CENTER FOR TROPICAL AND SUBTROPICAL AQUACULTURE

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Letter from the Director

Aloha,

Mahalo to everyone who submitted a pre-proposal for FY26 funding consideration. Per standard procedure, the full set of proposals will be discussed at our joint IAC/TC meeting at the end of July, and we look forward to seeing the next round of projects that will benefit our region. New this year, we are offering PIs the opportunity to present their pre-proposal project ideas directly to the committees. We hope this addition will give our voting members the opportunity to engage directly with PIs and ask questions as they weigh which projects to fund.

As we look ahead to the next round of investment, June also gives us reason to pause and consider what we are investing in. June is World Ocean Month, a fitting time to reflect on how much the ocean provides for our region. It is a source of food, a regulator of climate, and a driver of economic opportunity for our communities. As one of the five Regional Aquaculture Centers (RACs), CTSA has always promoted an integrated, collaborative approach, working alongside industry, researchers, and resource managers to identify the best contributions our industry can make.

That collaborative approach is especially relevant to a topic getting a lot of attention this year: Marine Protected Areas (MPAs), particularly in the context of the global 30x30 goal to conserve 30 percent of the world's ocean by 2030. It is a worthy and ambitious target, but recent analyses are clear that designating an MPA is not the same as protecting one. A significant share of existing MPAs remain under-implemented, lacking the rules, enforcement, or management needed to deliver real benefits, and even well-managed areas cannot offset pressures that originate on land, such as wastewater and nutrient runoff reaching coastal waters. MPAs are an important tool, but they cannot do the job alone. The same is true of aquaculture, which contributes most to decarbonization when it's integrated with complementary strategies -such as utilizing waste streams- rather than treated as a standalone solution.

From hatchery to plate, the seafood production and supply chain determine whether aquaculture's promise as a food source and decarbonization tool actually materializes. Food safety and processing are essential links in that chain, and like any production system, they generate waste. Rather than treating that waste as a disposal problem, our industry is increasingly finding ways to recover it as a resource, whether as a nutrient source, an input for other industries, or as feed. CTSA is proud to be a part of these efforts. Zero-waste feed development and circular economy approaches are a growing part of this conversation, and they reflect a broader truth: a healthy ocean depends on an aquaculture industry that wastes nothing and works with the systems around it, not apart from them. We look forward to seeing more innovative projects take shape as we work together to advance aquaculture's role in the blue economy.

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

CTSA FY25 Projects Approved to Start this Year

The following new projects included in the CTSA FY25 Plan of Work have been approved and are set to begin within the next few months:

Hawaiʻian Fishponds: Developing Improved Pacific Oyster Seeds for Enhanced Farm Yield
P.I. Francis Pan, Pacific Hybreed, Inc
The overarching goal of this project is to identify elite hybrid lines for fishpond environments through genetic breeding and on-farm trials. Oyster farming is among the most sustainable and cost-effective

sectors of animal protein production, and is recognized for its ecosystem services. Hawaiʻian fishponds represent unique growing environments for oysters and have a high potential for increased productivity. This one-year project will demonstrate the effectiveness of yield selection to improve farm stocks for fishpond environments by collaborating with Hawaiʻi-based companies that currently cultivate shellfish in fishponds. Oyster farms in Hawaiʻi rely on hatchery-produced seeds from broodstock that have not been selected and optimized for fishpond conditions, and seeds not optimized for specific environments often have inconsistent and unpredictable yield returns. Pacific Hybreed -the first commercial shellfish breeding company in the U.S.- has established a broodstock repository where different lineages of multi-generation genetic lines of the Pacific oyster are available for breeding efforts, which have already allowed a series of test crosses that created hybrid lines for on-farm trials from California to Alaska. The work plan features pedigree analyses by genotyping, crossbreeding inbred lines to produce within-species hybrid oysters, on-farm trials to evaluate farm yields at different fishpond environments, and estimation of combining abilities and gene-environment interactions on yield phenotypes. Broodstock from up to 10 inbred lines will be conditioned and genotyped, seven inbred lines will be crossbred to produce up to 42 hybrid crosses, and hybrid oysters will be reared to the seed stage in Pacific Hybreed hatcheries before being outplanted at two farm sites in replicated cage baskets equipped with environmental sensors for temperature, salinity, and oxygen. Based on field trials in other oyster-producing areas, hybrid lines can improve the yield (growth and survival) by as much as 30% and uniformity by up to 50%.

Advancing Commercial Aquaculture of Hawaiʻi's High-Value Endemic Reef Fish: Potter's Angelfish and Hawaiʻian Cleaner Wrasse

P.I. Chatham K. Callan, University of Hawaiʻi at Hilo, PACRC

The overall goals of this project are to significantly improve the survival and production efficiency of Potter's Angelfish (Centropyge potteri) and Hawaiian Cleaner Wrasse (Labroides phthirophagus) during critical periods of larval development. Potter's Angelfish and Hawaiʻian Cleaner Wrasse are two of the most valuable and ecologically important reef fishes endemic to Hawaiʻi. Prior to the 2021 ban on aquarium fish collection, more than 9,000 Potter's Angelfish and several thousand Hawaiʻian Cleaner Wrasse were harvested annually for the global aquarium trade. With commercial collection now prohibited, and Hawaiʻian Cleaner Wrasse excluded from any future permitted harvest, aquaculture represents the only sustainable pathway to supply these species for the foreseeable future. At the Oceanic Institute, researchers developed the first reproducible rearing protocol for Potter's Angelfish, demonstrating settlement survival up to 3.4% and establishing proof-of-concept that this species can be cultured in captivity. Building on this foundation, the Pacific Aquaculture and Coastal Resources Center (PACRC) has successfully conditioned F1 broodstock of both species, with Potter's Angelfish spawning regularly and Hawaiʻian Cleaner Wrasse producing viable eggs in captivity for the first time. Despite this progress, the most critical technical bottlenecks occur during larval feeding transitions (copepods to rotifers to Artemia) and through flexion and post-flexion stages, where survival remains inconsistent and yields too low to support commercial viability. In Year One, broodstock will be monitored daily for spawning activity, health, and egg production; at least three full-cycle rearing runs will be conducted for both species to establish baseline benchmarks of growth, survival, and juvenile yield at key bottlenecks (early first-feeding, flexion, and settlement), which presently average below commercially viable levels (<1–2%); and targeted rearing trials will be conducted to improve early feeding transitions and reduce mortality during first-feeding. In Year Two, broodstock management will focus on stabilizing egg production outside natural peaks and improving egg quality through targeted dietary enhancements, while treatments comparing combinations of copepods, rotifers, and Artemia will identify feeding protocols that maximize early survival and reduce live feed production costs, culminating in validated rearing protocols that demonstrate measurable improvements in survival to settlement.

Harnessing Two Decades of Symbiotic Seaweed Farming to Develop Natural Microalgaecides and Pathogen Inhibitors for Sustainable Seaweed and Fish Cultivation

P.I. Zhi-Yan (Rock) Du, University of Hawaiʻi at Manoa, MBBE

The overall goal of this project is to identify and develop natural, plant-derived microalgaecides and pathogen inhibitors that can support healthier, more resilient seaweed and fish farming systems in Hawaii. This project aims to elucidate the biological mechanisms underlying the long-term success of symbiotic sea plant cultivation at the Olakai Farm in Hawaii, where seaweed and fish have coexisted in outdoor ponds for nearly two decades. A central feature of this system is the sea asparagus, which creates a balanced pond environment by naturally suppressing harmful microalgae and pathogens; when sea asparagus is absent, these opportunistic organisms quickly dominate, leading to the collapse of the entire farming system. To achieve this goal, the project will pursue three integrated objectives: identifying bioactive compounds produced by sea asparagus that inhibit harmful microalgae and pathogens using untargeted metabolomics on systematically collected samples representing environmental and biological variability; validating compound activity in laboratory systems that mimic farm conditions, enabling precise evaluation of inhibitory effects and optimization of application conditions; and conducting field trials at Olakai Farm and Ocean Era Inc. to assess the effectiveness of the identified compounds in improving pond health, water

quality, and the productivity of both seaweed and fish under commercial aquaculture settings. Olakai Farm, with nearly 20 years of cultivation experience, provides a unique living laboratory and historical insight into symbiotic plant-seaweed-fish systems, while Ocean Era, a commercial aquaculture company, will host applied field trials and contribute expertise in scaling and evaluating solutions for broader industry adoption. By uncovering the biological foundation of Olakai's long-term success, this project will deliver practical tools to enhance the sustainability and resilience of seaweed and fish farming, with outcomes that will directly benefit Hawaiian aquaculture and offer scalable solutions to global challenges in food security and environmentally responsible aquaculture.

Circular Bioeconomy Strategies for the Sustainable Valorization of Hawaiian Seaweed Processing Waste: Recovery of Mycosporine-like Amino Acids (MAAs)
P.I. Nan Jiang, University of Hawai'i at Manoa, MBBE
The overarching objective of this project is to establish a scientifically validated, industry-integrated framework for the sustainable valorization of seaweed processing waste in Hawai'i through the recovery of MAAs. Hawai'i's aquaculture sector is rapidly expanding, with seaweed cultivation playing an increasingly important role in food, nutraceutical, and environmental applications. Traditional processing generates substantial postharvest seaweed biomass that is routinely discarded as processing waste with no value recovery, even though this waste contains significant biochemical value, including Mycosporine-like Amino Acids (MAAs): natural UV-absorbing compounds with potent antioxidant, anti-inflammatory, and cosmeceutical applications. While commercial interest is high, industry adoption of recovery technologies has been limited by the absence of practical and scalable extraction processes that can be seamlessly integrated into existing workflows. This project proposes to address this bottleneck by developing, optimizing, and demonstrating circular bioeconomy strategies that valorize seaweed processing waste into valuable bioactive compounds, focusing on recovering MAAs from waste streams, validating modular extraction technologies compatible with traditional processing infrastructure, demonstrating pilot-scale integration within existing processor workflows, assessing economic and environmental impacts, and transferring technologies to stakeholders. Working with partners, the team will collect representative samples from nine macroalgal species including Kahuku ogo, Limu ogo, Limu manauea, Dragon's breath, Pacific dulse, Limu ʻakiʻaki, and Sea grape for comprehensive biochemical profiling using UV-Vis spectrophotometry, HPLC-DAD, and LC-MS to identify and quantify key MAAs. Three extraction modalities (enzyme-assisted extraction, ultrasound-assisted extraction, and solvent-based methods) will be optimized using Response Surface Methodology, with protocols ready for pilot-scale validation by the end of Year 1. In Year 2, optimized extraction protocols will be scaled and integrated into real-world seaweed processing operations on Oʻahu and Hawai'i, with each partner site piloting at least one extraction system using their own processing waste, while a parallel techno-economic analysis and life cycle assessment will estimate return on investment, costs, and environmental benefits.

Investigating Resistance of Pacific White Shrimp, Litopenaeus vannamei, to a Microsporidian Pathogen (Enterocytozoon hepatopenaei) Using a Genomics Approach
P.I. Dustin Moss, Oceanic Institute of Hawai'i Pacific University
The overall goal of this project is to use a genomics approach to investigate resistance of L. vannamei to the microsporidian parasite E. hepatopenaei, to benefit the Hawaii shrimp genetic improvement and broodstock supply industry. Over the last two decades, Hawaii has been a global leader in shrimp genetic improvement and the distribution of selectively bred, specific pathogen free (SPF) broodstock. The Hawaii industry generated exports worth ~$300M from 2013 to 2020; in 2015, 796,317 broodstock (>95% L. vannamei) were exported from Hawaii with an estimated value of ~US$40M. However, from this peak, annual exports have steadily declined to <400,000 broodstock per year, a drop largely attributed to increased global competition, even though it is currently estimated that annual global demand of L. vannamei broodstock is 1.3-1.7 million with a value of $78-102M. Enterocytozoon hepatopenaei (EHP) is a microsporidian parasite that has emerged as a significant threat to the global shrimp aquaculture industry, particularly impacting Pacific white shrimp, with its primary impact being severe growth retardation due to hepatopancreatic damage and metabolic disruption, leading to substantial economic losses potentially exceeding US$1 billion per year. There is a paucity of literature on the selective breeding of L. vannamei for resistance to EHP; however, recent advances in high-throughput genotyping and analytical methods offer breeders the opportunity to improve the efficacy and efficiency of shrimp breeding programs. The project will produce two cohorts of approximately 50 shrimp families (G1) with about 60 juveniles per family allocated for EHP challenges, conduct EHP challenges of both cohorts under "real-world" farming conditions, and carry out a genome-wide association study to identify potential genetic markers for EHP resistance, indicated by fast growth and high survival while infected with EHP, with the data also used to estimate standard genetic parameters needed to develop genetic improvement and breeding strategies. The long-term impact of the research will be the development of EHP-resistant lines of L. vannamei by US shrimp genetic improvement companies, several of which are located in Hawaii, helping these companies develop and maintain a competitive advantage in the global shrimp broodstock market while broodstock exports help offset US trade deficits in marine products and bring valuable revenue to the state of Hawaii.

Regional Aquaculture Announcements

Join July 2 or 7th Webinars with HAAA: Shaping the Future of Hawai'i Aquaculture

Click here to join the free webinar on **Thursday, July 2 (12pm HST) and/or Tuesday, July 7 (12pm HST)** to learn about a new HAAA initiative to identify and address barriers to aquaculture growth in Hawai'i. Speaker Dick Jones will share key findings from past studies, explain how this effort differs from previous surveys, and discuss how your input will drive meaningful action and industry growth. Two identical sessions are offered for your convenience.

NELHA Seeks New Executive Director

NELHA is searching for a visionary leader to serve as its next Executive Director at HOST Park. If you are a proven executive with a passion for sustainability, ocean science, and leading with a spirit of aloha, NELHA wants to hear from you. Email your cover letter and CV to nelha@nelha.org by July 19, 2026. Click here to learn more.

AquaClip: UH Hilo aquaculturists join $13.5M national consortium to strengthen U.S. seafood supply

The following article describes a new national aquaculture project, led locally by Dr. Chad Callan, a CTSA-funded researcher and member of our Industry Advisory Council.

An aquaculturist from the University of Hawai'i at Hilo is leading a UH research team collaborating on a new national effort to strengthen America's seafood supply and expand sustainable aquaculture. The National Oceanic and Atmospheric Administration announced on June 8 the creation of the Cooperative Institute Fostering Aquaculture Research and Markets (CIFARM).

Funded by an initial $13.5 million investment for its first year, the five-year cooperative institute aims to develop partnerships with researchers to unlock the potential of U.S. marine aquaculture. The University of New Hampshire will serve as the host institution, with UH participating as one of five core consortium members in this competitive national program.

The UH research team is being led by Associate Professor of Aquaculture Chatham Callan based at the UH Hilo Pacific Aquaculture and Coastal Resources Center. Callan is joined by co-investigators Professor of Aquaculture Maria Haws also based at the Hilo aquaculture center, Associate Research Professor Erik Franklin of the Hawai'i Institute of Marine Biology in the School of Ocean and Earth Science and Technology at UH Mānoa, and Hawai'i Sea Grant Associate Director for Extension Darren Okimoto and several other UH faculty partners.

"Being selected as a core member of CIFARM is a testament to the decades of world-class aquaculture research happening right here in Hawai'i," says Callan. "Through our partnerships with Native Hawaiian communities, we draw on a tradition of ocean stewardship and fishpond engineering that stretches back centuries.

"Our UH team is excited to bring that unique Pacific perspective and expertise to the national stage," he adds. "By focusing on cutting-edge tech, environmental forecasting, and real-world marine demonstration projects, we are actively building the blueprint for a more resilient, self-sufficient seafood industry." ...read the full article.

Source: UH Hilo // 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 2022-38500-38099, 2023-38500-40707, and 2024-38500-42306. The regional aquaculture centers integrate individual and institutional expertise and resources in support of commercial aquaculture development.
CTSA was established in 1986 and is administered by the University of Hawaii.

Center for Tropical and Subtropical Aquaculture
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