

*Regional
e-Notes*

Letter from the Director

Aloha,

As you may have heard, the aquaculture community recently lost one of its most distinguished members, Dr. Fred Wheaton, to a battle with cancer.

I had the personal pleasure of working with Fred when he served as the director of the Northeastern RAC. His remarkable career spanned multiple roles, from research to teaching, extension, and beyond. His achievements were most recently recognized with the Distinguished Life Time Achievement Award from the USAS in February. To read about his many accomplishments, please [click here](#).

My team and I wish to extend our warmest aloha to Dr. Wheaton. He will be missed, both as a colleague and friend.

Mahalo,

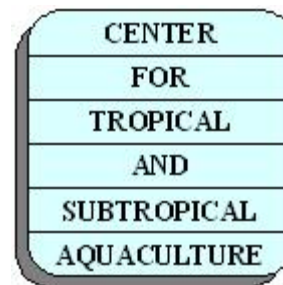
Cheng-Sheng Lee
Executive Director, CTSA

In This Issue

Letter from the Director
CTSA Call for Pre-Proposals
CTSA Yellow Tang Update
NEW Farmer Spotlight Video: Hawaii Fish Company
Pacific Island Spotlight: Open Ocean Aquaculture in the CNMI
March AquaClip: National Aquaculture Extension Conference scheduled for June 2011

Quick Links

www.ctsa.org
www.oceanicinstitute.org



[Join our Mailing List!](#)

Reminder: CTSA Pre-Proposals Due April 18!

This is a friendly reminder that pre-proposals for consideration in CTSA's FY2011 development process are due to the Center at 5pm HST on Monday, April 18. The Request for Pre-Proposals was released via e-notes on March 9th, and is also available on the CTSA website and aquaculturehub.org.

Pre-proposals will be reviewed by CTSA's Technical Committee and Industry Advisory Council and ranked based on merit and feasibility. CTSA will notify P.I.'s of their pre-proposal's status in late June or early July.

If you have any questions or concerns, please do not hesitate to contact Meredith Brooks of CTSA at mbrooks@oceanicinstitute.org

CTSA Yellow Tang Project Update

Development of Captive Culture Technology for the Yellow Tang (*Zebrasoma flavescens*)

Charles W. Laidley, Chatham K. Callan, Melissa D.C Rietfors, Michael Dean Kline, and Eric W. Martinson
Finfish Department, Oceanic Institute, 41-202 Kalaniana'ole Highway

The development of captive culture technology for yellow tang and other high-value reef species is imperative to protect our increasingly threatened coral reef ecosystem. Not only will captive production technologies help take pressure off wild fish populations, they will also provide new economic opportunities associated with the worldwide trade in marine ornamental species.

The first major hurdle encountered was the establishment of an egg supply. We were successful obtaining tank spawns from yellow tang early on in the project, but most eggs produced by captive stocks were either infertile, or failed to properly complete development (non-viable). Through a combination of better broodstock selection, improved broodstock holding systems and protocols, and superior broodstock diets we have slowly increased egg output, and most importantly, greatly improved egg quality. In particular, this last year we saw major gains with current yellow tang egg production, attaining levels of over one million eggs per month with a mean fertility rate of 84% with an egg viability rate of 51% (Fig. 1).

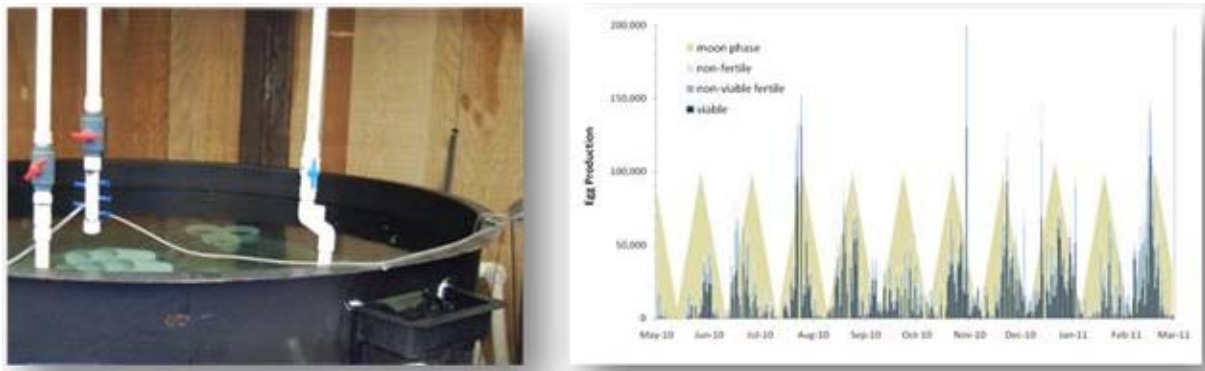


Figure 1. Picture of yellow tang broodstock tank (left photo) and overall egg production from captive broodstock population showing lunar pattern in egg production over time.

The second major hurdle was developing a suitable larval rearing system for newly hatched larvae. Yellow tang eggs demonstrate a typical developmental sequence to many pelagic spawning reef fishes with hatching occurring 21 to 22 hrs after fertilization. The resulting larvae are much smaller than other fish species cultured to date (including the pygmy angelfishes), which makes them highly sensitive to the physical attributes of the larval rearing system. Following hatch, larvae spend the first day at the tank surface and then move into the water column on day two while they complete mouth and eye development in preparation for feeding. Even light aeration (which facilitated hatching) was shown to be highly destructive to these fragile pre-feeding larvae. The use of static conditions helped improve early survival, however the deterioration in water quality precluded its practical application. In response we developed an upwelling water delivery system to maintain water quality while providing a less turbulent larval environment. These system improvements now support excellent early (pre-feeding) larval survival, enabling us to generate large numbers of larvae through the first-feeding period.

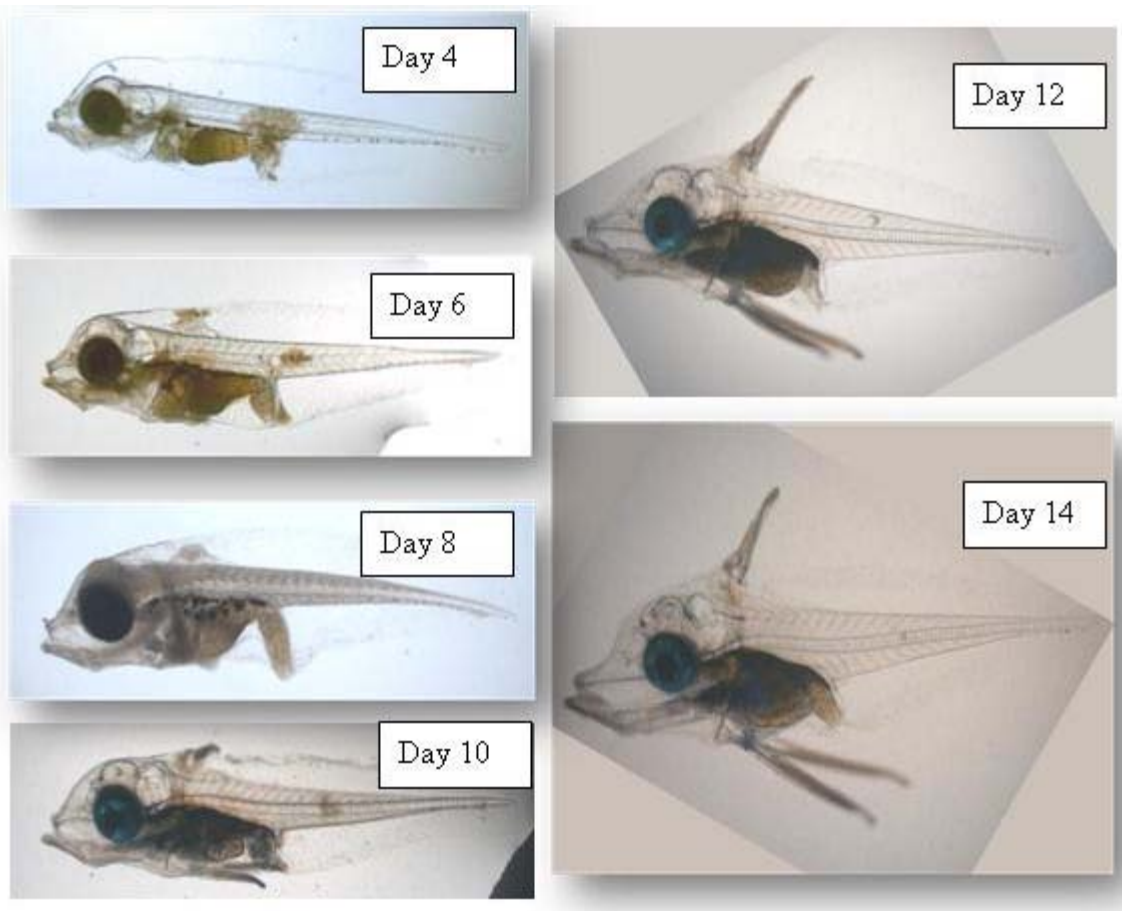


Figure 2. Pictures of yellow tang larvae as they begin to feed on available prey items including algae and early stage copepod eggs and nauplii and begin to develop into characteristic pelagic larvae with notable growth in dorsal and pectoral spines.

The next challenge was identifying a suitable feed for yellow tang larvae as they develop functional mouths and eyes and begin to feed on day three. Limited efforts to feed yellow tang larvae using a similar copepod nauplii feeding regimen (based on success with flame angelfish, red snapper and bluefin trevally) proved unsuccessful for the yellow tang, with larvae failing to feed and dying of starvation. However, with a combination of improved broodstock egg supplies, use of copepod eggs and smaller nauplii, and an improved larval rearing system we were able to stimulate larvae to feed on eggs and nauplii of both *Parvocalanus* and *Bestiolina* copepods. However, only *Parvocalanus* appears amenable to stable production and large-scale culture.

Initial trials with early developing yellow tang larvae yielded feeding rates that were quite low and highly variable. Subsequent research revealed that larval feeding rates were highly affected by tank lighting and coloration. Thus the adoption of dark (black) colored experimental tanks along with use of a gentle upwelling water delivery best supported yellow tang larvae as they initiate feeding, with over 80% of the observed larvae exhibiting full guts upon microscopic examination at days 4 and 5 post-hatch (Fig 2). Associated with the initiation of feeding, we began to see significant changes in size and appearance of larvae as they continue to actively feed (Fig. 2). Notable changes include changes in shape, a deepening in the head and body musculature, growth and development of the brain and internal organs, along with rapid growth of protective spines from dorsal and pectoral fins.

Farmer Spotlight Video: Hawaii Fish Company

by Meredith Brooks, CTSA

I recently had the pleasure of visiting with Ron and

Lita Weidenbach at their Oahu farm, Hawaii Fish Company. During my visit, I interviewed Ron about a variety of topics, from his own farm operation to the future of aquaculture in Hawaii, and much more.

[Click here](#) to watch the full interview with Ron, who in addition to being a farmer is the President of the HAAA and Chairman of the CTSA Industry Advisory Council.

Please enjoy this first edition of our Island Farmer Spotlight video series and as always, your feedback is welcome and greatly appreciated!



Ron and Lita Weidenbach

Pacific Island Spotlight: Open Ocean Aquaculture Symposium in CNMI

"Aquaculture Can Become Industry of the Future"

By Clarissa David, Saipan Tribune, January 27, 2011.

About 180 individuals, including business representatives and government officials, attended the first day of the Open Ocean Cage Culture Symposium at the Saipan World Resort Royal Taga Hall yesterday morning.

The symposium, sponsored by the Northern Marianas College-Cooperative Research, Extension and Education Services and the Western Pacific Regional Fishery Management Council, aims to present and discuss information about raising high-value fin fish species in off-shore cages.

In his opening remarks, Lt. Gov. Eloy S. Inos recognized the Commonwealth's potential and the economic opportunities that come in developing this highly profitable industry.

"The Northern Mariana Islands hold so much promise and potential for economic opportunities through our relatively undisturbed ecosystems," said Inos.

Through the symposium, Inos said, the CNMI will be better informed about the challenges concerning aquaculture research, environmental impacts, local and federal regulations, and investment opportunities.

Inos said the aquaculture industry can become "the industry of the future."

"We certainly look forward to the establishment of a viable aquaculture industry and successful business ventures that will provide much needed economic activity and job opportunities for our people," he added.

'Very viable'

In an interview at the symposium, NMC-CREES aquaculture specialist Michael M. Ogo said that open ocean cage culture in the CNMI is very viable and could be the solution to the challenges of onshore or land aquaculture.

Ogo told Saipan Tribune that with the rising cost of fuel and utilities, the production cost of onshore aquaculture has become more and more expensive.

"With open ocean cage culture, you don't have to worry about energy costs. Also, water would be limitless once you bring aquaculture to the ocean," he said.

According to Ogo, offshore aquaculture is particularly feasible in the CNMI since it is surrounded by deep waters with pristine ecosystems, with the best area for the open ocean cage just outside the reef.

With the islands' proximity to the East Asian market, Ogo said aquaculture in the CNMI would

potentially bring a high return of investment but noted that this kind of venture would require between \$5 to \$10 million.

Impediments

Neil A. Sims, president of Kona Blue Water Farms in Hawaii, emphasized that the CNMI must address the lack of legislation, technology, and capital before it could actually establish offshore aquaculture industry.

In his presentation yesterday at the symposium, Sims stated the need for an open ocean mariculture legislation that should take into account a clear permit application process, an opportunity for public reviews and comments, reasonable environmental standards, requirements for monitoring and reporting, and providing a secure tenure for investors for up to 15 to 20 years.

According to Sims, conducting research studies and acquiring sufficient capital to establish offshore aquaculture must also be addressed before dealing with challenges like freight cost for feeds, shipping cost of products, and global competition.

Sims added that the CNMI must also perform data collection and demonstration that can be financially subsidized by federal agencies that provide grants for these ventures.

AquaClip: National Aquaculture Extension Conference in June 2011

Taken from USDA/NIFA News, March 7, 2011.

Please note and share the following information with others about this event that is planned every 4-5 years. This conference represents a collaborative effort among the USDA National Institute of Food and Agriculture's Regional Aquaculture Centers and the NOAA National Sea Grant College Program. The final conference agenda is being finalized but do make plans now to attend in the great venue of Memphis, TN.

There will be special emphasis on poster presentations with all poster and oral presentations included in a Book of Abstracts. The duration of the conference is one day less than previous conferences so the meeting is action-packed and fast-moving. It provides an excellent opportunity for professional development and expanding the national network of extension professionals who work in many areas associated with the diversity of aquaculture.

The day of registration is June 5 and the conference ends late afternoon on June 7. The conference co-chairs are Jimmy Avery, Mississippi State University and Ron Blair, University of Tennessee.

Look for more details soon but do make plans to attend now and begin work on a poster presentation to share your professional contributions and experiences with colleagues from around the United States.

The Center for Tropical and Subtropical Aquaculture (CTSA) is one of five regional aquaculture centers in the United States established and funded by the U.S. Department of Agriculture's National Institute of Food and Agriculture (NIFA) under grants 2005-38500-15720, 2006-38500-16901, 2007-38500-18471, and 2008-38500-19435. The regional aquaculture centers integrate individual and institutional expertise and resources in support of commercial aquaculture development. CTSA was established in 1986 and is jointly administered by the Oceanic Institute and the University of Hawaii.