CENTER FOR
TROPICAL AND SUBTROPICAL
AQUACULTURE

Regional e-Notes ~ October 2020 ~ Volume 12, Issue 10

Letter from the Director

Aloha,

As we close out Seafood Month, I would like to take a moment to reflect on a major economic impact of the global pandemic that is directly affecting our industry: supply and demand of seafood, and the closure and/or limited capacity of restaurants. As you may know, up to 65% of seafood is consumed in restaurants. Just last week the popular Rubio's Seafood Grill filed for Chapter 11 bankruptcy. I was sad to hear this news, which highlights the need for us to increase the resilience of our seafood industry so that it can successfully navigate economic and environmental changes. It reminded me of how important it is to build strong communication and partnerships among all sectors in the seafood industry, from production to marketing and consumers. We need to not only increase production of seafood with social license, but also create products that are both accepted and desired by consumers. Publix Business Development Seafood Director Guy Pizzuti said it well: “For sustainability to truly take hold in the industry, it requires a partnership between the retailer, the industry, and the environmental group.”

While partnership is essential during uncertain times, CTSA has been talking for years about the importance of developing strong relationships and collaborative efforts throughout the seafood supply chain, and even beyond into consumer education. We need to utilize partnership, transparency and innovation to overcome the current situation and make seafood truly sustainable. I hope that the numerous online conferences and presentations organized by various seafood entities this month have increased understanding of the seafood industry, as well as its future direction. As our stakeholders and readers know, a strong seafood industry is important for our health, food security, economy and environment.

To this end, we are still in the process of developing the CTSA FY20 Plan of Work. We would like to express our sincere appreciation for those of you who have helped us during this development cycle, from our Industry and Technical advisors to our external review panels, who dedicated their time and expertise to help improve the quality of our Plan of Work. We could not do this without you, our valued partners!

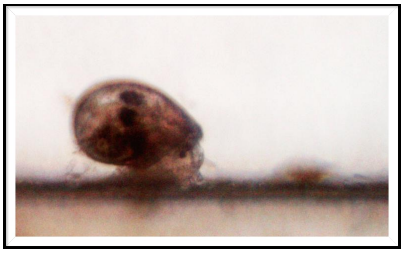
Mahalo,
Dr. Cheng-Sheng Lee
Executive Director, CTSA

CTSA Project Summary: Improving Hatchery Technology and Production of 'Opihi

By: Angelica Valdez, University of Hawaii at Mānoa; Anthony Mau, Kualoa Ranch; Bridget Murphy, University of Hawaii at Mānoa; and Jon-Paul Bingham, University of Hawaii at Mānoa

‘Opihi (*Cellana* spp.) aquaculture has been of interest for many years beginning in the 1970’s when research and development began on

technology for the ‘opihi makai’auli or blackfoot limpet (*Cellana exarata*) by Gladys Corpuz (1981). However, research was halted not long after when it was found that the technology established was not transferable to the more desirable species, ‘opihi ‘alinalina or yellowfoot limpet (*Cellana sandwicensis*) (Kay *et al,*1982). Around the early 2010’s, the idea of ‘opihi aquaculture was brought back to light to help support the increasing market demand, that has great impacts on the wild stocks.



To begin efforts towards closing the life cycle of ‘opihi, which has been the main goal since resurrecting the project, the first phase of the CTSA-funded project consisted of engineering a broodstock recirculating system that would maintain the necessary intertidal stimulus (sea spray). Once this system was established, extensive research went into developing formulated feeds that would support good, long-term growth in our closed systems (Hua & Ako, 2014; Mau & Jha, 2018). This formulated feed allowed us to hold and mature wild broodstock in our lab until they were need for spawn trials. Moving forward, major improvements to spawning and larval rearing methodologies have only brought us closer to closing the life cycle of ‘opihi.

This next phase of the project (Years 5 & 6) kicked off with the development of a novel settlement system. To make this system as close to a natural intertidal environment as possible, raceways were constructed using entirely PVC piping. The system is equipped with adjustable water flow and underwater wave fans to help simulate the natural change in currents. Although still in the testing phase, this recirculating system will help to support an increase in production numbers coming out of our settlement experiments.

Maintaining excellent water quality was one of the most important lessons learned during this project. Since we are not equipped with a direct salt-water line here at UH Mānoa, we do not have the ideal flow-through system. Regular water changes on our broodstock systems are crucial in maintaining the health of our animals and when it comes to our larvae, we have taken extra measures to ensure they are healthy. To upgrade our water filtration, we built an additional system that would serve as our inhouse seawater reservoir. This system recirculates water through a 0.35-micron canister filter and a UV sterilizer that removes larges protists and bacteria, giving us clean water to raise our larvae.

Improving settlement was one of the main aspects of these project years. To increase survival beyond settlement key factors had to be identified that would help to formulate the ideal grow-out protocol. Plate orientation, microalgae type, and age of the biofilm were all factors that were tested of the course of various trials. To determine the proper plate orientation, microscope slides seeded with a diatom biofilm were positioned in horizontal (0°), vertical (90°) and slanted (45°) orientations. Overall, the horizontal orientation had the highest settlement and from our qualitative and quantitative observations, it was determined that ‘opihi are passive settlers. Having determined the proper plate orientation, we were able to begin testing the proper diatom for a biofilm. Different combinations of *Navicula* sp.,*Nitzchia*sp., crustose coralline algae (CCA), and a natural intertidal culture from Makapu’u were tested. After several settlement trials it appeared that CCA and *Navicula*sp. had the highest settlement, however CCA also had very high mortality rates. It appears that although CCA is one of the main components of a natural intertidal environment, it did not support a healthy settlement surface. The last factor to test was the age of the biofilm and how it effects larval settlement and growth. To do this we introduced larvae to three different ages of *Navicula* sp. biofilm; a 1-week old biofilm, a three-day old biofilm, and a biofilm introduced the same day as larval stocking. From these trials, we found that the three-day old biofilm had the highest number of metamorphosed larvae compared to the other treatments. This led us to believe that having too dense of a biofilm may be harmful to the survival of the larvae, possibly overloading them with too many settlement cues. It was during these trials that we were able to have a few larvae make it through our bottleneck.

This bottleneck, being unable to go beyond 14 Days of survival, had prohibited us from reaching our goal. Changes had been made during these trials to the overall protocol including the implementation of daily water changes and the removal of larval mortalities to prevent the appearance of pests and an increase in bacterial build-up. These changes to our settlement protocol allowed use to bypass this roadblock by having a few larvae at the end of the 2019 season, enter the juvenile stages and begin the development of their adult shells. These few juvenile ‘opihi gave us the opportunity to monitor early shell growth rates which became a very important metric for understanding life-history and successfully recruitment. These early growth measurements also helped to support interpretations of juvenile daily growth rates of *C. sandwicensis*using their shell record made during an additional project (Mau et al, unpublished). Although the 2019-2020 season encountered an additional roadblock regarding the maturation of Oahu’s female ‘opihi population, we were still successful in rearing a few larvae onto the juvenile stages and showing growth in their adult shells. Having successfully reached this stage again, shows great potential in reaching it in the upcoming seasons.

Each of these accomplishments have helped us to build a story behind the early life stages of ‘opihi, all while

giving us valuable information that will aid us in bringing ‘opihi to production for market sale. By consistently producing ‘opihi, we will be able relieve harvesting pressure on wild populations with hopes of reducing the overall decline of their populations, keeping ‘opihi on our coastline for decades to come.

This article was prepared as part of the CTSA project Opihi Aquaculture, "Year 6: Improving Hatchery Technology and Production." A short video on the protocols to spawn 'opihi is in final production. Click here for more information on the project and to watch the video.

USDA Corona Virus Food Assistance Program

If COVID-19 continues to impact your aquacuture farm, you may signup for the Coronavirus Food Assistance Program 2 (CFAP 2). The application period opened on Sept. 21, 2020 and will continue through Dec. 11, 2020. CFAP 2 provides eligible producers with direct financial assistance due to market disruptions and associated costs because of the COVID-19 pandemic.

CFAP 2 is a separate program from the first round of the Coronavirus Food Assistance Program, now referred to as CFAP 1. Farmers and ranchers who participated in CFAP 1 will not be automatically enrolled and must complete a new application for CFAP 2.

To watch a USDA video that describes applicability and applying click here. Or jump right into CFAP 2 application information specific to US aquaculture by clicking here.

AquaClip: Low-cost formulated feed increases body weight and survival in milkfish and tilapia

A new feed formulation for milkfish and tilapia was developed through a Philippine collaborative project of NFRDI, BFAR and SEAFDEC. The initial results of the formulated diet promise a lowered aquaculture production cost and increased profits for small-scale fish farmers.

The collaborative project, called Aquafeed Research, Development and Extension Project (ARDEP), finished two of its field trials in Guimaras, Iloilo and the Science City of Muñoz, Nueva Ecija. The novel feed formulation by SEAFDEC/AQD incorporated minimal fishmeal and sourced locally available ingredients as an alternative protein source to make it cheaper. These ingredients include distiller’s dried grain with solubles, poultry by-product meal and the protein-enriched copra meal. Milkfish and tilapia were fed a commercial diet and the formulated low-cost feed.

Results from the milkfish trial showed an average body weight of 393.45 grams for milkfish fed with SEAFDEC/AQD diet, while milkfish fed with commercial diet weighed an average of 325.35 grams. Survival for milkfish fed with SEAFDEC/AQD Diet and milkfish fed with commercial diet was 92.83% and 91.45%, respectively.

Results from the tilapia trial showed an average body weight of SEAFDEC-treated tilapia of 338.24 g, while the control fed by commercial diet was at 308.24 g. Survival for SEAFDEC fed tilapia was 85.91% and 80.64% for tilapia fed with a commercial diet.

“With the goal of lowering the production cost in aquaculture and increasing profits for the small-scale fish farmers, the recent success of these field trial experiments encourages the project collaborators, the ARDEP group and NFRDI to continue the research and assessment of the novel formulated feed, to address further gaps and widen the scope of the verification studies across regions with varying culture environments for

milkfish and tilapia. This will give more foundation to the data acquired from the research and eventually transfer the polished technology to small-scale Filipino farmers," researchers said.

Source: Aquafeed.com // Original Article

This newsletter is written and prepared by the CTSA Information Specialist Meredith Brooks.
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 active grants 2016-38500-25751 and 2018-38500-28886. 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 University of Hawaii and the Oceanic Institute of Hawaii Pacific University.

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