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REGIONAL NOTES
CENTER FOR TROPICAL AND SUBTROPICAL AQUACULTURE

Oceanic Institute carries on

Oceanic Institute (OI), the largest marine aquaculture institution in the USA, turns 45 this year, and while it is well known around the world, not everyone may be aware of the variety and scope of its programs. OI, an affiliate of Hawaii Pacific University (HPU), is a not-for-profit applied research organization dedicated to marine aquaculture, biotechnology development, and coastal resource management. The following is a brief overview.

photo courtesy of OI

Arial view of the Oceanic Institute

Research and Development

Seven departments and programs located at its main 56-acre Makapuu Point, Oahu campus comprise OI's research and development core.

Fisheries and Environmental Science. Director David Ziemann and his staff are dedicated to finding ways to conserve and restore depleted fisheries. Restrictions alone cannot do the job. The department's Hawaii Stock Management Program, funded by an annual grant from the National Marine Fisheries Service, is developing and testing techniques to use cultured fish, like Pacific threadfin (moi) and bluefin trevally (omilu), to restore Hawaii's fish populations. The department is also conducting acoustic tracking research to examine the effectiveness of marine reserves.

Shrimp. 2005 has been an exciting year for the shrimp department, led by Director Shaun Moss. The department, through a five-year research project funded by the U.S. Department of Commerce Advanced Technology Program, has achieved record-breaking shrimp production in its BioZEST (Biosecure Zero-Exchange Shrimp Technology) system. The department's main source of funding is from the U.S. Department of Agriculture through the U.S. Marine Shrimp Farming Program (see below).

Nutrition. Department Director Reza Kamarei uses the phrase "from feed to food" to summarize his department's vertical integration approach. The process links aquaculture from feed development to product quality evaluation and production of value-added products. Current research projects are funded by the USDA Agriculture Research Service. Kamarei and his team of research scientists manage the department's five groups: aquatic nutrition, feeds science and technology, aquatic foods, aquatic neutraceuticals, and nutritional biochemistry.

Finfish. Director Charles Laidley heads the finfish department, which is focused on the development, demonstration, and transfer of new culture technologies for commercial aquaculture, both the marine food fish and marine aquarium industries, and fisheries enhancement. Through projects funded by NOAA and USDA (through CTSA), the department has made advances in the culture of species such as Pacific threadfin (moi), amberjack (kahala), and flame angelfish. Yellowfin tuna is one of the species targeted for future investigation.

USMSFP. OI is home to the administrative center for the U.S. Marine Shrimp Farming Program, a USDA-funded multi-state consortium of seven institutions created to support and advance domestic shrimp farming. Director Anthony Ostrowski manages the program and also serves as a liaison between industry, government, and research, and between aquaculture and the larger seafood industry. Program accomplishments include the establishment of the world's first and most advanced marine shrimp breeding and genetic selection program, development of the only full-service shrimp disease diagnostic program, and the cultivation of new, biosecure, water-reuse, superintensive technologies that foster shrimp production in nontraditional sites (i.e., desert and inland). While Texas is the largest U.S. producer of farmed shrimp, Hawaii reigns as the technology leader in specific-pathogen-free shrimp broodstock production, thus making Hawaii an apt home for the program's administrative center. The center functions as

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Letter from the director

During my visit to Saipan in early May, I was pleased to see more interest in aquaculture as a tool for economic development and as a supplemental source of income for families. It was particularly nice to see families who are making use of otherwise idle resources. For example, Anthony Pelegrino is using his vacant land for shrimp production, and Ines Guerrero is culturing tilapia in a formerly abandoned pig pen.

CTSA would like to offer its help in any way possible so that these ventures will succeed. To have a profitable aquaculture business, we need to choose the right species, be able to culture the species, and market the end product at a profitable price. CTSA will work with other institutions and experts to provide technical assistance to the industry to make success a reality. While there is much work to be done, it is encouraging to see what has already been accomplished.

Cheng-Sheng Lee

REGIONAL NOTES

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AQUACLIPS

In a pinch: Kohala crawfish company harvests 6,000 pounds annually

By Toni Romp-Friesen, West Hawaii Today, Sunday, March 20, 2005

Crayfish. Crawfish. Crawdad. Mud lobster. Ecrevisse. These small crustaceans, resembling lobster, go by different names, depending on where you're from. Lance Caspary, owner of Kohala Crawfish Farm in Hawi, has another name for his Louisiana red swamp crawfish: delicious. For Caspary, who grew up in New Orleans eating crawfish, "it was not a big leap for me" to start raising them in 1994 after other career plans fell through.…Caspary now has almost five acres [of wetland rice] planted in one-acre ponds…He describes his operation as "very low-tech, natural, and environmentally friendly." He typically harvests 1,200 to 1,500 pounds [of crawfish] per acre per year.

Caspary is grateful for support from the Department of Agriculture, who encouraged him to grow crawfish. He has also had offers from other scientists and grant writers to assist him in obtaining grant money to expand his farm. He is interested in trying to develop new techniques for growing crawfish in Hawaii and would like to encourage taro farmers to allow crawfish to grow side-by-side with taro, doubling their crop. Crawfish are an excellent source of protein and contain naturally occurring astaxanthin that make the crawfish very red. Unlike lobster, they are also fat- and cholesterol-free, Caspary says. They are grown without fertilizers or chemicals and have also encouraged several endangered species—including koloa and akuu—to thrive in the rice wetlands.

Offshore cages to grow tons of fish a year

Honolulu Star Bulletin, Friday, April 8, 2005

KAILUA-KONA—A deep-sea fish farm a half mile offshore of Keahole Point is stocked with 30,000 juvenile Kona kampachi that should be ready for harvest by fall. Kona Blue Water Farms completed installation of the moorings and first pair of submersible grow-out cages, which now contain the kampachi fingerlings that were raised at the company's hatchery at the Natural Energy Laboratory of Hawaii. "It's tremendously exciting to see this coming to fruition," said Neil Anthony Sims, vice president of Kona Blue. "It's exciting for furthering the research that will allow us to have more sustainable use of our oceans." Installing the offshore cages involved building a complex underwater mooring grid of 14 steel anchors, each 10 feet tall and weighing 7,500 pounds, along with 12 submerged steel buoys and miles of mooring lines, the company said. The submersible cages are 60 feet tall and 80 feet in diameter, encompassing nearly 2,600 cubic yards. The company plans to add two smaller surface cages and four more of the larger submersible grow-out cages, which are designed to sit 30 feet below the surface in water up to 220 feet deep about a half mile offshore. The location, which allows the cages to stay out of high surf, minimizes potential impact on shoreline reefs and avoids conflicts with fishermen and ocean recreation, Kona Blue said. Kona Blue is the only open-ocean farm growing Kona kampachi, which is prized for sashimi. The fish, which is commonly known as kahala, is a close relative of Japanese hamachi or yellowtail.

Four Seasons pond wins Environmental Protection Agency award

By Travis Loop, West Hawaii Today, Friday, April 22, 2005

When a chef at Four Seasons Resort Hualalai needs fish or shrimp for a dish, a fresh supply is available at the fifth hole of the golf course. That's where the "living machine" is located. The three-million-gallon pond is an example of phytoremediation—the treatment of environmental problems using plants. Water in the Four Seasons pond is filtered by floating islands of plants with extensive root systems that are colonized by nutrient-consuming bacteria. The water is then clean enough to be stocked with moi, mullet, milkfish, and Pacific white shrimp, which are used in the resort restaurant. The pond—dubbed a "living machine" for its use of micro-organisms—was recognized by the Environmental Protection Agency at an awards ceremony Thursday in San Francisco.

CTSA executive director visits CNMI

photo courtesy of C-S Lee

Saipan shrimp farm

Center for Tropical and Subtropical Aquaculture (CTSA) Executive Director Cheng-Sheng Lee sees potential for aquaculture to become a revenue-generating industry in the Commonwealth of the Northern Mariana Islands (CNMI). Lee visited Saipan, the capital of the CNMI, from May 3 to 6 to exchange aquaculture news and information with extension agents, farmers, and government officials. He sought to see the situation firsthand and determine possible ways in which CTSA could help the CNMI develop a viable aquaculture industry.

Lee made two presentations, both well received—one at the Northern Marianas College (NMC) and one at the capital. At the latter, he gave a small group of congressmen a global overview of aquaculture along with a closer look at Hawaii's aquaculture industry. Hawaii has a $28 million dollar industry, and Lee says he would like to see similar success in the CNMI. As the Saipan Tribune reported in an article about Lee's visit, agriculture specialist Michael Ogo said the "CNMI's proximity to Asia gives the islands more advantages than Hawaii."

With federal and local government grants and the support of NMC President Tony Guerrero, NMC is gearing up to build a Marine/Environmental Sciences and Mariculture Demonstration Center to promote public awareness of marine resources and of aquaculture as an alternative to harvesting wild resources. The center will also be used to produce fingerlings for aquaculture farms. Lee applauds this effort and stresses the importance of local government and community support for the development of a successful industry.

From conversations with farmers, Lee identified the immediate constraints to be a lack of sources for fingerlings and feed. Farmers also need more technical support. Lee told them that "CTSA is ready to help and is willing to work with them to solve the challenges they are facing." Lee toured several farms, including the tilapia farms of Ines Guerrero, who resourcefully operates out of a converted pig farm, and Ben Sablan and the shrimp farms of Anthony Pelegrino, Frank Cepeda, and Island Landscapers (soon to be handed over to another investor). Lee met with Saipan members of the aquaculture farmers association led by Benigno Sarlac, and through a teleconference, he was also able to speak to members on the islands of Rota and Tinian. "It was so nice to see more people interested in aquaculture," Lee says. While Lee was pleased to see the new developments, he cautioned farmers to really do their homework before rushing into business—he wants to see their ventures succeed.

Lee extends his thanks to interim NMC-Cooperative Research, Extension, and Education Services Director Anthony Benavente and CTSA Industry Advisory Council representative John Gourley for coordinating the presentations and meetings and making his trip so well planned and fruitful.

Hilo aquaculture expanding

photo courtesy of C-S Lee

Ornamental hobbyist society meeting

Aquacultlure research and industry is expanding in Hilo, Hawaii. Center for Tropical and Subtropical Aquaculture (CTSA) Executive Director Cheng-Sheng Lee spent May 13 and 14 in Hilo to visit several freshwater fish farms and meet with researchers.

Lee went with Hawaii Sea Grant aquaculture extension specialist Jim Szyper to see Jerome Sasaki's backyard Chinese catfish operation and Roy Tanaka's tilapia and catfish farm. Sasaki's main business is in fingerling production for other farmers, and every year he produces about 150,000 fingerlings, which does not meet the high demand.

Lee also attended a Hilo ornamental hobbyist society meeting and stopped by Bob Kern's farm, Tropical Ponds of Hawaii, to obtain firsthand information on the progress of the freshwater ornamental fish industry. At the meeting, Lee spoke about CTSA's support for the industry and what can be done in the future. Kern showed Lee his new ten-acre site, an expansion from his former three-acre site. Kern and his partners plan to outfit the new site with raceways they designed based on their years of experience. The three main species their farm cultures are swordtails, gouramis, and barbs. With an added dose of good fortune to their hard work and skillful planning, this farm will soon be producing high-quality, disease-free fish that can compete in world markets.

The industry and community can anticipate more support for aquaculture in Hawaii now that construction is underway at the University of Hawaii at Hilo's Pacific Aquaculture and Coastal Resources Center, which Lee also visited. The center's goals are to: (1) provide infrastructure needed for world-class aquaculture and marine science programs at UH Hilo, (2) support commercial aquaculture, fisheries, and eco-tourism in East Hawaii, and (3) transfer technologies developed and tested at the Center to similar coastal areas throughout the world.

AQUA TIPS

Comparison of simple land-based rearing techniques with traditional lagoon-based nursery methods for black-lip pearl oyster spat (*Pinctada margaritifera*)

Simon Ellis,* Eileen Ellis,† and Maria Haws*

***Pacific Aquaculture and Coastal Resources Center, University of Hawaii at Hilo, Hawaii**
†Marine and Environmental Research Institute of Pohnpei, FSM

This article was written as part of the work for the project "Addressing Some Critical Bottlenecks to Commercially Viable Hatchery and Nursery Techniques for Black-lip Pearl Oyster Farming in Micronesia," which was funded in part by the Center for Tropical and Subtropical Aquaculture under a grant from the U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service.

Introduction

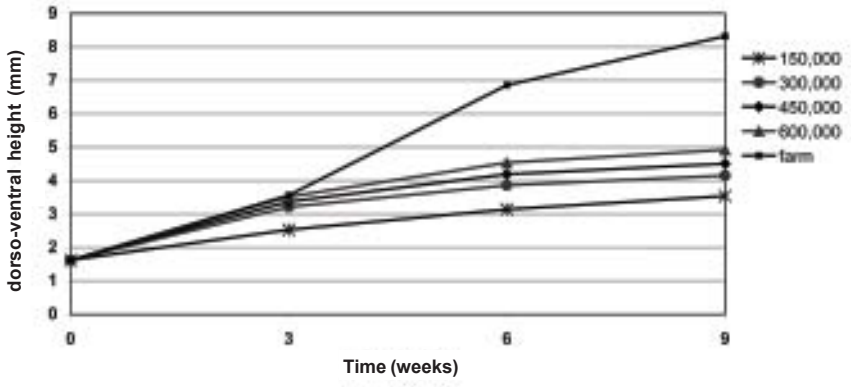
The high cost of black-lip pearl oyster hatchery production coupled with chronically poor survival in the early part of an ocean-based nursery stage led to an investigation, conducted in Pohnpei, of the practicality of simple, land-based nursery techniques compared to the traditional, ocean-based nursery system. Farming of black-lip pearl oysters to produce pearls has high economic potential in much of the Pacific region, especially in the more impoverished and marginalized areas such as the Federated States of Micronesia (FSM) and the Republic of the Marshall Islands (RMI). In most of these islands, however, the pearl industry is dependent on hatchery production for farm stock, and this has represented a major impediment to the development of a strong industry. From an economic standpoint, the need for hatchery production adds a large amount of labor and capital costs to pearl farming, placing farmers at an economic disadvantage to producers in French Polynesia and the Cook Islands who rely on spat collection. If farms are to survive, then they must be run as efficiently as possible. Pearl oyster hatcheries are operating or being developed in Hawaii, the RMI, the FSM, and Palau, and it is crucial to make them more efficient by lowering mortality during the early part of the nursery phase when spat are highly vulnerable to predatory snails. The high mortality rates associated with ocean-based spat culture are problematic but can be partially overcome if spat are stocked out at larger sizes, making them less susceptible to predation.

Methods

This study was designed to look at the combined effects of feed and spat densities in land-based culture and thereby refine land-based nursery techniques. At the Marine Environmental Research Institute of Pohnpei, juvenile black-lip pearl oyster spat at a size of 1.6 mm (s.d. = 0.33 mm) were placed into 1-mm mesh bags at treatment densities of 110, 220, and 330 spat per bag. Each stocking density was replicated three times per tank. Bags were hung in one of four land-based 300-liter treatment tanks and supplied with microalgae (*Isochrysis galbana, Tetraselmis succecia,* and *Chaetocerus muelleri*) at densities of 1.5 x 10^5, 3.0 x 10^5, 4.5 x 10^5, or 6.0 x 10^5 cells per spat, fed twice daily. Water was exchanged in all tanks once per day, and moderate aeration was provided. Four bags of spat at each treatment density were also placed into 1-mm mesh bags on an established farm in Pohnpei lagoon.

At intervals of three, six, and nine weeks after stocking, randomly selected spat from each bag were measured, and all spat in each bag were counted. Relative growth rate and percent survival data were arcsine transformed, and two-way ANOVAs were

Figure 1. Effects of feed density (cells per spat or farm) on spat size.



performed to look for significant differences ($P < 0.05$) between animals that were fed different feed concentrations and stocked at different densities. Tukey's Pairwise Comparisons were used to look for differences between treatment groups. A separate one-way ANOVA was also performed on animals kept on the lagoon-based farm to determine if stocking density affected growth in this environment.

Results and Discussion

The effect of feed density on spat growth at three, six, and nine weeks post-stocking is presented in Figure 1. At three weeks post-stocking, relative growth was not significantly different ($P > 0.05$) among the 3.0 x 10^5, 4.5 x 10^5, 6.0 x 10^5 cells per spat treatments and the farm spat. By week six, the spat from the ocean farm were growing significantly faster than the land-based treatments, and a clear trend of growth being directly related to feed density was evident. This trend continued into week nine when spat from the farm averaged 8.32 mm in comparison to 4.51 and 4.72 mm, respectively, in the 4.5 x 10^5 and 6.0 x 10^5 cells per spat treatments.

Spat stocking density did not affect growth rate in the first three weeks of the study, but thereafter, spat stocked at 330 spat per bag grew significantly ($P < 0.05$) more slowly than those in the lower stocking density treatments (Table 1). Further analysis of growth rates of spat stocked at different densities on the lagoon-based farm are presented in Table 2. Relative growth rate was not significantly different ($P > 0.05$) between stocking densities during the first six weeks of the study, but by week nine, there was a clear trend with growth being slowest in the 330 spat per bag treatment and fastest in the 110 spat per bag treatment.

By week three, spat fed the three highest feed densities (3.0 x 10^5, 4.5 x 10^5, and 6.0 x 10^5 cells per spat) had significantly higher survival (91.13–92.21%) than spat maintained on the lagoon-based farm (83.66%; Table 3). This trend continued, and by week nine, spat fed 4.5 x 10^5 and 6.0 x 10^5 cells per spat had significantly higher survival than those fed 1.5 x 10^5 and 3.0 x 10^5 cells per spat and those in the lagoon farm. There were no significant differences in survival between spat stocked at 110, 220, and 330 spat per bag during weeks three, six, or nine of the study. Further analysis of spat stocked only on the lagoon farm also showed no significant differences in stocking density on survival.

Results of this study reveal some significant findings for hatchery and farm management strategies in Micronesia. Probably of greatest significance is the result that at week three, growth of spat given the higher feeding densities was not different from the ani-

Table 1. Affect of stocking density on growth of *P. margaritifera* spat raised in a hatchery and on a lagoon-based farm, combined. Initial size of spat was 1.62 mm (s.d. = 0.33).

Stocking Density (spat per bag)	Relative Growth (%)		
	Week 3	Week 6	Week 9
110	$105.05^{a} \pm 35.26$	$201.31^{a} \pm 94.34$	$236.96^{a} \pm 131.66$
220	$98.59^{a} \pm 33.60$	$196.88^{a} \pm 98.44$	$229.37^{a} \pm 116.67$
330	$99.07^{a} \pm 31.54$	$165.82^{b} \pm 75.43$	$206.41^{b} \pm 103.44$

Means in columns with the same superscript are not significantly different ($P > 0.05$). Means were calculated from 16 replicates per treatment.

Table 2. Affect of stocking density on growth of *P. margaritifera* spat reared on a lagoon-based farm.

Stocking Density (spat per bag)	Relative Growth (%)		
	Week 3	Week 6	Week 9
110	$120.29^{a} \pm 0.52$	$342.90^{a} \pm 62.13$	$448.55^{a} \pm 38.79$
220	$117.59^{a} \pm 0.34$	$347.92^{a} \pm 34.56$	$420.27^{ab} \pm 15.99$
330	$120.68^{a} \pm 0.29$	$280.40^{a} \pm 36.40$	$371.85^{b} \pm 33.58$

Means in columns with the same superscript are not significantly different ($P > 0.05$). Means were calculated from four replicates per treatment.

Table 3. Mean (+ s.e.) survival of *P. margaritifera* fed four algae densities or kept on a farm in the lagoon for nine weeks.

Feed Treatment (cells/spat or farm)	Survival (%)		
	Week 3	Week 6	Week 9
1.5 x 10^5	$90.37^{ab} \pm 6.30$	$85.59^{a} \pm 7.46$	$76.99^{ab} \pm 6.65$
3.0 x 10^5	$91.13^{b} \pm 5.49$	$83.52^{a} \pm 7.58$	$77.26^{ab} \pm 9.13$
4.5 x 10^5	$92.21^{b} \pm 4.26$	$88.06^{a} \pm 3.04$	$80.62^{b} \pm 4.59$
6.0 x 10^5	$91.38^{b} \pm 7.78$	$88.06^{a} \pm 7.90$	$81.20^{b} \pm 10.60$
Farm	$83.66^{a} \pm 5.35$	$74.04^{b} \pm 4.85$	$69.97^{a} \pm 4.72$

Means in columns with the same superscript are not significantly different ($P > 0.05$). Means were calculated from 9 replicates per treatment except for the farm treatment, which had 12 replicates.

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Comparison continued from page 5

mals kept on the lagoon farm. This, coupled with the significantly higher survival of spat in the higher feed density treatments, indicates that keeping animals in a land-based nursery may have some management and financial advantages. After week three, growth became so much higher in animals kept on the ocean farm that keeping spat in the land-based system past this time, using the current experimental feed densities, seems unwarranted. The slowdown in growth in the land-based system was most likely due to a lack of sufficient amount and/or quality of food. This is confirmed by the clear trend in growth with increasing food ration in the land-based system. Superior nutrition in a lagoon setting has been documented in other studies relating to spat growth in land-based systems (Pitt and Southgate, 2000). Black-lip pearl oysters have some of the highest pumping rates of any bivalves (Pouvreau et al., 2000), which would allow them to take advantage of less limited and nutritionally better food in a lagoon environment. Food density did not appear to become a problem for the spat on the lagoon farm until week nine when growth was lower in the 330 spat per bag treatment. Spat should be thinned to 220 per bag or less at this time to avoid loss of growth.

Cost Benefit Analysis for Land-based versus Ocean-based Nursery of Black-lip Pearl Oyster Spat. A simple cost benefit analysis for a hypothetical land-based operation versus a lagoon farm scenario was undertaken based on a farm that needs 500,000 spat per larval run to stock its operation. Both the land-based and ocean-based models assume that the hypothetical facility already has established rearing areas and equipment for handling spat and that these are sunk costs. No depreciation costs are included for either model.

Keeping spat on land for an extra three weeks would cost $1,111 compared to $1,098 on a lagoon farm. Most of the costs involved with the lagoon farm are the high cost of labor to check spat bags for predatory snails after the first three weeks. This would be a highly variable cost based on farm location and local labor rates. Based on survival data from this study, total number of spat remaining in the land-based nursery at the end of the three weeks would be 461,050 spat compared to 418,300 in the ocean nursery, a difference of 42,750 spat. Unless costs for checking bags for snails in the lagoon farm scenario could be drastically reduced, economics indicate that it would be better to keep the spat in a land-based facility for an extra three weeks prior to stocking into an ocean nursery.

Some areas, such as the RMI, have reported very high mortalities in the first three weeks of stocking, and this should be taken into account when determining which method to use. Many other factors, such as local labor and operational costs, would have to be considered for each specific location. It should also be noted that a commercial hatchery may be able to get a significantly higher price for larger spat. Hatchery-reared pearl oyster spat are a relatively expensive animal. Taylor et al., (1997) estimated the cost of rearing *P. maxima* spat to be US $0.10–0.14 per mm. If this is the case, keeping the spat for an extra three weeks in the hatchery would add over a millimeter in size to each animal, potentially adding up to 10–14 cents in value for the 0.22 cents per spat spent to keep them on land.

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HAWAII AQUACULTURE ASSOCIATION

HAA serves up another winner

HAA conference participants listen intently during the "What's New" session. The session featured updates on the Hawaii Aquaculture Development Program, University of Hawaii Sea Grant College Program, CTSA, Hawaii Institute for Marine Biology, Pacific Aquaculture and Coastal Resources Center, and Pacific Tropical Ornamental Fish Program.

The Hawaii Aquaculture Association held its annual conference and trade show on May 25 at Windward Community College on Oahu. More than 120 people attended the conference, and CTSA was proud to be one of the five sponsors. HAA President Ron Weidenbach gave the opening address, and Oceanic Institute President Bruce Anderson shared his vision of a bright future for Hawaii aquaculture during the special lunch session.

As always, the conference concluded with the mouth-watering "A Taste of Hawaii Aquaculture" reception featuring products from local farms prepared by four top Hawaii chefs.

www.hiaqua.org

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the focal point for international and domestic shrimp farming news and information dissemination. It maintains an informative Web site (www.usmsfp.org) and publishes a newsletter, *Industry Briefs*.

AIP and CTSA. The Aquaculture Interchange Program, directed by Cheng-Sheng Lee and funded by a grant from NOAA, brings U.S. and international aquaculture experts to Honolulu to participate in intensive three-day workshops on selected topics. Since 1999, there have been 11 workshops. Peer-reviewed proceedings are available for each one. The next workshop, "Principles and Practices for Sustainable Aquaculture Development: A Socioeconomic Perspective," is scheduled for October 17–21 at the East-West Center in Honolulu. Lee also serves as executive director of CTSA. OI has fiscal and administrative responsibilities for CTSA operation, and OI's President Bruce Anderson serves as the chair of the Executive Committee of CTSA's Board of Directors. For general information about CTSA, please go to page eight.

Education and Training

Gary Karr, OI's director of communications and education, has assisted with many of the new developments afforded by the affiliation with HPU in June 2003 and the opening of the OI Learning Center (OLC) in December 2003. For example, OI hosted two training workshops at the OLC in the fall of 2004: the Hawaii Aquaculture Association's Recirculating Aquaculture Technology workshop on November 3 and a Sea Grant workshop on the use of copepods in marine larval culture on November 20. HPU has also provided management training for OI staff.

HPU and OI aim to establish a world-class marine research education curriculum with eventual graduate-level programs. Since the summer of 2004, a variety of HPU marine biology and oceanography courses have been held at OI. A new course was offered in spring 2005—Practices of Saltwater Aquaculture—that was team taught by a dozen of OI's researchers, a HPU microbiology professor, and a Sea Grant aquaculture extension specialist. This summer, classes will commence June 13 and students will be able to make use of the newly completed outdoor training and demonstration complex, which is fully equipped with tanks, raceways, and filtration systems. In addition to these classes, students have the opportunity to gain practical experience through internships in one of OI's research departments.

OI also supports secondary school education. Since 1993, OI has partnered with Waianae High School to offer students hands-on aquaculture instruction. OI helped design the facility where Waianae's Marine Science Seminar is conducted. The year-long seminar includes a three-day trip to OI's Kailua-Kona site where students learn techniques such as shrimp culture and larval identification, tank maintenance, and water quality sampling. Cultural aspects are also incorporated, such as an introduction to Hawaiian fishponds. Over 30 students participated in the 2005 trip, which was held February 19–21. OI is open to offering workshops for interested schools, and schools such as the Myron B. Thompson Academy have used OI's facilities for classes.

For more information about OI, please visit the newly redesigned Web site at www.oceanicinstitute.org.

UPDATE

CTSA requested selected proposals for Year 19:

CTSA received 22 preproposals in response to its Request for Preproposals, and the Industry Advisory Council and Technical Committee reviewed and ranked these preproposals. Based on their reviews and in accordance with procedures, CTSA requested eight full proposals from submitters of the following preproposals:

1. Disease management in Pacific aquaculture
2. Seedstock transportation and spawning synchronization in sturgeon
3. Commercial-scale production of all-female lyretail swordtails in Hawaii
4. Culturing the harlequin shrimp, *Hymenocera picta*, for the marine aquarium industry
5. Developing Hawaiian bivalve species for culture to position Hawaii as a supplier of safe, premium, edible shellfish products
6. Pacific Regional Aquaculture Information Service for Education (PRAISE)
7. DNA markers for shrimp/fish growth and disease resistance
8. Bio-process of Pacific island by-products for production of value-added feed ingredients

Proposals are due on Monday, June 27. The proposals will undergo further review in accordance with CTSA procedures.

CTSA to help support AquaNIC

Through its Publications, Information, and Library (PIL) project, which began on June 1, CTSA will contribute a small amount of funds to the Aquaculture Network Information Center. AquaNIC is "the gateway to the world's electronic aquaculture resources" (http://aquanic.org). Its primary source of funding is from the National Oceanic and Atmospheric Administration Sea Grant College program, and its secondary source of funding is from the North Central Regional Aquaculture Center. AquaNIC will use the additional funds to help it maintain and improve existing services, develop new services to effectively deliver information to the aquaculture industry, and support the educational needs of the industry.

CTSA's PIL project also supports the Pacific Regional Aquaculture Information Service for Education (http://lama.kcc.hawaii.edu/praise/). While AquaNIC has a broad, national and international focus, PRAISE specializes in information about or relevant to aquaculture in the CTSA region, and services include journal literature searches and document delivery services. Both PRAISE and AquaNIC are excellent resources.


CENTER FOR TROPICAL AND SUBTROPICAL AQUACULTURE

The Center for Tropical and Subtropical Aquaculture (CTSA) is one of five regional aquaculture centers in the United States established by Congress in 1986 to support research, development, and demonstration and extension education to enhance viable and profitable U.S. aquaculture. Funded by an annual grant from the U.S. Department of Agriculture's Cooperative State Research, Education, and Extension Service (USDA/CSREES), the centers integrate individual and institutional expertise and resources in support of commercial aquaculture development.

CTSA currently assists aquaculture development in the region that includes Hawaii and the U.S.-affiliated Pacific islands (American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Republic of Palau, and the Republic of the Marshall Islands.)

In its 17 years of operation, CTSA has distributed over $9 million to fund more than 177 projects addressing a variety of national aquaculture priorities.

Each year, the Center works closely with industry representatives to identify priorities that reflect the needs of the aquaculture industry. After consultation with appropriate technical experts, CTSA responds with a program of directed research with objectives that focus on these industry priorities. A Board of Directors is responsible for overseeing the programmatic functions of CTSA. Results of CTSA projects are disseminated through its print publications, hands-on training workshops, and Web site.

CTSA is jointly administered by the Oceanic Institute and the University of Hawaii. Its main office is located at the Oceanic Institute's Makapuu Point site on the island of Oahu in Hawaii.

For further information, contact Cheng-Sheng Lee, Ph.D., Executive Director, by telephone (808-259-3107), fax (808-259-8395) or e-mail (cslee@oceanicinstitute.org).

FAST FACT

"U.S. tilapia imports surged to 249 million pounds in 2004, up 25 percent from 2003."

--Economic Research Service, USDA

CENTER FOR TROPICAL AND SUBTROPICAL AQUACULTURE

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