CENTER FOR TROPICAL AND SUBTROPICAL AQUACULTURE

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Letter from the Director

Aloha,

As Seafood Month comes to a close, I am reflecting on the good seafood-related news from our region this month. First, I am thrilled to report that a new investment group from Japan has joined Big Island Abalone (BIA) and will be keeping the farm open. Not only will they make full use of the existing BIA facilities at NELHA, but they may also be expanding production. Longtime BIA workers have shared that they are excited to work with the new partners and utilize their unique skills to help implement innovative ideas to expand farming operations. I personally am looking forward to meeting the new investment group and learning more about their short and long term vision for Big Island Abalone and aquaculture in Hawaii; stay tuned! This BIA development coupled with the recent news about Symbrosia's expansion will usher in significant growth for Hawaii's aquaculture industry.

In the Western Pacific Islands, I am happy to share that on World Food Day (October 16), Palau farmers received the first batch of milkfish fry produced in the National Aquaculture Center hatchery. Under the guidance of the 'Palau Blue Prosperity Plan' and in partnership with the Taiwan Technical Mission, the hatchery is helping the island nation reduce its reliance on importing milkfish fry from other countries; this is a significant step for the development of milkfish farming in Palau. More information is shared in the article below by Specailist Po-Yuan Hsieh (pictured holding milkfish broodstock).

Indeed, there are opportunities across our region to secure the local and national seafood supply. It was recently reported by the Vietnam Association of Seafood Exporters and Producers that Vietnam's tilapia exports have surged this year, driven by the booming demand from U.S. consumers. To ensure food safety and secure our seafood supply, we must invest in more domestic seafood production. Hawaii has the resources to farm high quality tilapia; it is my hope that we will gradually be able to increase our regional contribution to the U.S. seafood supply. CTSA has supported several research projects to achieve this goal.

I am thankful for the opportunity to be able to share good news stories during these challenging times. On that note, I encourage our friends and colleagues to 'go the extra mile' and help ensure that your communities are fed and nourished as we enter the season of thanksgiving. There are many ways to get involved!

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

Palau Hatchery Delivers First Batch of Milkfish to Farmers

CTSA is pleased to share the following article describing the recent progress in milkfish farming in Palau. During his first visit to Palau decades ago, CTSA Executive Director Dr. Cheng-Sheng Lee was advised by resource managers that milkfish are an important species in the local market; the managers expressed a long-held desire for a local hatchery to supply farms and reduce reliance on imported fry. Over the course of two decades, CTSA has worked to assist Palau in achieving this goal. CTSA first funded a multi-year milkfish hatchery project at Palau Community College. The project experienced success in collecting and spawning broodstock, but fertilization was too low. At that point, Dr. Lee connected the Palau resource managers with the Taiwan Technical Mission and provided the group with previous CTSA milkfish research and publications. We are pleased to hear about the exciting recent developments described in this article. CTSA extends our sincere gratitude and congratulations to the Taiwan Technical Mission on the success of this critical first step towards a sustainable milkfish hatchery in Palau. We look forward to more collaborative efforts to develop aquaculture for high-demand species --such as mangrove crab-- in the region.

Report on the Taiwan Technical Mission (TTM) Aquaculture Project in Palau of Taiwan International Cooperation and Development Fund (Taiwan ICDF): Cultivation of Milkfish Fry and the Promotion of the First Batch of Fry

Written by Po-Yuan Hsieh

Milkfish are an important species in Palau, both as a food fish for the local market and as bait for tuna fishing boats. The government of Palau recently proposed the "Palau Blue Prosperity Plan," one of the main themes of which is to promote the development of the milkfish aquaculture industry. To help achieve this goal, the Taiwan Technical Mission (TTM) Aquaculture Project in Palau of Taiwan International Cooperation and Development Fund (Taiwan ICDF) launched in 2021, using the Palau National Aquaculture Center as a breeding facility. In response to the Palau government's expectations for early milkfish fry production, the project also investigated the feasibility of collecting wild broodstock from the Palau coast.

Broodstock Cultivation, Spawning, and Fry Rearing
Discussions with local fishermen revealed that the seabed off the west coast of Palau is a major milkfish fishing ground, typically from March to October. Subsequently, the project began collecting and selecting broodstock, culminating in the collection of 50 broodstock by May 2025, each weighing 6.7 kg and measuring Fork Length 69 cm. The newly captured broodstock were initially isolated and housed in a 45-ton, 2.3-meter-deep indoor pond. After three months of recovery and acclimatization, they were then transferred to a 160-square-meter, 1.2-meter-deep outdoor pond for breeding. Since the broodstock were collected from the wild and are accustomed to a diverse diet, they were fed a 24% protein milkfish artificial feed, along with frozen squid, shrimp, and other forage fish to supplement gonadal development. The daily feed intake is 1-3% of the fish's body weight, adjusted based on their daily feeding habits. Water quality is generally maintained through 24-hour aeration and the addition of new sea water, maintaining a year-round water temperature of 27.5-30.5°C, dissolved oxygen 4-6 ppm, pH 7.8-8.2, and salinity 27-33 psu.

After the broodstock were transferred to the outdoor pond for one year and three months, the females began ovulating during the full and new moon periods, but most were unfertilized. Two months later, on May 22, 2025, fertilized eggs weighing 134 grams were spawned. Thereafter, spawning frequency increased; fertilized eggs spawned every one to two months, with egg yields ranging from 80 to 230 grams.

The first batch of fertilized eggs was hatched and reared in an indoor fry pond containing 18 tons of water at a depth of one meter. From the moment the fry hatched, they were fed with algae-rich water. Rotifers were fed on the fourth day, and micro-grain feed was added on the 18th day. Starting on the seventh day of hatching, insufficient algae-water supply and an increase in rotifers resulted in green algae and elevated ammonia nitrogen concentrations in the pond, impacting fry survival. By the 35th day of hatching, 1,600 fry survived. Although the number of spawning fertilized eggs at this moment is low, the frequency of fertilized egg production is stable, indicating positive growth. Further improvements are needed in fry breeding to increase fry survival, such as improving algae and zooplankton supply and water quality management. This is the direction of our next phase of efforts.

The promotion of the first batch of fish fry
After four and a half years of broodstock domestication and fattening, the first batch of fertilized eggs was produced at the end of May 2025. Following four months of trial rearing and cultivation of the fry, a total of 1,500 milkfish fry were produced, ready for stocking by fish farmers.

On October 16th, World Food Day, the Ministry of Agriculture, Fisheries, and the Environment (MAFE) invited TTM and the Ngatpang State government to participate in a promotional event at a public aquaculture farm in Ngatpang State. The event was titled "The First Batch of Milkfish Fry from the Palau National Aquaculture Center Distributed to Farmers." Participants included a MAFE's BOF aquaculture division chief Mrs. Cherelle Williams and technicians, TTM leader Mr. Benjamin Tsai and members, Ngatpang Governor Mr. Jersey Iyar and State Legislator Mrs. Elien Rebeluud, operators of public aquaculture farms (Ngatpang Chiefs organization), two private milkfish farmers from Ngatpang and Koror States, and Okada Techitong who is president of the BOFI (Belau Offshore Fisheries, Inc.), totaling 30 people.

In his speech at the event, the Governor first thanked the TTM for its support and assistance in aquaculture and agriculture in the state, which has enabled local men and women to find employment. The State Legislator then noted that the public aquaculture farms previously sourced fry from abroad but due to the pandemic, international shipping was disrupted, resulting in a two-year suspension of Milkfish production. She thanked the TTM for their assistance in producing milkfish fry and strengthening food security. At the end of the event, 1,500 fish fry were distributed to three farms and released into fish ponds and sea cages.
Pictured: The Palau Chief of Aquaculture Division releasing fry into a pond.

Aloha to Hawaii Aquaculture's Dean Akiyama

CTSA joins the Center for Responsible Seafood (TCRS) and others in the shrimp aquaculture industry in mourning the passing of Dr. Dean Akiyama on Oct. 13, 2025, at the age of 70. Akiyama was honored in June with a Lifetime Achievement Award at the third annual TCRS Shrimp Summit.

"Dean was more than just a great scientist," said George Chamberlain, President of TCRS and an early collaborator with Akiyama. "He was a delightful human being who quickly earned the affection and respect of everyone around him." The Lifetime Achievement Award recognized Akiyama's "enduring achievements in science, commercial production, and education that have advanced the productivity, sustainability, and livelihoods of shrimp farming," The video above was recorded just prior to the presentation.

Akiyama always exuded the Aloha spirit – treating everyone with kindness and respect – that was ingrained in him in Hawaii. Those who have had the privilege to work with Akiyama have posted pictures, testimonials, and memories online that attest to his immense popularity and impact.

Source: The Center for Responsible Seafood (TCRS)

Regional Aquaculture Announcements

CNMI Job Announcement: Aquaculture & Natural Resources Program Leader

Northern Marianas College is seeking a Program Leader for Aquaculture and Natural Resources. This position is a Non-Instructional Faculty (12-Month) contract. The position is located in the NMC Cooperative Research, Extension, and Education Services (NMC-CREES), under the supervision of the Dean of CREES. The position is approximately 80% research, and 20% Extension. This position is responsible for leading the CREES Aquaculture & Natural Resource Management (A&NR) Program in fulfilling its mission by conducting need-based research and extension services, as outlined in the description.

Upcoming Sea Grant Events

A New Chapter: The Future of Hawai‘i Aquaculture is Now

Dick Jones has been named the new Executive Director of the Hawaii Aquaculture and Aquaponics Association. Join Sea Grant at noon on November 19th to discuss the exciting direction and vision of HAAA and its future impact on the growth of Hawaii’s aquaculture industry. Meeting link.

Save the Date: Waipahu Natural Resources Teacher and CTSA Co-PI, Jeff Garvey, will discuss the ongoing aquaculture workforce project and other natural resource activities inspiring students in his classroom on December 10 (zoom link not yet provided - check CTSA website and next month's e-notes for additional details).

AquaClip: Bipartisan MARA Act Introduced to Strengthen Sustainable Offshore Aquaculture in the U.S.

Representatives Ed Case (D-HI-01), Mike Ezell (R-MS-04), Kat Cammack (R-FL-03), and Jimmy Panetta (D-CA-19) introduced the Marine Aquaculture Research and Advancement (MARA) Act of 2025, a bipartisan bill that empowers the National Oceanic and Atmospheric Administration (NOAA) to expand offshore aquaculture in a sustainable, science-based, and environmentally responsible way.

As the global demand for seafood continues to rise, the MARA Act establishes a clear federal framework to help the United States become a leader in offshore aquaculture while protecting marine ecosystems and involving coastal communities in the process.

“The MARA Act ensures that as we grow our offshore aquaculture sector, we do it the right way with science, transparency, and public engagement at the center,” Ezell said. “This bill puts the U.S. on a path to food security, environmental stewardship, and coastal economic development. Offshore aquaculture, when done responsibly, holds enormous potential to feed more people, create jobs, and protect wild fisheries. The MARA Act gives us the tools to lead the world in sustainable seafood production.”

“America should be leading the world in responsible, sustainable seafood production, not outsourcing it," Cammack said. "The MARA Act will strengthen our food security, support our coastal communities, and ensure that growth in aquaculture off our shores happens the right way—with transparency, science, and accountability.”

“The Marine Aquaculture Research for America Act is a forward-looking, bipartisan step toward strengthening America’s seafood supply and coastal economies while ensuring ocean health remains a top priority," Maddie Voorhees, Coalition for Sustainable Aquaculture, said. "We thank Representative Ezell for his leadership on this important legislation, which invests in the science and innovation needed to ensure U.S. aquaculture grows responsibly—supporting communities, creating jobs, and protecting our marine resources for the future.”

“We thank Reps. Ezell and Ed Case for their leadership in introducing the MARA Act in the U.S. House, legislation that is necessary to support the expansion of American aquaculture,” Drue Banta Winters, campaign manager of Stronger America Through Seafood (SATS) said. “This bill is an important step forward as the U.S. seeks to increase the supply of sustainable seafood coming into U.S. ports. Open ocean aquaculture would work in complement with our nation’s wild fisheries to help increase America’s seafood supply, create jobs across the seafood supply chain, and spur investment in coastal communities.”

Key Provisions of the MARA Act of 2025:

- Expands Scientific Research: Directs NOAA to conduct and support research on sustainable offshore aquaculture practices and environmental impacts.
- Streamlines Permitting: Improves interagency coordination to develop an efficient, transparent permitting process grounded in science and stakeholder input.
- Invests in Workforce and Infrastructure: Supports training programs and infrastructure development to prepare America’s workforce for opportunities in this growing industry.
- Builds Guardrails for Responsible Growth: Emphasizes environmental stewardship, public engagement, and accountability throughout the development of offshore aquaculture projects.

The MARA Act is supported by a broad coalition of environmental organizations, aquaculture researchers, and industry stakeholders committed to building a sustainable future for America’s oceans and coastal communities.

Source: Press Release

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 2020-38500-32559, 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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