CENTER FOR
TROPICAL AND SUBTROPICAL
AQUACULTURE

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Letter from the Director

Aloha,

As we enter a new season, I am reflecting on our productive summer at CTSA. In addition to making progress on our annual development cycle and some forthcoming program publications, I had a few opportunities to travel to other Hawaiian islands to check in on CTSA projects and aquaculture activities. I am happy to report that during my summer travels, I observed a notable increase in unity among our regional aquaculture farmers and organizations.

Visiting with Neil Sims and Dr. Simona Augyte of Ocean Era

Most recently, I visited Ocean Era in Kona to check on the status of the CTSA-funded nenue project. The collaborative project between UH Hilo and Ocean Era is progressing well in its goal to commercially produce the popular herbivore nenue, and I am invigorated by my chat with Ocean Era President Neil Sims about the future of aquaculture in Hawaii. Neil and I agree that collaboration is the best way to advance our regional, national and global aquaculture industries. He was excited to tell me about working together with NELHA, UH Hilo, Blue Ocean Mariculture, and other regional stakeholders to achieve our shared ultimate goals of increasing the supply of sustainable seafood. He was also excited to discuss the Ocean Era project to produce macroalgae for biofuels, funded by a grant from the Department of Energy and assisted by Dr. Simona Augyte, a former student of my friend and colleague from the U.S. east coast, Dr. Charles Yarish. We are hopeful that the findings from this project will also provide additional technical information on farming macroalage for human consumption and animal feed.

Just this one visit to Kona highlights the vast possibilities of aquaculture, especially when we all work together. As I have shared before, our region has a limited talent pool. It will take a concerted joint effort to overcome this obstacle and meaningfully utilize our abundant aquatic resources to resolve global issues, from food security to reducing emissions. I am excited to continue on this journey together with you, our valued stakeholders.

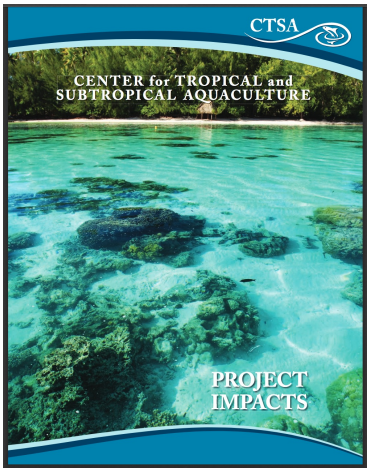
Finally, in light of the coming U.S. National Seafood Month, I salute the effort from the Global Seafood Alliance's first consumer marketing campaign, "Healthy Fish, Healthy Planet, Healthy You!" It is a timely reminder that we all must work together to increase sustainable seafood production and consumption for our future.

As always, we welcome your partnership, suggestions and other feedback.

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

Last Chance to Have Your Photo Featured in the CTSA

'Project Impacts' Publication - Send Pics by Oct 7!



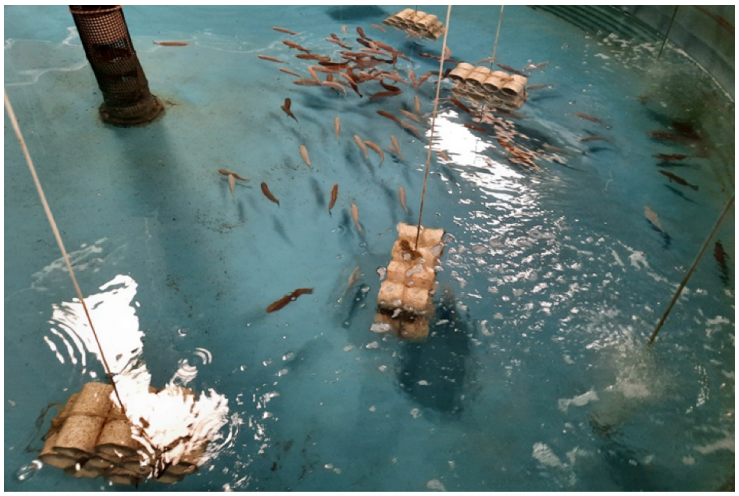
CTSA is finalizing our latest *Project Impacts* publication to highlight the accomplishments of the Center and our funded projects. We are still seeking high quality aquaculture photos, including a captivating image for the cover!

We invite you to submit your best photos of farms, fishponds, fish, bivalves or other species. Photos should represent aquaculture in the CTSA region (Hawaii, Guam, Palau, Marshall Islands, American Samoa, Northern Mariana Islands, Micronesia). Photos must be high resolution and ideally professional quality – drone shots are encouraged! The photo and photographer chosen for the cover will receive promotional exposure through our newsletter and other media. **Please submit photos to mbrooks@ctsa.org by October 7**.

The forthcoming publication will serve as an update to the *Project Impacts* publication released nearly a decade ago (pictured), and will focus on impacts since 2013. Click here to read the 2013 publication.

CTSA Project Summary: Optimizing coral grouper culture to promote rapid commercialization in the U.S. Affiliated Pacific Islands

Termination Report submitted by PI Dr. Chatham Callan, Oceanic Institute of Hawaii Pacific University (OI)



Coral grouper currently at Marshal Islands Facility. These fish are approximately 40g, and will be transferred to sea cages at 100g

The bright red external coloration and white meat of the Leopard Coral Grouper, *Plectropomus leopardus* (Lacepede, 1802), also commonly known as the Coral Grouper or Coral Trout, have made them a high value species in the live reef food fish trade of South East Asia and in particular in Hong Kong, China, which accounts for more than 50% of the trade. The majority of the fish found in the trade are wild caught as either adults ready for market or as juveniles to be grown to market-size in cages or ponds. Only a small percentage -- less than 10%-- are reared from egg to adult using aquaculture techniques. Although attempts at culturing grouper began over four decades ago, mostly in Asia, progress has been slowed by very low survival (<1%) during the early larval stages and during juvenile grow-out. Therefore, a significant need remains for development of intensive hatchery technologies to meet the ever-increasing demand for product. The purpose of the recently completed CTSA project “Optimizing coral grouper (*Plectropomus leopardus*) culture to promote rapid commercialization in the U.S.-Affiliated Pacific Islands” was to build upon prior CTSA-funded success with this species to further refine the hatchery technology, fingerling production and effective grow-out methods for coral trout/leopard coral grouper.

The project’s first objective was to maintain and expand broodstock populations of coral grouper and monitor egg production at OI. We currently have three wild-collected coral grouper that were originally obtained in Palau in 2017. These fish are now >55cm in length and over 4kg. We also have two populations of F1 Coral Grouper that were produced at OI in August 2017 and May 2018. In June of 2020, those fish were divided into three tanks: one indoor and two outdoors. Shortly after the introduction of wild males, in July 2020, we began to observe spawning in our indoor tank. This population spawns nearly every day, producing up to 250,000 eggs per spawn. Egg viability is still fairly low, and typically ranges from 25-50% of the eggs produced. It is anticipated, however, that this will improve with time.

Once spawning began, we initiated larval rearing to produce juveniles needed for the grow-out portion of this project. Six, separate, larval runs were initiated using 30,000 to 50,000 viable eggs per run. Initial runs resulted in poor larval survival, mostly due to low egg quality. Our later runs resulted in 15-20% survival to

complete settlement (60 dph), which is a new record for our lab, and for this species. Literature values for larval survival to settlement for this species are approximately 1%.

Juveniles that resulted from one of these later runs were divided into 4 tanks with 1,200 fish per tank. These fish were approximately 1.0-1.5g at stocking (at 75 dph) and fully weaned onto dry diets. Two of these tanks were reared utilizing commercial feeds, and the other two tanks were weaned onto a conventional “wet-fish” diet regimen consisting of raw Capelin, Squid & Shrimp along with a supplemental gelatin diet. The latter diet regimen is what was used at OI in the past to grow the current F1 broodstock. These fish were sampled monthly for growth measurements and to estimate survival through the end of the project. It was expected that the fish fed the “Raw” diet would grow much faster than the fish receiving pellets, as this was our observation in prior work with this species. However, this was not the case. Fish fed the “raw” diet failed to grow much at all over the first 4 months of the trial, reaching only 5g at the same time fish on the pellet feed were nearly 3x larger. Due to this, we discontinued the “raw” diet treatment and continued monitoring the fish being reared on the commercial feed. This has impacted the refinement of hatchery protocol.

Upon completion of our prior CTSA project with Coral Grouper, we were pleased to have developed a hatchery protocol that yielded approximately 10% survival. This is an order of magnitude greater than what is currently reported in the literature. However, one of the challenges we observed under the last project was the reluctance of coral grouper fingerlings to wean onto conventional dry feeds and subsequent related issues of cannibalism. Under the current project, we have since developed a modified dry-feed regimen and, accordingly, also modified some of the live prey delivery timelines.

It is important to note that the increased survival rate and decreased occurrences of cannibalism may also be due to the fact that these are the offspring from F1 females. As domestication typically results in superior hatchery performance, it would be worthy of future investigation to test these hypotheses.

Although not part of the original project objectives, similar grow-out tests were planned using surplus fingerlings produced at OI in Majuro, Marshall Islands and related partners in FSM. The College of Micronesian Land Grant Program (COMLG) and the College of the Marshall Islands Land Grant Program (CMILG) received USDA HATCH funding to support a grouper project in the Republic of the Marshall Islands and the Federated States of Micronesia. Atoll Mariculture of the Marshall Islands Inc. (ATMI) and the Marshall Islands Marine Resources Authority (MIMRA) will allow CMILG and COM LG access to a fish hatchery at Ajaltakae (pictured) and a farm in Rita to develop nursery management protocols for coral grouper, *Plectropomus leopardus*, using fingerlings imported from Oceanic Institute of Hawaii Pacific University (OI).

This project successfully demonstrated the sustained, natural production of eggs from captive coral grouper broodstock, improved fingerling production methods to achieve over 20% survival in the hatchery, and began evaluation of grow-out methods for determination of growth to market size on-shore. Further evaluation of grow-out methods will help guide future directions for the commercial culture of this species.

Aquaculture Announcements

Hawaii 2021 Aquaculture Sales Reach Record High $79.7 Million

Hawaii 2021 aquaculture sales totaled a record $79.7 million, up 20% from 2020, according to USDA, National Agricultural Statistics Service. Algae contributed $36.7 million and accounted for 46% of the total sales. Ornamentals accounted for $3.62 million of total sales. The “Other” category comprised the remaining 49% of total sales at $39.3 million. Some producers reported continued issues due to the pandemic, but overall industry seems to have recovered. The peak number of hired workers on the payroll was 408 for 2021, as reported by the producers.

USDA NIFA FY23 SBIR/STTR Phase1 Applications due October 25

USDA NIFA released the FY23 SBIR/STTR Phase 1 RFA. The SBIR program supports US-based small businesses solving issues (with commercial potential) related to food and agriculture. This program has and continues to support an Aquaculture priority area (SBIR 8.7). Click here to learn more.

NOAA Announces Final Programmatic EIS for Pacific Islands Region Aquaculture

NOAA Fisheries announced the availability of a final Programmatic Environmental Impact Statement for offshore aquaculture. The final PEIS analyzes the potential direct, indirect, and cumulative effects of several management alternatives on the human, physical, and biological environment. This analysis will help inform the Western Pacific Fishery Management Council as it considers amending its five fishery ecosystem plans and implementing regulations to include aquaculture management in the region.

Public participation has been integral to this process. NOAA solicited input on the draft PEIS during 90-day

public comment period that ran May 7, 2021, through August 5, 2021, and included four virtual public meetings. NOAA Fisheries considered and addressed the comments received in the final PEIS. The PEIS and related information are available here. NOAA Fisheries will issue a Record of Decision on the PEIS no sooner than 30 days after its publication.

Reminder: Sign Up For 2022 Census of Aquaculture

The 2022 Census of Agriculture is right around the corner and USDA NASS is making every effort to count all aquaculture producers in the United States. If you produce any aquaculture products and want to make sure that you are counted in the 2022 Census of Agriculture and the 2023 Census of Aquaculture, please sign up your operation using this online form: https://www.agcounts.usda.gov/cgi-bin/counts/. Once you have signed up, you might receive a short survey in the next two years to further categorize your operation. Most likely, you will not receive a survey until the 2022 Census of Agriculture in January or February, 2023

AquaClip: Restoring Ecosystems and Communities with Limu

Ongoing CTSA projects are aiming to cultivate native species of macroalgae, known as Limu in Hawaiian. CTSA is proud to promote Hawaii's 'Year of the Limu' celebrations, including the most recent event highlighted in the following article:

Limu practitioners, advocates, and supporters gathered this week for the Year of the Limu Celebration community event at Sea Life Park in Waimanalo, Oʻahu.

Members representing three different limu groups on the island – Mālama Pūpūkea-Waimea, KUA/Ewa Limu Project (KUA), and Waimanalo Limu Hui were present at show-and-tell tables aimed to educate and inspire attendees about limu, from proper harvesting techniques and species identification to ecological and cultural importance.

Limu has many uses, including in food, medicine, traditional practices, and ceremonies. It serves as the base of the food chain in coastal ecosystems, providing fish, turtles and urchins with food, and small invertebrates with protection. One limu variety, crustose coralline algae, contains calcium carbonate and is vital to coral reef structural integrity, growth, and resilience.

Event activities included a turtle release at Kaiona Beach, just one mile up the coast from Sea Life Park, limu-pressing, stamp art for children, and a behind-the-scenes, interactive limu tour led by expert limu practitioners. Over 20 species of seaweed were on display, and visitors got the opportunity to see up-close, touch, and even sample some of the varieties.

This was just one of several events held throughout this “Year of the Limu” as designated by Governor Ige for 2022. The park provided a perfect setting as host for the event, allowing families to learn more about limu and different projects and partnership efforts taking place on Oʻahu and statewide.

Uncle Wally Ito, former KUA Limu Hui Coordinator, has been deeply engaged in various efforts including cultivating limu in aquaculture tanks since 2005. He’s shared limu with groups involved in ecosystem restoration projects on Lānaʻi, Molokaʻi , Kauaʻi , and Oʻahu. “The most important aspect of these projects, even more than the limu itself, is the people,” says Ito. “Getting the kids out of the house. Involving the kupuna. Some groups make dyes from the limu and even integrate hula into their efforts. It’s a community restoration, a Hawaiian cultural restoration.”

A resolution has been introduced by Limu Hui members to the legislature to designate limu kala as the official state limu for Hawaiʻi. “Our ancestors relied on it as an important, main component in their diet,” said Aunty Pam Fujiʻi, KUA board member. “Traditionally, there were certain foods that were kapu to women and even across classes. Limu kala was able to be shared by everyone.”

Source: Hawaii Department of Land and Natural Resources //Full 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, 2018-38500-28886, and 2020-38500-32559. 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.

Center for Tropical and Subtropical Aquaculture
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