

REGIONAL NOTES

CENTER FOR TROPICAL AND SUBTROPICAL AQUACULTURE

Waianae students – Tomorrow's aquaculturists

Initiated by Na Pua Noeau, the Center for Gifted and Talented Native Hawaiian Children, which is funded by the U.S. Department of Education (DOE) under the Native Hawaiian Education Act, the Oceanic Institute (OI) began holding summer aquaculture workshops for Native Hawaiian children and selected educators from around Hawaii. During the first teachers' workshop in 1990, Susan Lum, a Waianae High School teacher, met workshop leader and OI's Training and Education Coordinator, Gary Karr. Lum was so excited by what she had experienced that she became motivated to find a way for her students to be able to learn what she had, and more.

At around the same time, the State DOE had allocated funds to various high schools around the state to construct learning centers. Waianae High School was commissioned to setup a center dedicated to marine science. After attending the workshop, Lum decided to take the Center a step further than reef walks and an aquarium in the classroom. She envisioned a miniature aquaculture facility in which the students could integrate what they learned in the classroom with hands-on aquaculture techniques and practices. After receiving supplemental funds from the Legislature to drill a saltwater well and to construct tanks, Lum recruited Karr to rally OI's support. OI was quick to jump in and cooperated in the effort by site planning, providing equipment specifications, and exploring various ways to make the facility as versatile as possible while still being consequential.

In 1993, Lum began the Marine Science Seminar for advanced Waianae juniors and seniors to integrate with the learning center. Also incorporated into the yearlong course is a trip for the students

to OI's Keahuolu site on the Big Island in January. There, students participate in a three-day workshop in which they are taught various aquaculture techniques not possible in their center, including water quality sampling, microalgae and *Artemia* culture, reproductive readiness checks, shrimp artificial insemination, and finfish transport and acclimation. Although the Big Island trip has been a part of the program since its inception, the program has evolved to include a weeklong voyaging canoe trip around Oahu and a visit to OI's Makapuu site.

Because aquaculture was part of the ancient Hawaiian culture, a large part of the program now also incorporates cultural awareness. Students learn and practice entrance chants, which they sing to request permission to enter Hawaiian fishponds while on the Big Island and other various sites during their canoe trip. The program has not only fostered an awareness of the Native Hawaiian culture, but a respect for the practices of their ancestors.

Hard work and budgeting are keys to success in an aquaculture business, however it is nothing new for the students. Initially partially funded through various sources, the students have

been paying their own way for their trips since 1995. In addition to selling sweet bread and portugese sausage, and doing car washes, the students have put some of their classroom knowledge to work by culturing and selling ogo, a type of edible seaweed, on the weekends. The ogo has traditionally been their biggest moneymaker. After suffering a setback this year when all of their ogo was stolen, the students thought their trip would be cancelled, but the Waianae responded to the plight of their children. As a display of support



Waianae students practicing fish collection in Kona -- Photo courtesy of the Oceanic Institute

Letter from the director



As mentioned in our previous newsletter, CTSA held its annual IAC meeting on February 21-22, 2001 to prioritize Year 15 funding. The IAC reviewed over 30 concepts that had been submitted to CTSA as suggestions for Year 15 projects. From these concepts and from the status of aquaculture reports given by regional representatives, the group discussed and determined the areas in which research should be conducted. Shortly after the IAC meeting, CTSA disseminated the call for pre-proposals. Once the pre-proposals were received, they were sent to the IAC and TC members for comments. CTSA will call for the full proposals in June.

We have to admit that we had a rough ride through a year of new procedures. However, we all agree the new process addresses the needs of the industry more acutely. To make sure CTSA fully supports the needs of aquaculture development in the region, you have to voice your concerns and comments to us. CTSA values your opinion whether you are or are not one of our IAC or TC members. So please, tell us what you think.

Cheng-Sheng Lee



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AQUACLIPS

Marshalls college aims to counteract reef-ripping

By Giff Johnson, Marianas Variety News and Views – Tuesday, February 20, 2001

Franklyn T. Te, program coordinator of the marine science program, cites numerous examples of lack of knowledge and information that the local college program is attempting to change through its recently launched training and research programs. Three years ago, no marine science program existed in this country [CNMI] that covers about 750,000 square kilometers of ocean area. Now more than 60 students are attending classes in the marine science area. Te sees the college program offering research assistance to aid local businesses that are developing aquaculture and marine export products. And increasing the number of people with awareness about marine resources will pay off in the future, he says.

Kauai shrimp farm to benefit from loan bill

By Ben DiPietro, Pacific Business News – Friday, March 3, 2001

A bill approved this week by the Senate Agriculture Committee would allow a total of \$5 million from the state agriculture and aquaculture revolving special funds to be used for loans to farmers looking to expand their businesses and create new jobs to replace those lost by the closing of the Amfac's Lihue and Kekaha sugar plantations. Controlled Environment Aquaculture Technology, Inc. (Ceatech) is looking to purchase some of the former state-owned sugar lands to expand its shrimp growing operation in Kekaha. "Support for the development of new activities and existing agribusiness enterprises can have a very sustaining effect to the employment and economic perspectives for Kauai," says Ceatech Vice President William Richards.

Deal OK'd to raise fish in high-tech sea cages

Star-Bulletin – Monday, March 12, 2001

The State Board of Land and Natural Resources has authorized a 15-year ocean leasing agreement for commercial production of fish in offshore sea cages. A first of its kind in the state and the nation, the ocean lease agreement approved is for 28 acres about two miles off Ewa Beach. The high-tech sea cages will be stocked with moi, a valuable local species that has great export potential for markets in Japan and the U.S. mainland.

Aquaculture Cooperative gets \$76,777 ANA grant

By Aeo'ainuu Aleki, Samoa News – Monday, April 9, 2001

The Aquaculture Cooperative of American Samoa (ACAS) has received approval of a \$76,777 grant. The money comes from the Administration for Native Americans (ANA), which has a division that gives out money to native Americans for Social and Economic Development Strategies. "For a long time we've wanted to start a nursery to develop stocks for nurturing at the farms around the island," Banner Fanene, one of the pioneer members of ACAS, said. "Now that assistance is here, we look forward to speeding that up for the benefit of the economy."

Aquaculture project launched on Tinian

Marianas Variety News and Views – Thursday, April 26, 2001

As a result of a newly created joint venture between Tinian High School and Northern Marianas College, a new aquaculture project was launched to teach the island's youth how to grow fish, sea food and vegetable products and can make money, while preserving the quality of Tinian's fragile island environment. The original concrete ponds were built with funds provided by the Tinian Legislative Delegation. Unfortunately, the ponds fell into disuse. This year, NMC gave the Tinian High School the authority to refurbish the ponds and use them for educational purposes. Its goal is to promote the development of private enterprise and provide the community with competent high school graduates who are prepared to be productive members of either the public or the private community.



HAA holds 2001 conference

Hawaii Aquaculture Association (HAA) held its 2001 conference on March 2, 2001 at Windward Community College on Oahu. Participants were greeted by Ron Weidenbach, President of HAA. The day consisted of four sessions of lectures given by various researchers, farmers, and other industry representatives from around Hawaii.

The first session "Back to Basics" began with Jeff Koch owner of Mokuleia aquafarm, discussing the important issues to assess prior to starting an aquafarm. Joe Tabrah, Technology Transfer Manager for the Oceanic Institute (OI), spoke on basic management skills gleaned from his 25 years in aquaculture. His suggestions ranged from planning carefully to "cultivating a corporate culture that encourages honesty among your employees." Bruce Smith concluded the session with his lessons on the value of tenacity.

The Ornamentals sessions started with Charles Laidley, reproductive physiologist in the Finfish Department at OI, discussing the advances made by OI researchers on marine ornamentals.



Michael Haring of OI, Jim Szyper of Sea Grant, and Howard Takata of Hawaii Sturgeon and Caviar Company chat over food and drink at the HAA meeting.

Achievements include daily spawning of flame angelfish (*Centropyge loriculus*) continuously for 15 months, nearly continuous spawning of Potter's angelfish (*Centropyge potteri*) for eight months of the year, and multiple infertile spawns of wild-collected and captive yellow tang.

Clyde Tamaru, Sea Grant Extension Agent, spoke on the current status of the freshwater ornamental industry and its future. Expectations are that hatchery production will be focused on egg layers. Recent trials have shown conclusively that *Corydoras aeneus* fed three maturation diets spawn consistently more eggs per spawn when fed a diet consisting of heart/seafood.

Quality was stressed by marketing specialist for Aquatic Inno-

ventions, David Cohen, to establish mainland buyers.

As in past years, participants were treated to a gourmet box lunch packed by Sam Choy's Diamond Head. Featured guest speaker, Dr. John Craven of Common Heritage Corporation, entertained participants with his humorous lessons and theories on thermodynamics.

After lunch, Session #3 "Food Production & More," began with Kevin Hopkins of UH Hilo speaking on the status of aquaculture on the Big Island. One major development is the establishment of the Pacific Aquaculture & Coastal Resources Center in Hilo. Its focus is on sustainable coastal development. The site also provides facilities for teaching and research.

Dee Montgomery-Brock of the Aquaculture Development Program, discussed disease remediation and the progress made on *amyloodinium* infestation in Pacific threadfin (*Polydactylus sexfilis*) by using a low-light treatment. She also reassured everyone that a replacement for Jim Brock, highly respected State veterinarian, is being sought since his acceptance of a position in the private sector.

The last session of the day focused on the future of aquaculture and its current direction. Department of Agriculture representative, Domingo Cravalho, is not a new name to anyone that has gone through the permitting process. During his update on species importation, Domingo informed participants of a listing of legal species on the Department of Agriculture's website: www.hawaiiag.org. Anything not listed on the website is prohibited.

Tony Ostrowski, head of OI's Finfish Program, gave an overview of the recently implemented ocean cage for Pacific threadfin culture. The permit process, although arduous, has been defined. Future work will focus on increasing fish survival, increasing harvest density, and lowering the feed conversion rate to remain competitive in production, reduce the impact to the environment, and ensure quality seafood products.

The final speaker of the day Albert Tacon, head of the Feeds Program at OI, gave a socioeconomic profile of aquaculture comparing the eastern style with the western style. Because their intentions are divergent, different species are emphasized. The main goal of eastern aquaculture tends to be subsistence, whereas westerners look for profit, therefore the species cultured serve those purposes. Additionally, Eastern aquaculturists employ large open-systems and therefore do not have to stress survival because of the sheer volumes they culture. Westerners, however, must be more technologically based and efficient to achieve higher rates with less space because they are limited by land costs.

With the completion of the lectures began the overwhelmingly favored part of the conference, the reception featuring farm-raised products prepared by Oahu's top chefs, Participants wine, dined, socialized, and the conference was deemed a success.

Thoughts on advancing the ornamental industry in Hawaii

At our February 2001 IAC meeting, we were joined by ornamental hobbyist and discus distributor, Ray Kosaka. Kosaka discussed his thoughts regarding the fledgling ornamental industry in Hawaii and ways to elevate its future by dispelling common beliefs and proposing unlikely partnerships.

Aquaculture has been gaining increasingly more acceptance nationally as well as locally. Hawaii's ornamental industry, although growing, is not yet the booming business farmers had hoped it would become. Producers face several problems, some of which are based on misinformation and others based on Hawaii's relative newness to the industry. The belief that Southeast Asia is Hawaii's main competitor stifles the progress of local farmers discouraged by the obvious inequities in the losing battle. Additionally, with the help of its government, Hawaii needs to forge a symbiotic relationship with business leaders from Florida, a state beyond Hawaii in terms of production and marketing.

Southeast Asia (comprised of Thailand, Viet Nam, Malaysia, Indonesia, Philippines, and Singapore) is widely considered as Hawaii's chief competitor in the production of ornamental tropical fish. However, Kosaka believes differently. Southeast Asia has several significant advantages over Hawaii:

- They have a true tropical climate.
- The land is extremely inexpensive, especially when compared to the high real estate prices of Hawaii.
- Their construction costs are very low.
- Their labor costs are also much lower and employees receive no benefits (i.e. no sick leave, no vacation, no disability insurance, etc.).
- Their energy costs are much lower because of their use of natural sunlight and their lack of need for heating water, mechanical filtration, purification, etc.
- There is an abundance of cheap, live fish foods such as daphnia, blood and tubiflex worms, mosquito larvae, white worms, shellfish, shrimp eggs, etc.
- An abundance of fresh water allows farmers to afford 100-200% or more water exchange daily. In some farms, there is a constant water flow. This eliminates the need for water filtration and the fear of ammonia or nitrate buildup.
- Farmers are able to use color enhancers and hormones or steroids to achieve fast growth and artificial color intensity for higher market prices.
- Their products are far superior and cheaper than ours.
- In some countries in Southeast Asia, farmers do not pay any taxes.

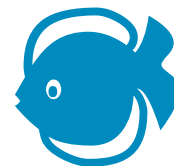
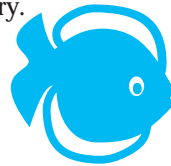
Accordingly, it is simple. Southeast Asia is *not* a competitor of Hawaii's because to be a competitor one must compete. Hawaii cannot compete and for farmers to continue believing they are fosters a false and unneeded sense of failure. However, by looking elsewhere we are able to see an ornamental industry thriving under the same limitations we face – in Florida.

Florida copes with the same land acquisition costs that we do. They pay taxes, startup fees, employee benefits, and high utility charges. However, Florida has a state government that recognizes the industry's \$100 million contribution and consequently is very supportive. The size of their industry also gives them credibility with the federal government, Congress, South American and African fish collectors, and suppliers and manufacturers. They have negotiated and established delivery routes by air and land covering the entire East Coast to the Midwest. They have an established fish farmers' association that benefits them for volume purchases, fish shows, and state and federal lobbying.

Nevertheless, Hawaii also has its advantages. Although often called "sunny," in the winter Florida's farmers would be ecstatic to have Hawaii's year-round mild climate. Their water is not ideal for all species of ornamentals like Hawaii's pure artesian water. There is an abundance of available land on the Northwest plains of Oahu. Many former plantations workers used to working outdoors are eager to study and try new farming techniques. There are many planes flying eastward from Hawaii with half empty or empty cargo spaces, seeking new industries and products to transport. From an informal survey Kosaka conducted, it appears that it is less costly to ship ornamental fish from Hawaii to the West Coast than from Florida. What Hawaii lacks is the marketing and production know-how of the Florida farmers. With their expertise, Hawaii's farmers could become the ornamentals purveyors of the West.

Kosaka believes that for Hawaii's industry to advance in a timely manner, the best solution is to merge the industries of the two states by enticing several established fish farms to our island paradise. Working with Hawaii owners of currently uncultivated land to construct aquaculture parks with low startup leases and water rates, and asking the State of Hawaii to offer tax breaks and streamlined zoning and construction approvals could accomplish this. Florida businessmen would benefit because it gives them a chance to expand their market west and allows them to have full production year-round. Hawaii's ornamental industry would benefit not only from conveyance of knowledge, but also by the increase in its size with lowered cargo rates, recognition by the State as a full-fledged industry, increased support by the State, and a diversification of cultured species produced in Hawaii. In addition, Hawaii as a state would benefit from the residual effects of a strong industry.

From the demolition of the Southeast Asian competitor propaganda to the partnership of Hawaii and Florida, Ray Kosaka has shared his views with many in the hopes that the right person would come along and lead Hawaii to a stronger and more profitable industry.



Linda Gusman gives CNMI aquaculture tips

Introduced to the nation in 1995, aquaculture is a relatively new concept to the farmers of the Commonwealth of the Northern Marianas Islands (CNMI). Although an optimal place for aquaculture, the industry in the CNMI is still considered to be largely unexploited. Increasing interest and participation is however noticeable, with three commercial farms and thirteen backyard farms online in September 2000. Yet, because of its tremendous potential, CTSA sponsored Linda Gusman of Oahu's Island Aquaculture on a trip to the CNMI to provide technical assistance to existing and prospective farmers, in the hopes of fostering further growth and development of the industry. Because of its hardiness and its mild taste, the culture of tilapia was to be the focus of Gusman's efforts.

As a technical consultant for the Waianae Coast Development Corporation (WCCADC), Gusman helped design and implement WCCADC's successful Backyard Aquaculture Project on Oahu. WCCADC owns and runs a tilapia hatchery, which provides fingerlings to approximately 30 families in Waianae. Each family has at least one tank in their backyard in which they raise the tilapia to market size and then take the fish to WCCADC for them to sell. The family is allowed to keep up to 25% of the fish for their own use and keeps 75% of the profits; the other 25% covers the agency's costs of maintenance, marketing, administration, etc.

The Waianae project provides a basis for the CNMI to assess their needs and their capabilities in considering a similar community-based project. While in the CNMI, Gusman led two one-day workshops – one each on Saipan and Rota. A mixture of people



Aquaculture extension agent, Tony Benavente with three workshop participants at the Northern Marianas College demonstration facility --Photo courtesy Linda Gusman

attended the workshops, including hatchery workers, existing farmer, startup farmers, and some college employees. The workshop was a combination of lecture and demonstration. Gusman gave technical information on tilapia and introduced the concept of the community project. On a more technical side, she also discussed the logistics of tanks, selecting filters, and assessing resources. Gusman felt that she was well received and anticipates returning soon to conduct another workshop on constructing tanks and tank management for tilapia

West visits East

Taiwan, the hub of aquaculture today, was described by a participant in the CTSA-sponsored trip to Taiwan as "diverse, massive, and inspiring . . . a picture of a very mature flexible industry."

Although they may have heard so before, the six aquaculture representatives from the region that CTSA sponsored to visit Taiwan now know it firsthand.

For four days, Rick Spencer of Hawaiian Marine Enterprises, Neil Sims of Black Pearl, Inc., Tom Iwai of Anuenue Fisheries Research Center, Robin Shields of The Oceanic Institute,

Yimnang Golbuu of Palau Community College, and Ron Weidenbach of Hawaii Fish Company joined Cheng-Sheng Lee, Director of CTSA, for an intensive tour of Kaohsiung's finest aquaculture facilities. The participants, some of CTSA's IAC and TC members, were responsible for their own flights and CTSA paid for most in-country expenses. The purpose of the trip was to facilitate discussion between aquaculture representatives from the CTSA region and Taiwan.

The participants visited farms to view fingerling production and growout techniques of grouper, seabream, seabass, milkfish, shrimp, and abalone. The men were amazed at the integration between the industry and the government and the willingness of the people to exchange information and ideas among themselves and to strangers. Neil Sims commented, "They are perhaps 5-10 years ahead of the rest of the world in hatchery and growout technology and yet, remarkably, the farmers, researchers, and technicians that we met were very willing to share with us and answer our questions." The success of their trip would not have been possible without the assistance from Dr. I.C. Liao, Director General and Dr. M. S. Su, Deputy Director General of Taiwan Fisheries Research In-



CTSA participants and Taiwan scientists at Tung Kang Marine Laboratory.

Continued on page 6

Waianae cont'd from page 1

for the children and the program, the community was able to gather enough money for the students to go to the Big Island.

Students also learn the value of business skills and knowledge through the Aquaculture Business Game. The students are forced to budget their money to run a mock business. Although all the students find the game challenging, they find it equally rewarding. A participating teacher from the last workshop commented, "Even though it takes a lot of time and is quite difficult, it is an eye-opener for students into the complexities of running an aquaculture business."

In a society where children generally dread school, their willingness and enthusiasm to learn is astounding. According to Dana Hoppe, the current teacher of the Marine Science Seminar, "This

workshop has become the highlight of the school year for our students and they work extremely hard to keep their grades up and fundraise so that they are able to attend." Karr believes that this is a valuable venue for giving the students another option for post-graduation and he seems to be right. In response to the question of how this workshop might affect them in the future, Senior Rachel Allen commented, "It opened my eyes to see that marine life might be a future thing for me!"

The students develop a sense of cultural awareness, self-worth, and camaraderie, while learning the value of knowledge and teamwork – a notable accomplishment for the teachers at Waianae High School and the education team at the Oceanic Institute.

Taiwan cont'd from page 5

stitute, and Dr. T.-I. Chen, Director of Tungkang Marine Laboratory, and Dr. H. M. Su, a researcher at Tungkang Marine Laboratory. Dr. H. M. Su was extremely helpful and hospitable, and accompanied them on their visits and gave them a tour of the research facility.

After each long day of visits and discussion, the participants dined at restaurants around Kaohsiung, where they enjoyed exotic dinners of mola (a marine sunfish), devil ray, manta shrimp,

scorpionfish, and bluefin tuna. Most of the seafood swam in tanks around them before being taken into the kitchen and cooked into a delectable dish.

The experience was both educational and enjoyable and participants gained valuable information to take back to their respective industries.

More information on Taiwan's aquaculture industry will be presented in the next issue of the Regional Notes.

Marine Ornamentals project achieves noteworthy success

Wild-caught marine fish in Hawaii supply a large portion of the international marine ornamentals market. Only 30 of the 800 species currently traded in the industry are cultured in captivity. Hawaii's \$800,000-\$900,000 annual contribution to wild-collected marine animals has been advancing the rapid depletion of marine ornamental populations in Hawaii. To curb the decimation, the Oceanic Institute (OI) has initiated research in hopes of being able to culture flame angelfish (*Centropyge loriculus*) and yellow tang (*Zebrasoma flavescens*) to relieve pressure from the natural stocks and supply the industry's demands. If the effort proceeds as anticipated, the captive populations may also be used to enhance the local stock.

The research being conducted is part of CTSA's *Aquaculture of Marine Ornamentals* project, in which scientists in OI's Finfish Program have been working to establish broodstock populations of yellow tang and flame angelfish. At the end of the first year of the project, broodstock populations have been successfully developed and fertile spawns have been achieved for both flame angelfish and yellow tang.

The research done by OI on the flame angelfish has provided the successful captive spawning for the species. Natural

spawns were obtained within one month of broodstock establishment, which occurred in October 1999. The angelfish have continued to spawn daily, without interruption, for a period over 17 months. The fish routinely spawn once per day around dusk with the spawning output having increased substantially since the first spawn. Initial spawns were only of several hundred eggs with fertility rates below 50%. As of April, spawns were reaching over 3,000 eggs per tank with mean monthly fertility rates above 70%. Experiments on the effect of tank size on fecundity were initiated in April and are currently ongoing.

Research on the yellow tang has also had exciting recent success. Throughout February and March, broodstock populations produced numerous natural spawns just before dusk. All of the spawns were infertile. However, in March, a series of developments led to the captive production of the first fertile eggs ever recorded for the yellow tang. The eggs are tiny (approximately 708 μm) with a small (163 μm) yellow-pigmented liquid droplet. Embryonic development has been slower than for the flame angelfish, with hatching between 24 and 36 hours post-fertilization.

Results were obtained from *Aquaculture of Marine Ornamentals* May progress report submitted to CTSA.



Trip to Yap and Palau shows aquaculture has become a priority

On a joint expedition with the Pacific Business Center (PBC), Dr. Cheng-Sheng Lee, Director of CTSA, joined PBC's C.L. Cheshire on a trip to Yap and Palau in an effort to help foster economic development in the Pacific Islands through aquaculture.

Because of a rising awareness of the value aquaculture can have for island nations, the government of Yap expressed an increased interest in pursuing aquaculture endeavors. Mr. Cheshire and Dr. Lee met with the Governor of Yap, Honorable Vincent Figir, Lieutenant Governor, Andrew Yaltiman and his staff, Vice Speaker, James Mangefel, and several representatives of the Fifth Legislature of Yap State, as well as various business people from around the State, including Tony Ganggihyan, Chairman of the Yap Cooperative Association (YCA).

YCA was started by a group of people that pooled their money together to foster business ventures. They currently boast over 1100 members with gross sales over



Palau Community College's Ngermeskang Station

\$5 million. The cooperative has 100 employees, and if one of their employees becomes motivated to start their own business after working for YCA, the group gives the hopeful entrepreneur a startup loan. A video rental store was just opened with the help of YCA.

After learning the possibilities available through aquaculture, Mr. Ganggihyan reflected that YCA might be the venue for prospective farmers to get online. A future partnership between YCA and CTSA members is possible for CTSA to fund technology transfer to the aspiring farmers. For more information on YCA or to contact Mr. Tony Ganggihyan, please call (691) 350-2400/1.

Prior to his visit, Dr. Lee traveled to Palau and met with Anita Suta, Vice President of Palau Community College (PCC). During his trip he visited the Palau Mariculture Demonstration Center, the Palau International Coral Reef Center, and of particular interest was the new Ngermeskang Station of the Cooperative Research and Extension Department of PCC. The Station is an integrated agriculture facility leased by PCC from the Ngeremlengui State Government and is designed to focus on the agricultural issues Palau and the Micronesian region face.

According to Dr. Lee, the facilities appear ready to conduct world-class research, demonstration, and extension work. An area for a freshwater prawn pond is currently being cleared. The effluent discharge from the pond will be routed to irrigate vegetable crops. Overall, Dr. Lee was impressed with the progress made at the Station and the future it opens up for the people and industry of Palau.



Cheng-Sheng Lee and C. L. Cheshire met with the Governor of Yap and his staff.

Second International Conference on Marine Ornamentals

Collection, Culture and Conservation - November 26-December 1, 2001

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This conference is designed to contribute to the worldwide goal of creating an economically and environmentally viable future for the dynamic marine ornamentals industry and its diverse clientele.

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, 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 thirteen years of operation, CTSA has distributed \$7 million to fund more than 130 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 priori-

ties. 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 and is located at The Oceanic Institute's Makapu'u Point site on the island of Oahu in Hawaii.

For further information on the CTSA program, contact

Cheng-Sheng Lee, Ph.D., Director, by phone (808-259-3107), fax (808-259-8395) or by email at cslee@oceanicinstitute.org.

FAST FACT

About 70 percent of the world's coral reefs -- and 94 percent of all coral reefs under U.S. jurisdiction -- are located in the Pacific.

--Hawaii Tribune Herald



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