUTS
   i. Packaging fish 5 EDIS documents

We organized a teacher input meeting. Four teachers from middle and high schools evaluated and peer reviewed the curriculum modules. From this meeting we re-organized the modules to be activity based, because all the teachers expressed a need for activities in their classes. There is support material, background information, powerpoint presentations, pdf extension documents, and assessments in each module. These materials will provide teachers the majority of information they need to teach about aquaculture and the concepts in the modules.

We co-organized, with Harbor Branch Oceanographic Institute at FAU, two teacher conferences. The conferences were one full day each and included an introduction to the aquaculture curriculum, an overview of aquaculture in Florida, an overview of community college programs, career opportunities, and summarized specific production methods of clams, foodfish, and ornamentals. Additionally, functions of recirculating systems on large and small scale were taught. One middle school and one high school teacher gave an overview of their programs and a panel of speakers question and answer session was conducted. Finally, the days ended with a tour of an aquaculture facility.

91 middle and high school teachers attended the conferences. They were surveyed as to what they thought about the conference and what they learned. 98% improved their knowledge of aquaculture, 100% can now explain the basic concepts involved in aquaculture, 100% now have a general knowledge of the aquaculture industry in Florida, 100% understand how teaching aquaculture to their students can be an important part of their curriculum, 100% understand how aquaculture activities can be integrated into their existing curricula even other subject areas (biology, chemistry, mathematics), and 98% plan to incorporate aquaculture modules into their classroom activities.

We constructed demonstration systems at the UF Program of Fisheries and Aquatic Sciences in Gainesville. These include a shade house, interactive electronic displays, an underwater camera, and permanent display boards. These are all available for the over 8800 students and teachers who come through the facility each year for the “Fishing for Success” program. These students come to visit the ponds and learn about fish species and biology. Now they are educated about aquaculture and can see into the sturgeon production tanks, are provided an overview of aquaculture, and have interactive games to learn about aquaculture.

We constructed demonstration systems at the Indian River Research and Education Center in Fort Pierce. These consist of 12 rectangular blue poly tanks used for ornamental and baitfish displays. Additionally, 96 aquaria are used as a display for tours and for holding various species

and lifestages of species with aquaculture potential. Four fiberglass tanks are used to demonstrate broodstock holding and egg collection. IRREC has regular tours of K-12 students and university students and faculty. Additionally, there are regular tours of visitors to Harbor Branch Oceanographic Institute and numerous private companies and start-ups which tour the UF facility. These display systems will be viewed by many students and interested people in the future.

Hillsborough Community College upgraded their aquaculture greenhouse used for teaching/training a skilled workforce, located in Ruskin, Florida, to include state-of-the-art filtration components on two new recirculation aquaculture systems used for ornamental fish production. Also included in the expenditures were materials for building two complete recirculation systems capable of housing ornamental fish brood stock and a grow-out system to enhance production and training opportunities for students. Ultraviolet sterilization was also added to 4 systems to be used as demonstration/teaching components for students as well as prevent fish disease and improve water quality within the greenhouse/laboratory. In addition, an intensive aquaculture grow-out system was designed, constructed and put into operation. This will be used to train students about high-density production of food fish (similar to current aquaculture practices). Additional funds were used to increase the efficiency and capacity of the air system in the greenhouse to accommodate the new aquaculture training and production systems.

Published Abstracts

Garr, A.L., C. Ohs, F. Chapman, B. Myers, L. Creswell, C. Martinez, M. DiMaggio, C. Kasper, M. Davis, and D. Hanisak. 2009. Development of an aquaculture immersion classroom curriculum for secondary schools. World Aquaculture 2009. Vera Cruz, Mexico.