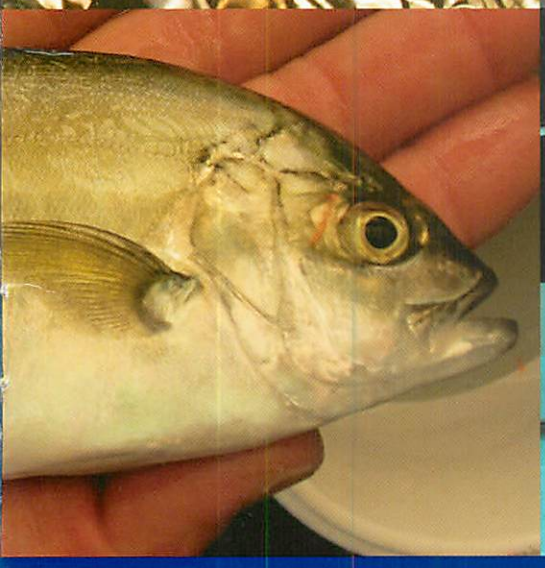
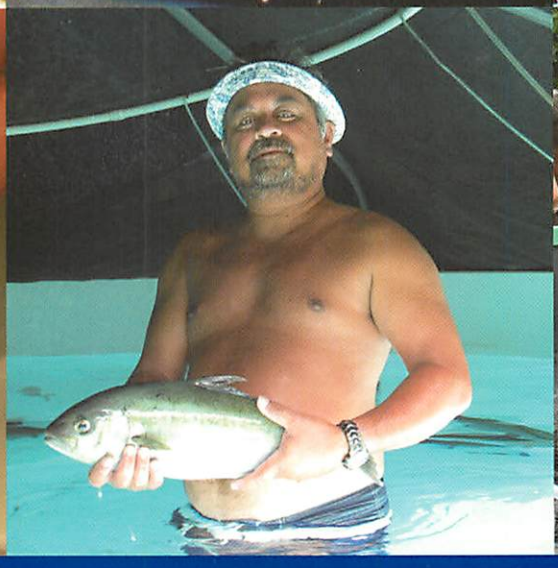
Oceanic Institute

An affiliate of Hawai'i Pacific University

Cultivating Community Partnerships: From Ancient Fishponds to the Open Ocean




Annual Report 2006

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Gayle Miyashiro
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USMSFP
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Susan Sparaga

Behind the Scenes at OI

Support staff at OI who comprise our Accounting, Administration, Information Technology and Maintenance departments are to be credited for providing their all-important services.

Because of OI's not-for-profit status, it's important that the checks and balances provided by our accounting and administration departments assure that we are always in compliance when it comes to federal and state regulations. Our Information Technology department maintains our virtual links to each other and to the rest of the world. And none of our programs would be able to complete their missions if it weren't for the assistance of our maintenance department, which provides everything from carpentry, electrical, plumbing and grounds-keeping services.

Sharing OI's Stories

As Oceanic Institute's role in Hawai'i's and the global aquaculture community grows, we seek to assure that information about our programs is available on a variety of levels. The OI website provides access to our people, information about our activities, as well as employment opportunities. Our Communications Department invites media coverage from television, print and Internet outlets. Oceanic Institute also contributes op-ed pieces regarding maritime and aquaculture issues when appropriate. AquaBytes, our new quarterly newsletter that debuted in April 2006, has become a popular resource to industry partners, federal and state offices, and to those interested in pursuing marine and aquaculture careers. Its stories focus on individuals at OI, new and exciting programs, community partnerships and issues of concern and interest. Exciting stories occur at OI. Sharing our news gives the community confidence in our work.

Cultivating Community Partnerships: From Ancient Fishponds to the Open Ocean

The Oceanic Institute's educational partnership with Hawai'i Pacific University is founded on a dedication to incorporating old methods with new technologies designed to preserve the world's fish stocks.

At just about any time, a visitor to the Oceanic Institute can find nets of various shapes and sizes draped along walls, drying in the sun, waiting for the next toss. It's a simple reminder that OI's technological advances in aquaculture are rooted in old fishing traditions. Some researchers are working on isolating disease-resistant genetics for shrimp. At the same time, others are busy tagging finfish for a studied release. There is no getting away from the fact that our research is built on centuries of aquaculture knowledge from right here in Hawai'i.

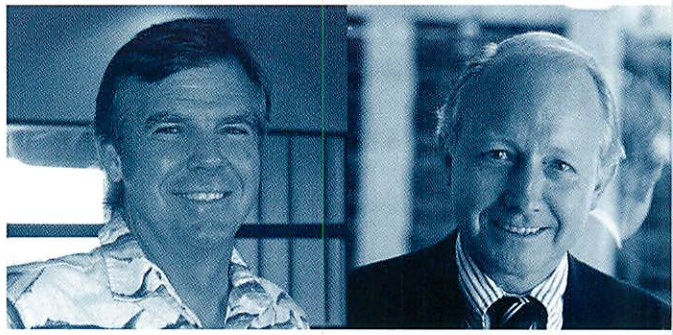
OI's focus on this type of scientific research and our location close to the ocean in Waimanalo make it a perfect fit as the setting for HPU's planned graduate studies program in Marine Sciences. But even before we have HPU graduate students at our facility, internships at OI give students who are interested in aquaculture and marine sciences an opportunity to experience working in our programs. Cultivating this interest should certainly yield tomorrow's researchers.

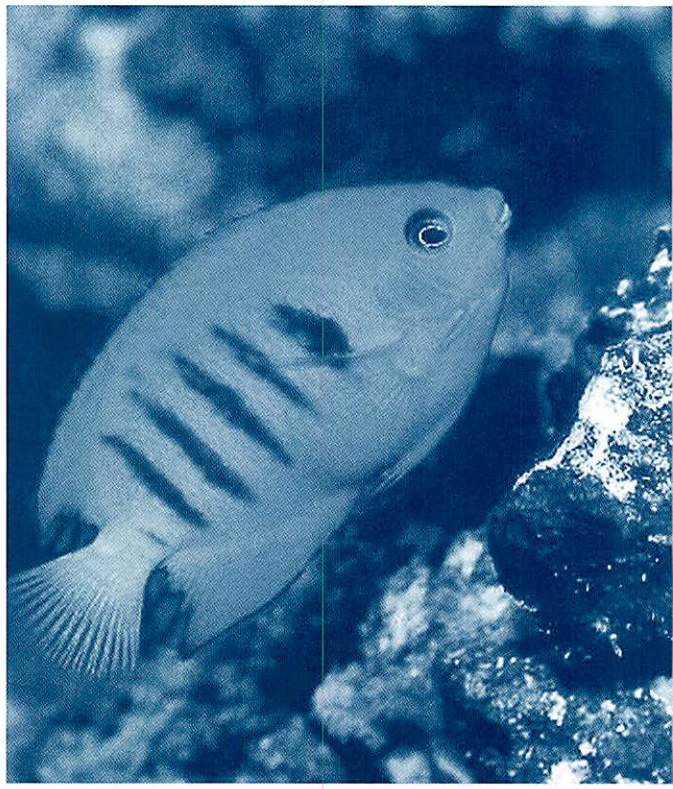
Naturally, we work hard at cultivating an interest in OI among our industry partners as well. OI has been successful in harnessing federal and state funding that will allow us to define the most efficient, cleanest, and productive ways to put aquaculture to use. One important reason for this success is the simple fact that our programs are staffed with knowledgeable and interested people. This funding, and support from HPU, make it possible for OI to pursue a wide variety of projects assisting the aquafarm community: Paepae O He'eia as it seeks to refurbish its ancient fishpond and replenish it with moi fingerlings hatched at OI; Kona Blue Water Farms as they become a world leader in hamachi production; and the U.S. Marine Shrimp Farming Program as we continue to develop disease-resistant Pacific White Shrimp for aquafarm production.

OI's goal is to replenish the world's oceans and show the world how to safely farm fish and shrimp for an ever-growing world population. From its earliest days, aquaculture has been a practice of low environmental impact. With the right approaches, those of us at the Oceanic Institute and Hawai'i Pacific University think that can still be the case.

Bruce S. Anderson, Ph.D.
President, Oceanic Institute

Chatt G. Wright
Chairman, Oceanic Institute
President, Hawai'i Pacific University





Database Chronicles Shrimp Development

OI's Shrimp Department has developed a computerized pedigree database which serves as a valuable tool for managing its shrimp breeding program. The database incorporates shrimp pedigree and performance data from 1989-2006 and provides the department with access to more than 130,000 individual shrimp records. This database serves as an invaluable tool to generate information about shrimp genetics, including heritability estimates and estimates of phenotypic and genetic correlations.

"This database also provides us with a valuable tool to manage the breeding program more effectively, and may represent the largest collection of integrated shrimp pedigree and performance data in the world," said Shaun Moss, Ph.D., Director of OI's Shrimp Department. "It will assist us as we continue to generate important information about shrimp genetics."

Much of the department's work is conducted within OI's Nucleus Breeding Center. During 2006, the Shrimp Department continued production of four different shrimp lines in the NBC.

"We successfully matured and spawned broodstock shrimp in our NBC maturation module, raised nauplii in the hatchery, reared postlarvae to juvenile stage in the nursery, and grew the shrimp to broodstock size in the NBC raceways," Dr. Moss said. "The importance of this facility is that it protects OI's valuable shrimp genetic resources from diseases while simultaneously protecting Hawai'i's environment by reducing effluent discharge and mitigating the risk of escapement of non-indigenous species."

The Shrimp Department is also in its eighth year of raising "Kona" shrimp at OI's satellite facility on the Big Island. For the fifth consecutive year, this facility has produced and distributed more than 570,000 "Kona" postlarvae to U.S. shrimp researchers and producers.

"These shrimp represent the 'white mice' for shrimp disease research because of their predictable response in disease-challenge tests," Dr. Moss said. "The use of 'Kona' shrimp as a standard reference strain for disease-related research has been critical in the development of disease-resistant shrimp and disease diagnostic tools."

Similarly, OI's Shrimp Department is collaborating efforts with Consortium partner University of Arizona, where a new Specific-Pathogen-Free (SPF) line of shrimp from Mexico is being developed. If these shrimp successfully complete the rigorous quarantine and disease-screening protocols, their genes will be incorporated into OI's breeding program, minimizing the accumulation of inbreeding and possibly contributing novel genes to improve farm performance.

Also, the Shrimp Department met most of its research milestones for the 5-year National Institute of Standards and Technology Advanced Technology Program (NIST-ATP). During Year 5 of this program, the department produced 220 genetically distinct families of shrimp, which serve as a valuable resource for ATP. This study was also used to determine how juvenile shrimp performed when stocked in raceways at high densities and minimal water exchange. The use of these biosecure raceways mitigate the risk of disease outbreaks in the shrimp culture environment while simultaneously reducing nutrient and biological pollution of surrounding coastal waters.

Better Fish Through Sensible Nutrition

Simply put, Oceanic Institute's Aquatic Feeds and Nutrition Department works at determining the best way to please the distinguishing palette of a research animal.

Such information helps the department develop feed formulas and feed process technology for the aquaculture industry. Work includes the use of island byproducts from tropical crops such as spent fruit-fly media, papaya and macadamia, as well as Alaskan byproducts from the fishing industry such as fish oils and fish meals. Its goal is to create economically viable feeds that appeal to aquacultured species and result in marketable products that are nutritional, healthy and delicious for consumers.

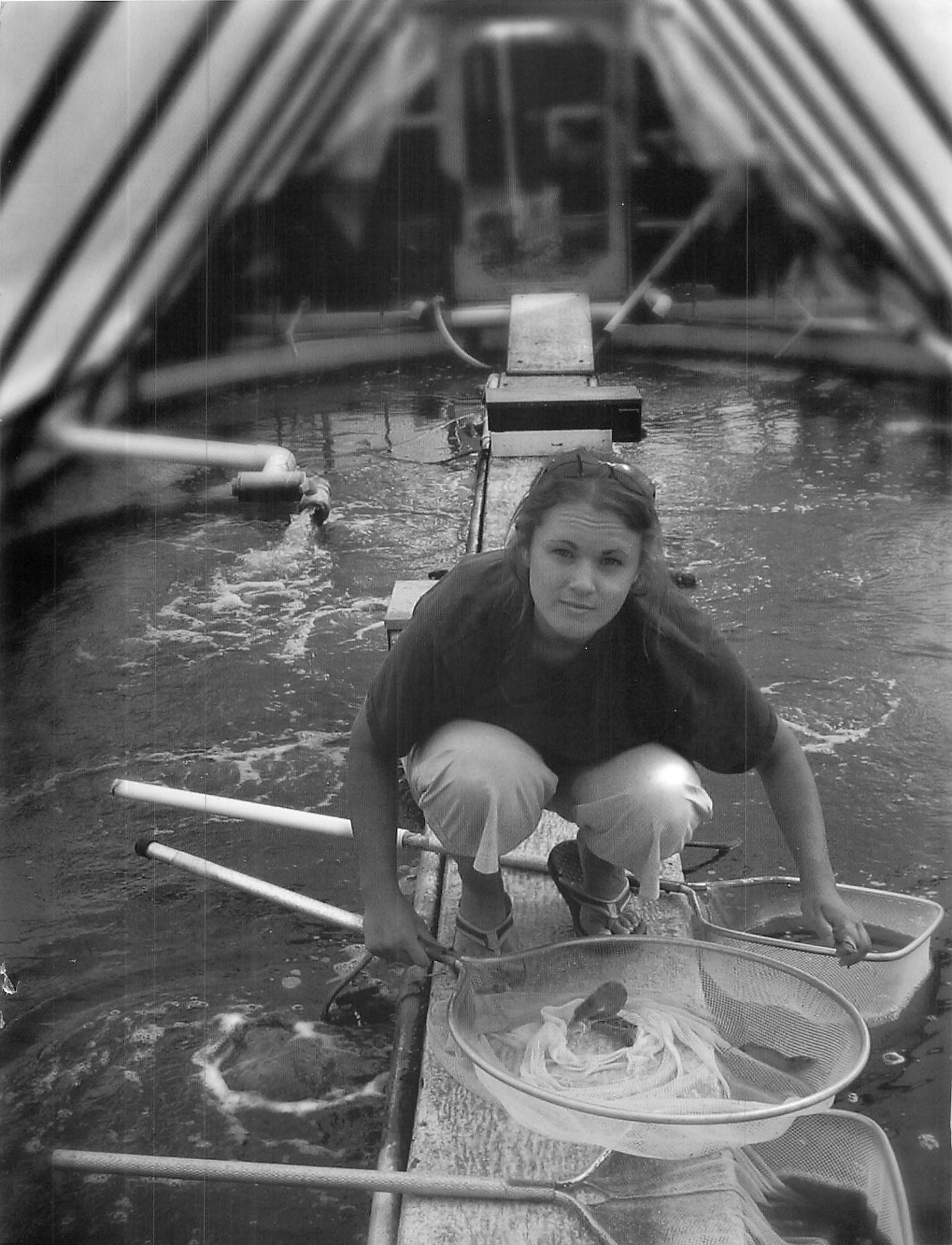
Through this department, OI has formed various partnerships with federal agencies and private industry to bring feeds processing research to a higher level. According to Acting Director Warren Dominy, Ph.D., collaborative efforts such as those with the USDA Agricultural Research Service, the University of Alaska Fairbanks, and the University of Idaho, focus on underutilized seafood processing byproducts. The results are expected to yield cost-savings for aquaculture farmers.

Toward this end, the Aquatic Feeds and Nutrition staff takes into consideration the nutrient requirements of species studied at OI: Pacific White Shrimp, Pacific Threadfin or moi, Amberjack or kahala, and marine tropical fishes. Working with practical ingredients, department members determine the optimal processing methods for increased animal performance, water stability, increased digestibility, lower feed conversion ratio and lower production costs.

To determine if OI's feeds research is on the mark, a product innovation laboratory has been established where trained taste testers sample shrimp and fish raised on certain feed formulas. The taste testers determine if the end product features desirable flavor, appearance and texture characteristics.

Finally, the food fish is analyzed for nutritional content. Is there more or less fat? Is there more or less protein? Do existing benefits in this species, such as omega-3 fatty acids and vitamins, still occur at levels exhibited in control animals?

From beginning to end, the Aquatic Feeds and Nutrition Department coordinates its efforts with OI's programs and with partners within the agriculture sector to produce the best possible feeds at the best possible prices.



Fisheries and Environmental Sciences: Wild about 'Omilu

Under the leadership of David Ziemann, Ph.D., the Hawai'i Stock Management Program at OI conducts research to evaluate the ecological, habitat, animal behavior, genetic, health, and cost benefit aspects of restoration and management of depleted fisheries. Understanding these factors is crucial to the responsible application of new technologies for stock enhancement as well as science-based coastal fisheries management efforts. These investigations are providing valuable information on the dynamics of fisheries as well as the principles for restoring them.

Of particular interest is the Bluefin trevally (*Caranx melampygus*, known in Hawai'i as 'omilu), a member of the Carangid family found throughout the Hawaiian Islands. 'Omilu are the most common of the larger jacks in Hawai'i. It is primarily caught as a recreational fish via shore casting and fishing from boats. Despite its popularity as a food and game fish throughout its range, and the wealth of evidence that stocks are not what they once were, comparatively little is known about the biology and ecology—such as life history parameters, and age, growth, mortality, level of predation and recruitment details—of many species of jacks.

Our research is focused on eight major areas. Tagging involves coded wire, visible implant elastomer, chemical and thermal indicators. Another area is release optimization, such as size, site and season of release. This helps clarify fisheries demographics and ecology including juvenile recruitment patterns, structure of the recreational fishery, diet and feeding, age and growth, sex and maturity, habitat utilization, and essential fish habitat and marine protected areas. Also observed are the areas of behavior and conditioning; health management; genetics management involving the structure of wild and hatchery populations; transgenerational genetic markers; effective population size; economic analyses; and ecosystem interactions.

Bluefin trevally broodstock are being held at OI in a temperature and photoperiod controlled system. This decade-old population of wild-caught broodstock provides periodic high quality spawns, and one such spawn was cultured in the OI research hatchery utilizing a very small copepod as its first live food. Approximately 3,500 'omilu fingerlings were produced. Some were used in a tagging and tag retention study examining placement and retention of coded-wire tags and visible implant elastomer tags, and in a chemical marking experiment using calcein. The majority of the fingerlings were used in a preliminary release experiment examining the effects of size at release and pre-release acclimation on post-release survival.

Planned releases were set for September 2006 at the Kaneohe Yacht Club. In our next annual report, we hope to report on feedback from fishermen who catch these 'omilu, providing OI with valuable data regarding survival of different release sizes and release acclimation.

USMSFP Redefining World Shrimp Markets

Distinguishing domestically grown Pacific White Shrimp, *L. vannamei*, has become the basis for research that is conducted by the U.S. Marine Shrimp Farming Program, of which the Oceanic Institute is a founding member. In its 22nd year, the USMSFP is the longest running and most highly acclaimed aquaculture program in the United States.

It is sponsored by the USDA/CSREES, and counts among its goals to develop a strong marine-farmed shrimp market in the United States, reduce the country's dependency on imported shrimp, and the further development of its specific-pathogen-free (SPF) selective breeding program for Pacific White Shrimp.

"The USMSFP is leading the way in high-density, biosecure, super-intensive raceway technology," said Canthony Ostrowski, Ph.D., Consortium Program Director. "Currently, about 50 percent of the 2.2 billion pounds of world farmed production is Pacific White Shrimp. The U.S. marine shrimp broodstock industry supplies most of the SPF genetic material for that production. And nearly all of that genetic material can be traced back to USMSFP stocks and research efforts."

Joining OI as partners within the USMSFP include the University of Southern Mississippi's Gulf Coast Research Laboratory, the University of Arizona's Department of Veterinary Science, Texas A&M University's Agricultural Experiment Station, the South Carolina Department of Natural Resources' Waddell Mariculture Center, Tufts Cummings School of Veterinary Medicine, Tufts University, Massachusetts, and Nichols State University, Louisiana. Consortium scientists provide opinion and guidance regarding domestic and international policies as members of the Joint USDA/NMFS/USFWS Subcommittee on Aquaculture, National Aquatic Animal Health Task Force, and the Office of International des Epizooties, Paris.

Although the USMSFP exists for the benefit of domestic marine shrimp farming and research, it's important that the Consortium maintain a global perspective when it comes to this valuable, yet vulnerable, industry.

"It's important that the Consortium continue in its efforts at developing advanced diagnostic methods for all major shrimp diseases, researching low-salinity marine shrimp farming, and fostering inland, environmentally responsible production methods," Ostrowski said. "This is important for our own shrimp farmers. But we also know the world is watching."


NBC

Paepae O He'eia: A Blueprint For Success

In the quiet of the morning at Paepae O He'eia, the wind is still and the fishpond is glassy. This sheltered haven is surrounded by a basalt and coral wall, or kuapā, and harbors both the secrets of ancient Hawaiians and the dreams of a new generation. Recognizing their ambitions, the Office of Hawaiian Affairs, the National Oceanic and Atmospheric Administration, and the National Marine Fisheries have funded a project for Oceanic Institute to provide Paepae O He'eia with moi fingerlings, on-site assistance, and training in the rearing, mating and spawning of moi, or Pacific Threadfin.

The fishpond has become a gathering place for both school children and adults who work hard maintaining the rock walls, removing invasive mangrove, tending to crops such as limu and taro, and with the raising of moi. Technological breakthroughs have made it possible for OI to provide the he'eia with fingerlings raised from tank-reared hatchlings. As these fish are released into this ancient, yet accommodating environment, they become one with those fish raised in this very pond hundreds of years ago. Today's science gives these fish, and these Native Hawaiians, a chance at success.

Finfish: Strengthening Stocks, Building Partnerships

Charles Laidley, Ph.D., is the Director of the Finfish Department, which focuses on generating new information, technologies and products to assist both fishery management and marine finfish aquaculture development in the United States. This department coordinates its efforts to develop core technologies in broodstock, live feeds, larviculture and grow-out systems for warm-water marine fish species. Its goal is to assure that each species has all the advantages necessary to spawn, hatch, survive the critical nursery stage, and to mature into fingerlings for release or for maturation to begin a new cycle. The Finfish Department is uniquely positioned as Hawai'i is home to more than 85 percent of all coral reefs in the United States, and supports the diverse species base required for a comparative, multi-species approach.

One of OI's primary links to the community, the Finfish Department is participating with several stakeholders within the aquaculture industry on several noteworthy programs. Among them, the department is coordinating efforts with Kona Blue Water Farms to build up hamachi stocks for off-shore growout. It's working with the University of Hawai'i on a NOAA-funded program to study off-shore aquaculture with Cates International and Kona Blue. And it is providing support for the revitalization of the Paepae O He'eia fishpond on Kaneohe Bay (see story above).

Algae, Copepods & Rotifers

Caldrons of green soup gurgle outside the Finfish Department, brews that are essentially the building block of OI's finfish projects. The algae are cultured and grown as feed for the next level of life reared at OI, copepods and rotifers. These tiny crustaceans have become the first meal of choice in the finfish hatchery. This living feed has gotten various species such as flame angelfish, moi and 'omilu beyond the critical early days of life and is the reason OI's finfish productions have increased.

Flame Angelfish

Flame angelfish broodstock populations have now been expanded and daily egg production and egg viability continue to steadily improve since the Finfish Department has switched to sterilized ocean water. Thanks to the completion of OI's new copepod production laboratory, rapid advances in the captive breeding and rearing of ornamental reef fish species are improving. Eggs from these stocks have enabled increased effort toward larval rearing of these sensitive ornamental reef species with small numbers of angelfish post-larvae being generated.

Moi

The Finfish and the Aquatic Feeds and Nutrition departments have joined forces to further the development of moi production technologies and help resolve current bottlenecks to moi fingerling production in the new Makapuu pilot production hatchery facility. During this period, OI has generated approximately 50,000 moi fingerlings per month for industry, as it continues research at the interface of aquaculture and fish nutrition.

'Omilu

Thanks to our novel hybrid copepod-rotifer feeding protocol, more than 4,000 'omilu larvae were successfully reared, showing the promise of increased hatchery survival of many marine fish species. Research on 'omilu metamorphosis to further fingerling output is under way. These fish will be used primarily for tagging and stock enhancement research under the NOAA-funded Hawai'i Stock Management Project.

Kahala

OI continues to provide kahala eggs to Kona Blue Water Farms and Pacific Ocean Ventures as both companies initiate commercial production. Efforts include providing backup egg supplies, hatchery technology transfer and development of backup broodstock populations. Kona Blue is also requesting assistance in developing a backup broodstock population of this amberjack fish at OI.

Tapping a World of Aquaculture Practices

Oceanic Institute understands that it can glean from the best aquaculture practices executed around the world.

Cheng-Sheng Lee, Ph.D., is the Executive Director of the Center for Tropical and Subtropical Aquaculture (CTSA) and the Director of the Aquaculture Interchange Program (AIP), at OI.

CTSA is one of five regional aquaculture centers in the United States established by the U.S. Department of Agriculture, and is jointly administered by OI and the University of Hawai'i. It seeks to enhance viable and profitable U.S. aquaculture wherever tropical and subtropical species are cultured within the U.S. and U.S.-affiliated Pacific islands such as American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Republic of Palau, and the Republic of the Marshall Islands. Through the AIP, which was established in 1989 through a grant from the National Oceanic and Atmopsheric Administration, OI helps facilitate the implementation of aquaculture information from abroad to the United States. As a result of its annual international panel meetings, peer-reviewed documents are published for dissemination throughout the U.S. aquaculture community.

In 2006, AIP published "Aquaculture Biosecurity. Prevention, Control, and Eradication of Aquatic Animal Disease" (Blackwell Publishing Professional) and "Design and Selection of Biological Filters for Freshwater and Marine Applications" (Aquaculture Engineering). Documents under preparation or in review include "Alternative Protein Sources for Aquafeeds," "The Role of Aquaculture in Integrated Coastal and Ocean Management: An Ecosystem Approach," and "Socioeconomic Aspects of Species and System Selection for Sustainable Aquaculture."

CTSA is currently funding projects for microalgae production, fresh seaweed preservation, shrimp waste processing, and the study of such marine ornamentals as Hawaiian wrasses and pygmy angelfish. Also funded are projects studying food fishes such as amberjack, sturgeon and tilapia; marine invertebrates, disease management, and harvesting strategies for fish and shrimp.

This year, CTSA has received 35 pre-proposals for consideration; has provided testimony to Congress through the Southern Regional Aquaculture Center; and saw its 20-year administrative grant application approved by the USDA in May 2006.

Education: Reaching the Community

At Oceanic Institute, 2006 was a year that saw a new course offering, new partnerships in technology transfer, seminars, workshops, and an industry summit.

HPU and OI joined forces to secure a grant from the Pacific Tropical Ornamental Fish Program enabling us to develop a college course in Marine Ornamental Fish Aquaculture. This course provided a mix of lecture and hands-on activities that gave the students a real understanding of how to maintain, reproduce, and raise marine ornamental fish. In addition, seven other HPU courses are offered at OI covering aquaculture, marine biology, marine mammals, and oceanography.

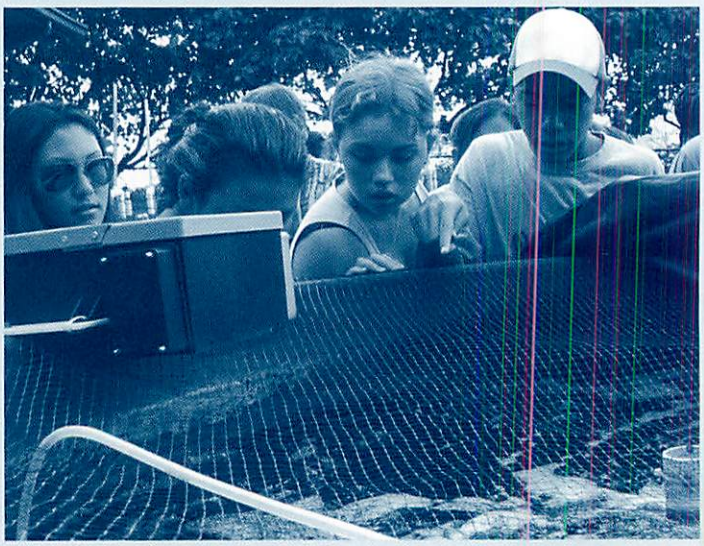
Megan O'Donnell is one of the more than 900 annual visitors who came to OI. The Make-A-Wish Foundation arranged the visit for the Pennsylvania high school student, who is a Hodgkin's Lymphoma patient. She is interested in pursuing a career in marine science.

Oceanic Institute was recognized for a Hawai'i Living Reef Award in the institutional category, competing against NOAA's Ocean Debris Cleanup Program. The annual Hawai'i Living Reef program recognizes members of the community working in ocean-related fields including education, regulation, research, and business.

On September 30, 2005, OI hosted the first Hawai'i Aquaculture Industry Stakeholders Summit for 72 participants, including farmers, seafood distributors, and suppliers; and those in the fields of research, extension, government, and NGOs. Its goal was to help identify a course for growing the local aquaculture industry and to identify constraints and possible solutions to overcome industry obstacles. Several standing committees were formed to address specific areas. Alliances were made to take advantage of the opportunities presented. Several initiatives were created to seek funding for particularly ripe targets.

For the 15th year, OI continued its relationship with Waianae High School's Marine Science Learning Center with a workshop for 37 students at its Kona facility. The students followed up with a visit to the OI main facility on Oahu later in the school year. We anticipate this educational partnership will continue.

OI's outreach for FY2006 included 80 tours conducted for 917 visitors from schools, community groups, industry, research, government, business, and the financial sector. Also, 11 seminars, retreats, receptions, and presentations were conducted at OI. OI participated in various events such as Aquaculture America, the Hawaiian Business Conference and Economic Expo, E Malama I Ke Kai "Care for the Ocean," and Hawai'i Science and Tech Day at the State Capitol.



Oceanic Institute and Subsidiary

Consolidated Statements of Financial Position

	June 30 • 2006	2005
Assets		
Cash and cash equivalents	**$ 1,393,724**	$ 751,663
Grants receivable	**718,085**	921,862
Other receivables	**284,175**	414,190
Prepaid expenses and other assets	**46,460**	138,873
Contributions receivable	**5,826,269**	6,498,199
Assets restricted for construction of facilities	**213,835**	213,835
Long-term investments	**25,000**	25,000
Property and equipment:		
Buildings and improvements	**17,809,921**	17,560,286
Machinery and equipment	**1,878,085**	2,453,397
Capital leases-equipment	**135,750**	135,750
Furniture and fixtures	**–**	35,312
Construction in progress	**116,506**	272,381
	19,940,262	20,457,126
Less accumulated depreciation and amortization	**(4,738,782)**	(4,468,158)
	15,201,480	15,988,968
Total assets	**$23,709,028**	$24,952,595
Liabilities and net assets		
Liabilities:		
Accounts payable	**$249,809**	$297,865
Accrued liabilities	**271,487**	534,351
Accrued payroll	**164,379**	178,515
Note payable to affiliate	**442,000**	442,000
Capital lease obligation	**–**	24,043
Liability for billings in excess of costs incurred	**874,769**	856,736
Total liabilities	**2,002,444**	2,333,510
Net assets:		
Unrestricted	**15,641,480**	15,882,051
Temporarily restricted	**6,040,104**	6,712,034
Permanently restricted	**25,000**	25,000
Total net assets	**21,706,584**	22,619,085
Total liabilities and net assets	**$23,709,028**	$24,952,595

Consolidated Statements of Activities and Changes in Net Assets

Changes in unrestricted net assets	Year Ended June 30 • 2006	2005
Revenue and other support		
Research grants	**$ 8,297,143**	$ 8,536,522
Rent	**748,626**	657,686
Technical services	**614,898**	759,425
Sales and other	**203,511**	197,942
Construction grants	**72,526**	240,133
Investment income, net	**27,032**	6,736
Contributions	**5,914**	2,928
Net assets released from restrictions	**1,000,000**	1,078,740
Total revenue and other support	**10,969,650**	11,480,112
Expenses		
Program - research and development	**7,339,378**	7,692,453
General and administrative	**3,870,843**	3,841,409
Total expenses	**11,210,221**	11,533,862
Change in unrestricted net assets	**(240,571)**	(53,750)
Changes in temporarily restricted net assets		
Contributions	**328,070**	253,075
Net assets released from restrictions	**(1,000,000)**	(1,078,740)
Change in temporarily restricted net assets	**(671,930)**	(825,665)
Changes in net assets	**(912,501)**	(879,415)
Net assets at beginning of year	**22,619,085**	23,498,500
Net assets at end of year	**$21,706,584**	$22,619,085

A copy of the complete, audited financial statements is available for inspection upon request.

OCEANIC INSTITUTE PUBLICATIONS AND PRESENTATIONS

AQUATIC FEEDS & NUTRITION DEPARTMENT

PUBLICATIONS

Dominy, W.G., R.K.H. Tan, D. Akiyama, and W.H. Bewley. 2005. Pelleting process for shrimp feeds. In: Feed Manufacturing Technology V, Chapter 26, Aquatic Feed. Eileen K. Schofield (Technical Editor). American Feed Industry Association, Arlington, Virginia. pp. 288-291.

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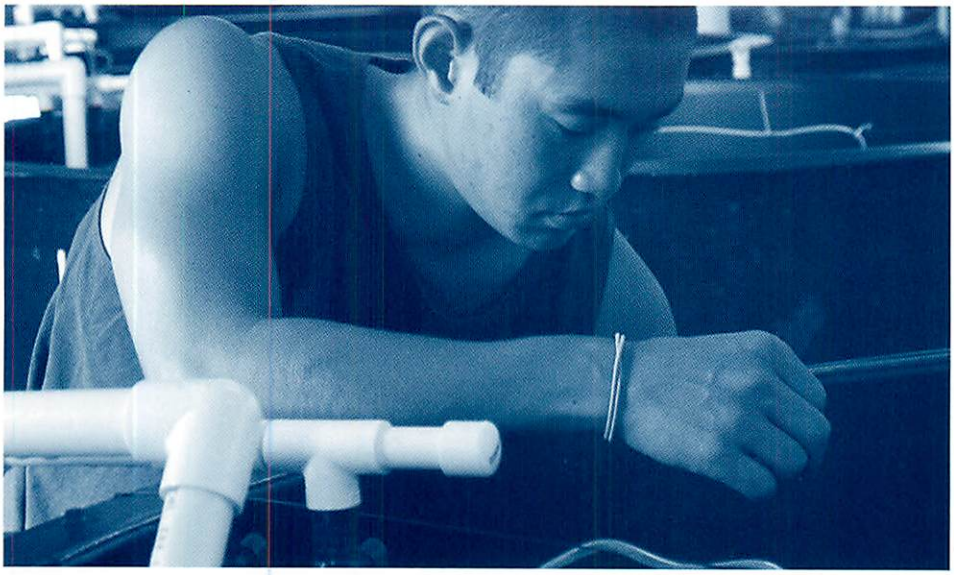

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