



## Letter from the Director

Aloha!

My staff and I are in the process of finishing our bi-annual project update conference calls, which coincide with midterm and annual reports due in June and November, respectively. We conduct these calls with PI's and industry liaisons to discuss the status, outputs, and impacts of each ongoing CTSA project. The purpose of the calls is not to micromanage our projects, but rather to connect and offer resources beyond our funding support.

Since we implemented this form of project monitoring nearly three years ago, we have noticed improvements in both communication and project outcomes. PI's are able to highlight research accomplishments and ask questions; liaisons share knowledge and suggestions to adjust the direction of research and/or enhance potential impacts of a project; and CTSA ensures that all administrative and outreach needs and objectives are being met. It is a win-win situation for all of us. One of our PI's stated it best at the end of our call last week: "if we want to go farther, we must go together."

One of CTSA's core beliefs is that we must work together to improve our food security, and at the same time protect our pristine environment. On a similar note, the International Coral Reef Symposium in Honolulu concluded last Friday with a pledge from over 2,500 participants to curb the destruction of coral reefs by reducing consumption of fossil fuels. It is clear that our planet is facing one of the toughest challenges of our times, and I believe that as with most other obstacles, we will find success through teamwork. Although the total consumption of fossil fuels in our island communities may be small, a concerted effort to import less goods and to swap our motor vehicles for bicycles and other green transportation can make a difference and show that we care about the environment. I encourage our stakeholders in the Pacific Islands to consider these and other actions as we stand together on the front lines of climate change.

Mahalo,  
*Cheng-Sheng Lee*  
Executive Director, CTSA

## Mid-Year Update on Ongoing CTSA Projects

*CTSA Midterm Progress Reports are due at the beginning of June each year. Although these reports are not as detailed as the annual progress reports due in November, they provide important insight to the status of ongoing research. The following is a summary of progress from several of CTSA's ongoing projects. Some projects are not included in this summary; these projects were*

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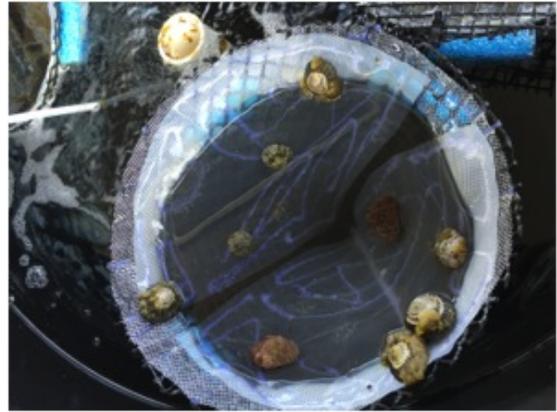
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either recently featured in e-notes, will be featured in the near future, or do not yet have significant results to report.

The two-year project "**Aquaculture of Opihi**" is a continuation of previous CTSA supported work to bring this high value species into aquaculture. The project is experiencing positive results thus far. Researchers are resolving and/or plan to resolve many of the issues uncovered in the original work related to collection methods, feeding, and spawning. For the current project, wild opihi (*Cellana Sandwicensis*) were collected at two locations on Oahu, Hawaii in March 2016. At the suggestion of opihi experts, the research team employed an innovative approach and experienced zero mortality during collection. Eight opihi were sampled to measure their shell length, shell width, tissue weight, and gonad weight and analyze nutritional composition of their meat. Opihi broodstock were conditioned and housed at Oceanic Institute, where the feeding and spawning behaviors are being observed. To date, researchers have observed that while opihi prefer their natural biofilm diet, they will likely feed on the artificial diet as long as biofilm growth is suppressed. In addition, they have discovered that certain tank modifications result in less stress and improved conditions for feeding. They hope to spawn the opihi during this project year.



Another project at the Oceanic Institute, "**Potential of Black Soldier Fly as a Feed Ingredient to Support Hawaiian Aquaculture**," reported on its progress since it began last December. Thus far, researchers have determined the nutritional profile of raw Black Soldier fly (BSF) larvae, including fatty acid and amino acid profiles, mineral, fiber, and proximate contents. This data will be very helpful in evaluating BSF potential as a feed supplement for local aquaculture feed production in Hawaii. In addition, this project has produced a method for defatting BSF larvae in the lab using hexane as the solvent, allowing for the defatted BSF meal to be safely used in aquaculture feeds. The optimized method, which will be presented in a later article, reliably produces Black Soldier Fly meal with lipid content under 8%. This is beneficial because without defatting, the BSF larvae lipid content would be too high for use in aquatic feeds.



Fungal bioreactor in operation

Across the island at the University of Hawaii, the project "**Utilization of local agri-processing by-products to produce fungal protein for aquatic feed production**" is similarly looking into alternative aquatic feed ingredients. Microbial protein such as fungi biomass production on low-cost feedstock has gained significant attention due to cost effectiveness and a long-term sustainability. Fungi are known to grow extensively on diverse organic feedstocks under optimal conditions (Sumbali, 2005). Stevens and Gregory (1997) suggested that fungal process is a low-cost and simple process for animal feed production. Filamentous fungi, *Rhizopus oligosporus* is an ideal organism for animal feed applications due to its edible nature. This project is aiming to maximize the yield of edible fungus, *R. oligosporus*, on molasses, damaged papaya and taro wastes, and to develop a cost effective fungal biomass production process. Researchers are currently optimizing the growth of fungal biomass and expect to produce 5 kg of fungal dry biomass by the end of the project's first year. Thus far, they have been able to produce roughly about 100 g of dry fungal biomass ready for characterization.

On the Big Island, the UH Hilo PACRC team is continuing research and extension efforts to establish and improve bivalve aquaculture in Hawaii. The project "**Increasing Production and Improving Food Safety for Hawaii's New Bivalve Industry**," now in its second year, has produced two major outputs thus far: a functioning depuration unit and a functioning off-grid nursery system. Researchers expect to achieve several impacts from this work, primarily improving food safety and the effectiveness of depuration by having larger depuration units that are easier to operate. In addition, they anticipate that information on the effectiveness of "salting" on depurated oysters will be useful to industry, as will a cost-effective nursery system that will allow Hawaii

farmers to produce their own spat. The details determined through this project are important to know in order to get more producers up and running in Hawaii.

PACRC has also been experiencing success with the project **"Assuring Oyster Seed Supply for Hawai'i and the West Coast,"** which began last August. After successful training with tetraploid expert Dr. Ximing Guo, researchers conducted five experimental spawns consisting of the eggs of between fifteen and four triploid females for each event. They have been experimenting primarily with dosage and duration of treatment to determine which set of factors yields the highest percentage of tetraploids. To date, the most successful cohorts of larvae contain 30-40% tetraploid larvae. This percentage is reduced as the larvae develop into spat. However, even a small percentage of tetraploids is adequate, since the ultimate goal is to then breed tetraploid males with tetraploid females, which results in >90% tetraploids. Now that dosage and timing issues have been worked out, researchers will focus on producing larger total numbers of putative tetraploid larvae as would be needed for commercial operations. They will also test combinations of salinity and pH to determine optimal conditions for tetraploid induction.



*Dr. Ximing Guo training hatchery personnel in tetraploid production*

In the Western Pacific, the project **"Development of Marine Finfish Aquaculture, Aquatic Feeds, and Training in the Republic of Marshall Islands (RMI) for Sustainability and Food Security"** is in the swing of year 2 activities. Thus far, the project work group has formulated and locally manufactured five test diets for rabbitfish; they are still working to finalize the optimum formula. The project has also established rabbitfish husbandry and farming protocols, and started a robust training program to transfer the technology to local technicians (reported on in a recent e-Notes article). To run the training program effectively, the project created a training manual containing feed and fish development technology and methods. To date, 11 people have been trained on Moi and feed production, and four farmers have been recruited for the project's Year 3 activities. In addition, 1,400 lbs of Moi and 2,000 lbs of feeds for moi were produced for a marketing trial.

*Detailed project results will be presented in our Annual Progress Report, released each December on the CTSA website. If you have any questions about our ongoing projects and/or reports, please contact [mbrooks@ctsa.org](mailto:mbrooks@ctsa.org).*

## **CTSA at the Hawaii State Farm Fair & New U.S. Aquaculture Video**

### **Join CTSA at the Hawaii State Farm Fair!**

The 53rd annual Hawaii State Farm Fair "Farm Family Fun!" sponsored by the Hawaii Farm Bureau (HFB) in partnership with the Hawaii State Department of Agriculture and Hawaii 4-H Livestock Council will be held at Kualoa Ranch on Saturday, July 11, 9 a.m.- 8 p.m. and Sunday, July 12, 9 a.m. - 5 p.m.

As we have in past years, CTSA will host an aquaculture outreach and education booth. We invite you to stop by and talk story about aquaculture in Hawaii and the U.S. Affiliated Pacific Islands, and bring the keiki to participate in our booth activities: testing water quality for aquaculture and making aquatic animals out of play-doh!

The event is free for children and students with a valid student ID and just \$5.00 for the general public. Free parking is available. Families will enjoy numerous educational exhibits, the freshest locally grown produce, rides for kids and fabulous local food. The fair also boasts one of the largest and most diverse plant sales on Oahu. Visit [www.hawaii.statefarmfair.org](http://www.hawaii.statefarmfair.org).

### **New Video Showcases Aquaculture in America**

Living Ocean Productions has released a new film on YouTube highlighting American aquaculture in the 21st Century.

The video, titled "The Working Waterfront," looks at four U.S. farms growing catfish, salmon,

oysters and mussels, their commitment to environmental responsibility, and the economic benefits of their businesses to local communities. The farmers also discuss the various challenges to growing a robust aquaculture industry in the U.S.

"To grow aquaculture in the United States, it's going to take an education effort," explains Gary Moretti, owner of Bangs Island Mussels and Wild Ocean Aquaculture. "Once people understand it, then they start to appreciate what the end product is, and the end product is very good. Not just sort of good, it's a very good and healthy end product."



[Click here to watch the video.](#)

### **AquaClip ~ Evonik developing amino acids to turn salmon and shrimp into vegetarians**

*by Aquafeed.com staff. June 22, 2016.*

Evonik scientists' long-term intention is to turn salmon, shrimp, and other marine animals into vegetarians. To that end, they are looking to replace the fishmeal and fish oil produced from wild-caught fish that is used in feeds.

"Thanks to modern fish farming concepts and our amino-acid products, it is already possible to achieve significant reductions in the proportion of fishmeal used in feeds. Now we're working on sustainable alternatives to fish oil," explains Christoph Kobler, who heads the Sustainable Healthy Nutrition Product Line at Evonik.

In order to turn salmon, shrimp, and other aquatic species into vegetarians, and protect the oceans in the process, it is not enough to substitute fishmeal with soy or another plant-based source. The resulting feeds would not contain the right composition or amount of amino acids such as methionine to meet the animals' needs.

Evonik researchers began looking for a solution to this problem nearly ten years ago, developing special amino acids and amino-acid derivatives for fish and crustaceans aimed at making fishmeal largely unnecessary in aquaculture in the future. The underlying principle is to selectively add amino acids such as methionine and lysine to vegetable-based feeds, improving them to the point where salmon and other marine animals can make optimum use of vegetable proteins as well. The most important task here has been to develop products tailored to the needs of individual fish species.

[Read full article.](#)

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 2012-38500-19566 and 2014-38500-22241. 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.

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