

## **TRIP REPORT INDIA FARMER-TO-FARMER AQUACULTURE NICHE PROJECT**

University of Arizona - Volunteer Assignment #11: Training in hatchery design and management in Chennai, India.

Beneficiary Organization: Marine fish farmer's cooperative in Chennai, India

Type of Assignment: Workshops, training, hatchery visits.

**Dates of Assignment:** April 9 – 15, 2011 (delayed from January)

**Objectives of the Assignment:** To teach and demonstrate to farmers the techniques to improve survival, yield and growth rates for larval marine fishes. The fish will be distributed to a cooperative of fishers who are adopting aquaculture. We will also discuss issues of sustainability and benefits of certification for the fish products for domestic and international markets.

### **Tasks carried out:**

1. Met with farmers, researchers, educators, in Chennai and Tuticorin and held workshops on hatchery design and operations, broodstock management, spawning, marine finfish larviculture, and general animal husbandry issues, opportunities, and trends.
2. Visited existing hatcheries and provided hands-on demonstrations of induced spawning, larval rearing, live feeds production, and water quality monitoring/management.
3. Described to farmers how Good Aquaculture Practices and Aquaculture Certification Programs operate and how farmers will benefit by getting products certified.
4. Conducted a half day open forum with undergraduate and graduate students from Tamilnadu University discussing mariculture careers, impact and potential for local fishers and their families, professional development, global trends and issues related to seafood quality, safety, and supply. This was a very interactive forum which led to many interesting and informative discussions with the students. All the students were very enthusiastic and many continue to maintain electronic communications.
5. Conducted two hatchery site visits. Visits included review of infrastructure, personnel, and capacity. Upon review each facility was provided recommendations to enhance specific reproduction and larviculture procedures and infrastructure. Further, specific recommendations were made towards cobia seed stock and growout production efficiencies and opportunities. All facilities were staffed with qualified and dedicated staff, were very open, friendly, and receptive to recommendations for improvements. Personnel from both facilities have remained in contact with the volunteer, and the volunteer may return in December of 2011 as part of a different initiative, but will again visit these locations to maintain communications and programs to enhance capacity, local and national mariculture capacity, and coastal impact to fishers and fisher families.

**Attendees and Impact:**

Number of farms / farming organizations, and other organizations benefited. 12

Number of recommendations provided by volunteer. 15

Number of participants. 118

Percentages 37% female, 63% male

Estimate of number of families and family members benefiting indirectly. 200

Direct attendees of the two workshops. One hundred and eighteen participants representing farmers, students, associated department officials, college teachers, scientists and research scholars from the central and state government organizations representing Tamilnadu, West Bengal, Karanataka and Kerala participated. There were fourteen presentations covering marine finfish farming in Asia, mariculture potential of India, status and strategies for finfish breeding and seed production under controlled conditions, culture of live food organisms, closing breeding and culture cycles of cobia by understanding their biology, cobia, an emerging candidate species for sea farming, marine ornamental fishes and other emerging food fish production species, development of convenience and diversified products from cobia and their wastes, and value addition for cobia into convenience products for domestic and international markets.

As part of a practical session, participants were taken to a floating net pen installed near shore at the MariTech Research Centre, Tharuvaikulam of FCRI. Feeding strategies and gonad development assessment methodologies for cobia broodstock maintained in High Density Poly Ethylene (HDPE) floating cages and wooden cages were explained to the participants.

**Recommendations**

From both workshops the following recommendations were made to improve mariculture activities in India.

- Formulate appropriate policies by the state government to promote sustainable mariculture activities.
- Identify suitable mariculture cage and net pen sites among India's maritime states, incorporating environmental impact assessments and mitigation plans as part of site assessments.
- Intensify research on cage design and construction to allow for local production and manufacture to maximize local multiplier effect.
- Prepare mariculture crop calendars for India's maritime states, taking into account climactic trends due to global warming.

- Develop manuals for reproduction, larviculture, and growout of marine finfish species for India, along with development of economic data and marketing trends and opportunities.
- Initiate pilot research and training programs with close involvement of local fishers and populations.
- Enhance domestic feed manufacturing for mariculture expansion, with emphasis upon utilization of domestically produced non-fishmeal and fish oil agricultural feedstuffs.
- Develop near shore mariculture zoning and mariculture parks to enhance research, extension and industry development, incorporating carrying capacity recommendations based upon appropriate scientific research, analysis, and monitoring in individual mariculture sites.

**Recommendations for the University:**

- Enhance collaborations with overseas institutions with expertise in mariculture, and enhance collaborative research and funding initiatives.
- Enhance and update mariculture infrastructure at both institutional mariculture research stations.
- Physically expand the facility acreage at the Maritech Research Centre to meet present and future mariculture research, extension, and education needs.
- Strengthen mariculture laboratory facilities in B.F. Sc and M.F. Sc curricula.

**Daily volunteer travel report for Trip: April 10 – 13, 2011**

**Date: 10.04.2011**

On 10.4.2011, Dr. Michael Schwarz from Virginia Tech University, USA, visited the facilities available at Maritech Research Centre (MRC), Tharuvaikulam a constituent unit of Fisheries College and Research Institute (FCRI), Tamilnadu Veterinary and Animal Sciences University (TANUVAS), Thoothukudi, Tamilnadu, India. The cobia broodstock maintained in cages, lobster fattening and marine ornamental fish culture activities and other facilities were explained to Dr. Michael Schwarz. He expressed that the facilities have to be improved to carryout cobia and other marine finfish research. He gave suggestions to modify the recently constructed broodstock holding 40 ton RCC circular tanks for collecting eggs of cobia and also {to retrofit the system for effective biofiltration and recirculation of the water. He emphasized the need to establish a recirculatory aquaculture system for year round supply of fingerlings.

**Date: 11.04.2011**

**Cobia and other Marine Finfish Farming and Celebration of World Veterinary year 2011**

A workshop on “Cobia and other marine finfish farming” and celebration of “World Veterinary Year 2011” were held at Fisheries College and Research Institute, Thoothukudi on 11.04.2011. Dr. R. Prabakaran, Vice-Chancellor, TANUVAS, inaugurated the workshop on “Cobia and other marine finfish farming” and Celebration of World Veterinary Year 2011. In his presidential address, the Vice-Chancellor mentioned that Aquaculture is getting towards major development in India. He was confident that the experts will share their experiences in the workshop and he assured that the university is ready to contribute significantly to the fisheries sector by strengthening the HRD, infrastructure and outreach programs. The Vice-Chancellor released a midterm report on “Cobia research at Fisheries College and Research Institute, Thoothukudi” and a value added product, “Cobia steaks in curry” during the workshop. Dr. Michael Schwarz, stated in his Chief Guest address that Aquaculture is an industry with incredible potential globally. Aquaculture provides health food and also employment opportunities. At present aquaculture is mainly from freshwater which is very much limited globally and hence, underutilized marine resources should be judiciously used with an environmentally sustainable approach. Aquaculture represents nearly 50% of the global seafood products and production needs to be increased to meet the globally growing population. He emphasized that it will be a tremendous challenge to double the global aquaculture production by the year 2030. He opined that aquaculture needs to be developed collaboratively at the global level.

Dr. M. Sakthivel, President, Aquaculture Foundation of India and Chairman, Consortium Advisory Committee, NAIP Cobia project, delivered the special address. Dr. M. Sakthivel listed out some of the significant points about cobia. Cobia is a very fast growing fish able to attain 6-8 kg in one year. It is highly adaptable and he expressed hope that India will be producing cobia very soon. {He invited the attention of the Vice-Chancellor for providing infrastructure facility at MRC, Tharuvaikulam} for not only producing cobia and also for other commercially important fin fishes. Dr. G. Gopakumar, Principal Scientist and Head, CMFRI, Mandapam in his address urged the State and Central Governments for enhanced funding support to invest in mariculture research for achieving a tangible outcome. He said that other than shrimp culture, only 20,000 tonnes of green mussels from the Malabar Coast and 5,000 tonnes of seaweed from the Tamilnadu coast contributes to mariculture. {We could not progress in finfish production in India due to inadequate field level technologies}. Dr. V. K. Venkataramani, Director of Research & Extension (Fisheries) in his felicitation address listed out some of the significant achievements made in Cobia project at Fisheries College and Research Institute, Thoothukudi.

Dr. M. C. Nandeesha, Dean in his address endorsed the views expressed by Dr. Michael Schwarz after his visit to Maritech Research Centre, Tharuvaikulam stating that the infrastructure facilities should be created to carry out research on cobia and other main finfishes. A project proposal in this regard has already been submitted for consideration under the final 12<sup>th</sup> year of an aquaculture plan. He appealed to the Planning commission for funding support to produce quality and competitive human power in the field of fisheries particularly in mariculture. He also informed us that the World Aquaculture Society (WAS) has expressed their willingness to assist Indian scientists in publishing scientific articles in high impact peer reviewed journals. {Dr. M. J. Prince Jeyaseelan proposed welcome address}. Dr. N. Felix, the Consortium Principal Investigator of the NAIP Cobia project served as Organizing Secretary of the workshop. Finally a vote of thanks was proposed by the Organizing secretary.



On 11.04.2011, after the inaugural function, the following presentations were made by the respective speakers.

<b>Sl.No.</b>	<b>Title of the Presentation</b>	<b>Name of the Speaker</b>
1.	Growth and development of Poultry Industry in India	Dr. R. Prabakaran Vice-Chancellor, TANUVAS, Chennai
2.	Marine finfish farming system	Dr. Michael Schwarz Virginia Tech University, USA
3.	Neuroendocrine hormonal pathway associated with fish reproduction and its application in aquaculture	Dr. S. Selvaraj Japan
4.	Global Cobia production and larval rearing	Dr. Michael Schwarz Virginia Tech University, USA

**The following Recommendations were derived from the Workshop on “Cobia and other marine finfish farming”**

1. Mariculture is a young science and huge investments with controlled Recirculating Aquaculture System (RAS) facilities need to be established for ensuring year round production of finfish seeds.
2. Globally mariculture technologies are available for certain marine finfishes. Scientific and technical manpower may be trained in the latest technologies available in Fisheries Institutes of different countries.
3. A thorough understanding of biology of cobia, their spawning ground; maximum and minimum temperature prevailing in spawning ground, larval congregation in sea and estuaries, and annual ovary status of wild cobia are required to carry out research in breeding and farming of cobia.
4. Collaboration with overseas institutions for staff and student exchanges for more exposure to practical knowledge on mariculture.

5. Strengthening the mariculture facilities at Maritech Research Centre, Tharuvaikulam in all aspects including, seawater pumping station, delivery and drainage canals, recirculating aquaculture system for brood stock and larval rearing, construction of brood stock holding tanks, indoor and outdoor live feed culture units.
6. Copepod is the best live feed for cobia. Mass culture of copepod may be attempted.
7. To acquire land from State government for expanding mariculture activity on a large scale in Maritech Research Centre, Tharuvaikulam.
8. To strengthen the laboratory facilities at MRC, Tharuvaikulam for handling mariculture courses of B.F.Sc and M.F.Sc students and to carry out advance research.

#### **Consortium Advisory Committee (CAC) meeting for NAIP Cobia Project**

A Consortium Advisory Committee meeting for the NAIP project on “**An export oriented marine value chain for farmed seafood production using Cobia (*Rachycentron canadum*) through rural entrepreneurship**” was conducted at 7.00 pm in the conference hall of Fisheries College and Research Institute, Thoothukudi.

#### **Proceedings of Fourth CAC meeting**

The following were present

1. Dr.M. Sakthivel,

Chairman

Consortium Advisory Committee, NAIP Cobia project

2. Dr. R. Prabakaran,

Vice-Chancellor, TANUVAS, Chennai

3. Dr. M. C. Nandeesha

Dean, FC&RI, Thoothukudi

4. Dr. V. K. Venkataramani

Director of Research & Extension (Fisheries), FC&RI, Thoothukudi

5. Dr. M. J. Prince Jayaseelan

Professor and Head, FC&RI, Thoothukudi

6. Dr. G. Gopakumar,

Principal Scientist and Head, Mariculture Division, CMFRI, Mandapam

7. Dr.K. Rathnakumar

Professor, FC&RI, Thoothukudi

8. Dr.K. Veerabhadran

Associate Professor, FC&RI, Thoothukudi

9. Dr. R. Jayashakila

Associate Professor, FC&RI, Thoothukudi

10. Dr. N. Felix

Associate Professor, FC&RI, Thoothukudi

11. Dr. Michael Schwarz, Virginia Tech, USA - **Special Invitee**

The midterm report on "Cobia research at Fisheries College and Research Institute, Thoothukudi" and Annual report of CIBA and CMFRI were submitted to the CAC.

Dr. Michael Schwarz, Special Invitee from Virginia Tech University, USA expressed that the facilities available at Maritech Research Centre (MRC), Tharuvaikulam of Fisheries College and Research Institute need to be improved at a greater level to produce technologies on breeding, larval rearing and culture of marine fin fishes. In this regard, the Consortium Principal Investigator informed that after undergoing

training in Vietnam, a request has been submitted to NAIP, New Delhi, for additional funding support of Rs. 63.6 lakh to create basic facilities. However no reply has been received from NAIP, New Delhi. In this regard, the CAC asked the CPI to submit a proposal on mariculture research to NFDB, Hyderabad, India for funding support.

The Consortium Advisory Committee recommended strengthening the co-operation among the institutes viz., FCRI, CIBA and CMFRI for sharing research materials like broodstock and cobia seeds.

The CAC discussed at length regarding importing cobia seeds and finally decided to give up as it is a policy decision.

The CAC recommended revalidation of funds allotted under International Consultancy for the year 2011-12.

Dr. G. Gopakumar, CCPI informed that synchronization of male and female broodstock is a problem in cobia spawning. Dr. Michael Schwarz also indicated that spawning is a major problem in cobia and this can be achieved only in a controlled RAS system and he also informed us that approximately US\$35,000 may be required to build up the facility. The CAC discussed the issue and it is decided that since only one year is left in the project period [whatever the results could be achieved that may be achieved until the end of the project period.]

To continue to sustain the mariculture research at Maritech Research Centre, Tharuvaikulam after the completion of NAIP project, the CAC suggested to propose a project on marine finfish farming and the same may be sent to Dr. Michael Schwarz, Virginia Tech, USA and Dr. M. Sakthivel, CAC Chairman for approval.

**The following suggestions were given by Dr. Michael Schwarz for cobia research and accepted by the CAC and recommended for action**

Identify spawning ground of cobia by surveying cobia larvae in estuaries, seaweeds or sea grass beds. Cobia larvae are black and their availability may be observed from any substratum.

Breeding temperatures differ from country to country, location to location for cobia, so need to record minimum and maximum temperatures in specific locality i.e. in sea and culture system annually.

Collect ovary and testis from dead fish, do biopsy and record the data for one year.

Cobia nutrition studies with soybean in the initial grow out feed and fish meal and fish oil in finished feed.

Estimate proximate and complete nutritional profile including amino acid and fatty acid of cobia.

Collect old literature on egg and larval history of Indian coastal water (old book available in library may be referred).

Do research on intestinal enzymes of cobia since they are able to consume larger quantity of feeds and are also able to digest crab exoskeleton.

**Date: 12.04.2011**

Dr. Michael Schwarz visited the following departments and other facilities in the main campus of FCRI, Thoothukudi on the forenoon of 12.04.2011.

1. Department of Aquaculture
2. Department of Fisheries Biology and Capture Fisheries
3. Department of Fisheries extension
4. Department of Fisheries Economics
5. Department of Fisheries Environment
6. Library
7. Boys hostel

Dr. Michael Schwarz visited the following departments in the shore laboratory of FCRI, Thoothukudi on the afternoon of 12.04.2011.

1. Department of Fish Processing Technology
2. Department of Fisheries Technology and Engineering

**Date: 13.04.2011**

On 13.04.2011, students' interaction event was organized at 9.00 am in the AV hall of Fisheries College and Research Institute, Thoothukudi. Dr. Michael Schwarz explained the importance of aquaculture particularly mariculture to the students. He also advised the students to be honest, energetic, hardworking and competitive. Student's questions on the aquaculture subject were answered by Dr. Michael Schwarz.

On the same day Dr. Michael Schwarz along with Dr. N. Felix landed at Chennai at 2.20 pm and visited CIBA-hatchery facilities at Mutukadu, Chennai. Dr. A.R.T. Arasu, Principal Scientist and Head, CIBA, Chennai explained the activities and Dr. Michael Schwarz appreciated the facilities and healthy cobia brood stock maintained in tanks and ponds.

At 10.30 pm Dr. Michael Schwarz was dropped at Chennai International Airport



View of Cobia and lobster production cage at MariTech Research Centre, Tharuvaiikulum of FCRI



Portion of Live feeds and larviculture production facilities at the MariTech Research Centre, Tharuvaiikulum of FCRI



Live algae production tanks at the Central Institute of Brackish Water Aquaculture, Chennai.



Review of broodstock maturation chambers at the Central Institute of Brackish Water Aquaculture, Chennai.



Additional cobia broodstock held in outside lagoon at the Central Institute of Brackish Water Aquaculture, Chennai.



Workshop participants on April 11<sup>th</sup>, 2011



Opening ceremonies Workshop on April 11, 2011.