



Visit to UTMarT and Aquaculture Learning Center Facilities in Tamaulipas, Mexico

F2F AwF Volunteer Assignments #15 & 16
Scott Lindell and Rick Karney

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Introduction

Aquaculture without Frontiers (AwF) has signed a Cooperation Agreement with the Universidad Tecnológica Del Mar De Tamaulipas Bicentenario (UTMarT) based at La Pesca, Soto la Marina, Tamaulipas, México. The UTMarT currently offers Technical, Bachelor and Graduate programs in aquaculture and is building a new center in (Tancol?) near Tampico. The target of this agreement is to jointly develop food security and personnel training in the International Center for Innovation and Technology Transfer for Aquaculture (CIITTA), which will be AwF's first Aquaculture Learning Centre (ALC). Another ALC is planned for Villahermosa near UTMarT in La Pesca that includes facilities for starting a shellfish (oyster) hatchery.

Project Overview

AwF invited Scott Lindell (Director of Scientific Aquaculture, Marine Biological Laboratory, Woods Hole, MA) and Rick Karney (Director of Martha's Vineyard Shellfish Group, MA) to conduct a survey of facilities, talk to fishermen about their needs, and offer trainings about shellfish and microalgae aquaculture to staff and students.

Day 1 (10/30/13 – Wednesday)

Our hosts and translators on our mission were Hector Gojon. and Ivonne Padron. We visited the Aquaculture Learning Center recently adopted by the University in Tancol near Tampico. Until recently it was a research station run by the State which left it in disrepair, Originally, in the 1930s, it was an “art deco”- styled water treatment plant (Figure 1) for the municipality pulling water from a large freshwater lagoon famous for its population of alligator gar. The site consists of several large concrete ponds, a meandering system of “raceways” (Figure 2), and series of smaller concrete ponds that appear to cascade downhill to each other in some cases. We saw construction of a hatchery that is planned for catfish and other freshwater fish. Classrooms and dorms and labs are being constructed and renovated. We saw one big pond with several (26) alligator gar that were each about 1 m long.



Old water treatment plant in Tancol, now the home of new UTMarT Aquaculture Learning Center



View of raceways with UTMarT's Hector Gojon in Tancol

During our 4 to 5 hour drive to La Pesca from Tampico we learned a little about the oyster "producers" (harvesters) and markets. They harvest oysters to fill orders e.g. 100 shucked meats for 80 pesos (less than a penny a piece). Typical harvest shell size is two inches. There is an understanding and appreciation that the shells need to be returned to the Laguna to maintain substrate for the cycle of natural spat settlement and recruitment. Presently, the harvested oysters are taken home and shucked and sold to buyers who transport them to city markets/restaurants. In La Pesca we did see one street vendor cooking and selling grilled oysters suggesting that at least locally there is some sales of shellstock. There is no current exploration of half-shell markets that could considerably increase the price per oyster. Selling chilled oysters in the shell would present new refrigeration and handling challenges.

One possibility to explore is developing hatchery with spat-on-shell capabilities. This is a low cost alternative to singles that complements what the fishermen are used to and need most immediately – more fishable oysters. From this extra stock they could begin to explore culling the “prettiest” oysters and try to develop a market for oysters on the half shell. There must be restaurants and retailers in Mexico City that buy Pacific oysters and produce a competitive product.

Day 2 – (10/31/13 – Thursday)

A fisherman, Margorito (who is also president of the local fishing cooperative with about 70 members) took Ivonne and us by boat to Laguna Morales which is large, lined with mangroves., and quite shallow (0.5 to 1.5 m). While wading in thigh deep water, he pulled up several clusters of oyster shells, most of which were dead. Ivonne thought that the recent and sudden low salinity effect of Hurricane Ingrid (which dropped about 20 inches of water in 2 days and dropped the salinity to 0 ppt in the river and at least the lower reaches of the Laguna Morales) might have contributed to their death. Silt (clay) was also implicated as a possible suffocating cause during flooding. We noted that there were ribbed mussels sometimes in these clusters of shells. Despite our efforts we could not find any of the sometimes reportedly problematic seaweed that was also a past problem. We did see crab traps that fishermen bait and set with color-coded floats that they tend almost daily. The fact that they set gear and tend it regularly is a good sign for the prospect of setting out oyster culture cages. Margorito said he believed poaching of cultured oysters would not be a problem because many fishermen were present in the Laguna during the day and no one came out there at night. We noted that among the clusters of oysters that there were ribbed mussels. Margorito told us these were apparently introduced in the last 20 years perhaps with contaminated shell cultch and according to him competed with the oysters.. The oysters in shallower water (possibly intertidal) and on firmer ground were healthier and bigger. We did not see any live oysters over 2 inches. Apparently besides (and perhaps because of) the declining abundance of oysters, the pressure has been to take smaller oysters, too.

Later that morning we lectured 45 or more attentive University students in General Aquaculture with an emphasis on shellfish aquaculture from 11:30 to 3pm.

Rick Karney with clusters of oysters in Laguna Morales



Ivonne Padron with deeply cupped oyster shell



Rick Karney leads training on microalgae and shellfish culture with help and translation from Ivonne

We returned to the University at 7pm for Dia de Muertos celebrations. Pictures speak louder than words here.



Day 3 (11/1/13 – Friday)

We returned to the University at 9 am to examine the oysters and the water sample we collected from the Laguna on the previous day. Some of the smaller oysters were gravid with sperm while some larger were spent and watery. Many of the inner shells had evidence of mud blisters possibly from a *Polydora* worm species.. The outer shells had serpulid-like worm tubes and barnacles on them. The water sample was not very concentrated (we did our best with a coffee filter) but we noticed some spiked diatoms (possibly a *Rhizolenia* spp) and other unknown small green phytoplankton plus organics. Taste-tests suggest that salinity was around 10 ppt and that waters are still recovering to normal (~25 ppt) post flooding from Ingrid. From 11 am to 2pm, we taught a class at the University on microalgal culture techniques to 46 students and a couple of professors.

After lunch we visited Villahermosa, a formerly state-run aquaculture facility recently turned over to the University that is 20 minutes away up river from La Pesca. There are still some issues around access that haven't been worked out with the State but hopefully will be resolved by year's end according to Hector. Here there is a pumping station from the river that supplies extensive outdoor ponds (12 that were about 40m x 15m x 1.5 m deep). The pump intake can be selected to pump from deeper saltier estuarine water or shallower fresher water. The ponds were newly plastic lined with new concrete borders and had pond-side electricity outlets. In addition to fish culture, these ponds could be used as basins to settle sediments out of the water, storing salty water in advance of heavy rain events to supply the marine portions of operations, or for mass phytoplankton culture.. The pumps also supply two indoor facilities and water may be sand-filtered and treated with UV. The larger older indoor facility will be dedicated to fish culture, and has 12 large (3m round) fiberglass tanks, some smaller tanks, and an algae culture room. The facility had been used in the past for catfish, freshwater shrimp *Macrobrachium*, freshwater crayfish *Cherax*.



Large outdoor ponds (40 m x 15 m) complement indoor rearing facilities (rear) in Villahermosa



Four of the 12 foot round fish rearing tanks in Villahermosa

A newer building is being designed and constructed for a shellfish hatchery. This is a relatively large building (26,000 sq. m.) built on slab but without drains (a major flaw) . There are redundant saltwater supply lines and airline plumbed overhead, and most of the culture tanks and algae tanks have been purchased. A special algae room has been constructed and wired. We estimate that the facility had the capacity to produce about 10 to 15 million eyed-oyster larvae in any one 4 week period.

Microalgae tanks (background) and broodstock tanks.



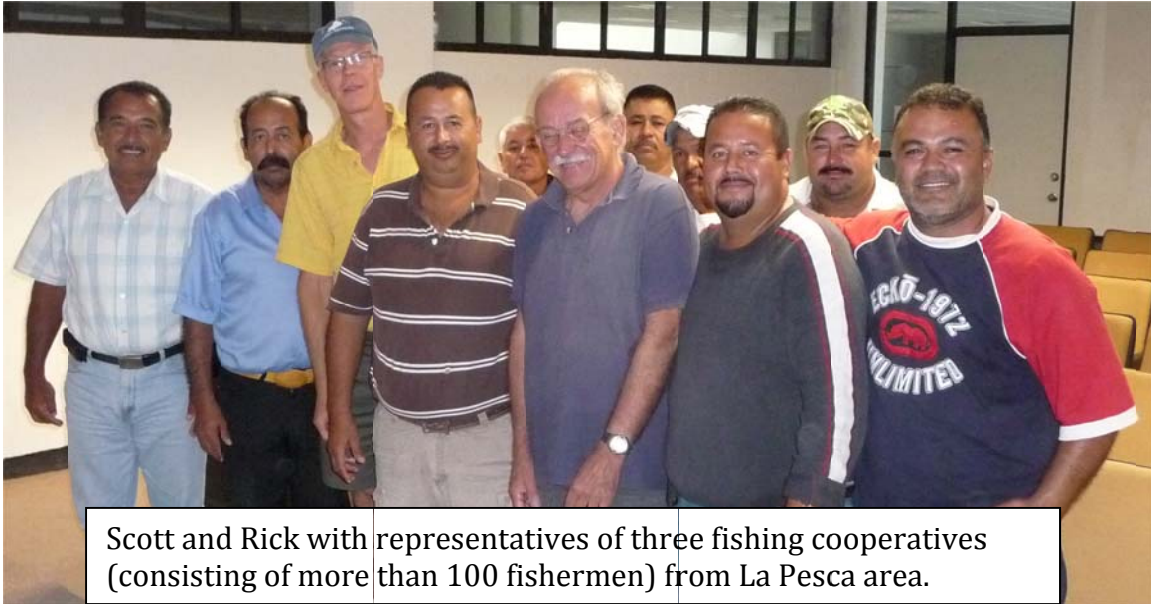
Shellfish larval tanks with overhead supply lines (but no floor drains).

Day 4 - 11/2/13 (Saturday)

We convened a meeting with 9 fishermen (“producers”) including the presidents of 3 local fishing cooperatives. The fishermen harvest a variety of seasonally abundant species besides oysters including shrimp, crab, and finfish. They are eager to expand their oyster harvests by means of better management, more open areas, and possibly culturing them. We described various means of collecting natural spat (French tubes, Chinese hats, shell-bags, sticks and branches) and ways of enhancing natural production via remote set, or culturing single oysters. More in-depth information was provided on hatchery methods and nursery and field culture methods for remotely set and single oysters. We showed pictures and explained various oyster grow-out culture methods including rack-and-bag, floating bag, stacking trays etc. We explained that much of the success of these methods is site specific and we encouraged them to experiment with some of these. We explained that the use of mesh bags was not only to contain the oysters but also to protect them from predators. Blue crabs are numerous in the Laguna and are likely a significant shellfish predator. The fishermen were less concerned about crab predation once the seed reach a certain minimum size (10mm) reported that some sort of fish (Spanish name was not easily translated) was a more important predator. We described how oysters in suspended culture were more likely to achieve a desirable size and shape. As an example we showed them an oyster shell that we found in the Laguna. It was deep-cupped and about 2.5 inches in length. We told them that an oyster of that size and shape has good market value and in the US could be worth about 20 x what they currently can expect from their smaller narrow-shelled oysters. The fishermen believed that if they broke up the natural clusters and thinned the oysters to an appropriate density they could grow a premium size for half-shell markets in 4 to 6 months. They expressed interest in aquaculture and appeared ready to try to plant seed oysters in bags as we had described. We told them it might be awhile before quantities of local seed oysters would be available from the local hatchery and suggested that they begin experimenting with wild-collected seed broken up into singles. This kind of experimentation would help them to develop the most suitable culture methods to use when hatchery seed from Villahermosa becomes available in the next few years.



Scott and Rick, with Ivonne’s help, discuss the potential for oyster culture in local lagoons with fishermen.



Scott and Rick with representatives of three fishing cooperatives (consisting of more than 100 fishermen) from La Pesca area.

Issues of concern, and remaining questions

- We had concerns of the negative impacts of low salinity events on newly planned aquaculture projects. Apparently there are areas in the Lagoon that remain suitably salty to provide refuge during those events. Monitoring is recommended particularly around those events; the University has an AUV that could be deployed to make this monitoring timely and effective.
- Certified water – monitoring should include bacteria, salinity, chl_a, turbidity
- Oysters are too small and mishapen for half-shell market and for optimum price.
- Are oysters being harvested from non-certified areas now? And if so, how are they differentiated in the marketplace so that they don't threaten the efforts being made to harvest in certified areas?
- What prices and sizes of oysters are being sold in major metropolitan restaurants? The fishermen were interested to learn more about markets and marketing and we left them with some pertinent information provided by the Northeast Regional Aquaculture Center
- As the need for seed grows, so will appropriate nursery rearing methods beyond the planned hatchery
- Could a fishery and holding facility be developed for marketing soft-shell blue crabs? We left Ivonne with a manual describing such an operation.

Conclusions:

The educational, research and productive potential of the fresh, brackish and saltwater aquaculture facilities at Tancol and Villahermosa are tremendous. Hopefully the many on-going and necessary upgrades will be completed soon, and qualified staff will be operating them in 2014. The UTMart staff in La Pesca who accompanied us (Hector and Ivonne) and others we met are inspirational teachers and evidently have the expertise to launch the Villahermosa facility nearby. The fishermen/"producers" we met are motivated to improve their fishing opportunities including trying basic oyster culture methods if and when seed is available.



Recommendations

- Expand monitoring program in Laguna Morales particularly if a higher salinity refuge for oysters is available
- Experiment with culturing wild seed separated from clusters in lower density bags, and in different areas of the Lagoon (including at different inter-tidal elevations and in surface floating bags) .
- Develop hatchery at Villahermosa in manageable stages particularly in the beginning when shake-down and troubleshooting may be required. Conducting a remote set of oysters at the earliest opportunity may be a good start.
- If oyster shell is limited, seek other types of shellstock or substrates (marl rock) for remote set oyster seed.
- Explore means of producing and marketing soft-shell crabs
- Assuming that it is feasible to grow single oysters, market studies should be conducted to see what market prices could be supported, and make an estimate of the cost to develop the icing, and refrigerated transport needed to serve those markets. We left some information about marketing considerations relevant to US oyster buyers and consumers.

• **Volunteer Assignment Activity Data**

Assignment (Trip) No.	Persons Directly Assisted			Persons Trained			Number of Volunteer Recommendations			
	Male	Female	Total	Male	Female	Total	Economic	Organizational	Financial	Environmental
15 Lindell	41	21	62	36	20	56	2	2	0	3
16 Karney	41	21	62	36	20	56	2	2	0	3

Electronic References/Training Materials Provided

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Manual for Holding and Shedding Blue Crabs, M.C. Oesterling, Virginia Sea Grant, 1995.
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Strategies to Restore Oyster Populations on Martha’s Vineyard, R. Karney, Powerpoint
Shellfish Culture on Martha’s Vineyard, R. Karney , Powerpoint