

AQUANEWS



Sustainable Aquaculture
for a Secure Future

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CLSU/FAC + PD/A CRSP = Formula for Success

by Chris Brown

University of Hawaii, US Regional Coordinator for PD/A CRSP Philippines Project

The PD/A CRSP has been active in the Philippines since the program's inception in 1982. Until 1998, the Philippines was a companion site to the prime Southeast Asia site in Thailand. Research was conducted from 1983 to 1987 at the Brackishwater Aquaculture Center in Iloilo as a collaborative project between the University of the Philippines in the Visayas and the University of Hawaii. In 1992, CRSP research recommenced at the Freshwater Aquaculture Center (FAC) at Central Luzon State University (CLSU). The Philippines became a PD/A CRSP prime site in July 1998 when the Philippines project was awarded funding beginning with the Ninth Work Plan. The lead host country institution is CLSU/FAC, located in Nueva Ecija, Philippines.

Continuing programs with USAID and the Pond Dynamics/Aquaculture CRSP have been a crucial part of the Freshwater Aquaculture Center's (FAC) scientific emergence. A few years back, economic growth in Thailand led USAID to rethink the placement of some of its regionally focused activities, and the consistency of programs at Central Luzon State University (CLSU) helped to make a strong case for its selection as a prime site for Southeast Asian aquaculture technology development and dissemination. PD/A CRSP Host Country Principal Investigator Remedios Bolivar is currently serving as Chairperson of the Department of Aquaculture at CLSU, as well as Associate Director of the FAC.

The first year of experimental field studies has recently been concluded. The results of these experiments are presently being drafted into manuscript form, but participating farmers have already adopted some of the practices being tested. Among conclusions supported by this work is the concept explored by CRSP researcher James Diana and coworkers at the Asian Institute of Technology that

delayed feeding protocols can effectively reduce production costs without significantly compromising yields. The results of our experimentation demonstrated that waiting two months before feeding ponds freshly stocked with fingerling tilapia netted the farmers approximately \$400 extra per hectare. Most of the farmers involved in these trials indicated at a December 1999 workshop that they are sufficiently impressed with this strategy that they have already implemented the delayed feeding protocol. The mix of reduced effort and increased profit has a kind of universal appeal. We have planned a series of follow-up experiments, and US associate investigator Robert Howerton has turned his keenly trained eye to the production of extension materials.

The pooling of ideas and resources from the various ongoing scientific activities at CLSU is a high priority for the Philippines CRSP participants. For example, the feed in the trials mentioned above uses inexpensive rice by-products and fishmeal and has been formulated under the guidance of University of Arizona colleague Kevin Fitzsimmons.

Another integrative aspect of our experimentation is the use of a genetically selected, sex-reversed strain of tilapia developed by ICLARM. These fish are now being distributed through the Genetically Improved Farmed Tilapia (GIFT) Foundation, which, not coincidentally, is next door to the FAC's experimental pond facility. Fish from this strain were made available to the CRSP project through a cooperative

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Aquaculture Takes Center Stage at the Central Luzon State University, Nueva Ecija, Philippines

by Chris Brown

These are exciting times for aquaculture at CLSU. Students arriving to study aquaculture find the atmosphere charged, upbeat, and cosmopolitan. The establishment of a Ph.D. program in Aquaculture, the opening of a new Fish Museum on campus, and ongoing cooperative genetics and biotechnology programs with the University of Wales, Swansea (UK), are a few of the attractants for the best of the best aquaculture students from all around the Philippines and elsewhere.

Long recognized as a major focus within the university, aquaculture programs continue to develop at CLSU and have recently gained national recognition for their leadership. Growth and modernization of Aquaculture and Fisheries at CLSU are now national priorities in the Philippines. In a prioritization of agriculture research centers within the Philippines mandated under the Agriculture and Fisheries Modernization Act, CLSU and its flagship programs at the FAC were identified as the national leaders in freshwater aquaculture and inland fisheries sciences. This recognition follows a sustained period of programmatic development and academic accomplishments. Not the least among a long list of considerations leading to this decision is the unusually high and still-growing percentage of faculty at the FAC who have obtained their advanced degrees at prominent universities overseas. Dr. Ruben Sevilleja, FAC Director, has orchestrated much of the institutional program-building, and despite recent accomplishments, he acknowledges that his task is far from complete. The identification of CLSU/FAC as the Philippine national leader in inland capture fisheries and freshwater aquaculture is viewed not so much as an accolade but as

KEVIN FITZSIMMONS



Hapas at Freshwater Aquaculture Center, Philippines

an opportunity. It is also a declaration of high expectations. The concept behind this executive endorsement is to redirect resources to the strongest institutions, such that the most capable among them can serve national interests as effectively as possible.

The program continues its loyal service to local fish farmers but increasingly strives to reach out to a broader constituency. Independently, but at approximately the same time as the first-place ranking under the Fisheries Modernization Act, the Fisheries Program within the College of Fisheries at CLSU was accredited nationally. This followed a highly competitive review process, which resulted in only a few such programs gaining formal accreditation at that level. Again, the balance of strengths in academic instruction, scholarship, applied research, and extension activities contributed to the conclusion that the CLSU program is outstanding and worthy of formal recognition.

Dr. Terry Abella, Dean of the College, has described the mood of his hard-working academic staff as “triumphant.”

The prominence of Aquaculture at CLSU is a result of a significant and sustained effort on the part of a university that takes a great deal of pride in the accomplishments of this program. Past CLSU President Dr. Fortunato A. Battad loved to describe the Freshwater Aquaculture Center in his uniquely diplomatic style as “one of the best, if not the best, program” within the university. Current President Rodolfo Undan has expressed his own determination to continue the trend of growth and improvement at the FAC; he is actively committed to the fulfillment of its potential on both national and international scales. 🐟

CLSU/FAC + PD/A CRSP

... from p. 1

arrangement with the Foundation, and they turned in a performance that disappointed no one—yields were consistently in the 5,000 kg/hectare range.

Efforts are under way to expand on these themes in the second year of the continuing CRSP Philippines project. The project will also take on responsibility for overseeing

CRSP education development activities in country. Plans are under way to diversify, expand, and upgrade CLSU's aquaculture program and to offer one or more promising graduate students honorary and competitive scholarships. The scholarship recipient will have the opportunity to receive training in the US. This initiative dovetails well with the expanding scope of CLSU's aquaculture and fisheries programs. (See related article, above.) 🐟

Graduate Student Profile: Oscar Zelaya

by John Hayes

Oscar Zelaya began his PD/A CRSP-funded research in 1999 with the start of his Master's program in the Department of Fisheries and Allied Aquacultures at Auburn University. Zelaya took an interest in the PD/A CRSP while working in his native Honduras. He relates that he was exposed to PD/A CRSP research both as a student working toward his Bachelor's degree in agriculture at Escuela Agrícola Panamericana (El Zamorano), and as an aquaculturist for Granjas Marinas, one of the largest shrimp farming companies in Honduras. While working at Granjas Marinas, Zelaya also came into contact with PD/A CRSP Principal Investigators Bart Green and David Teichert-Coddington from Auburn University. His graduate education is fully funded by the CRSP, and he was selected from a pool of four qualified applicants from Honduras based on his academic background and interests.

Zelaya studied agricultural engineering at El Zamorano for three years from 1992 to 1995. He then worked for Granjas Marinas in Choluteca for 18 months before returning to El Zamorano in 1997 to complete his final year and a bachelor's thesis on water quality and pond soils in tilapia farming. El Zamorano is a private, non-profit, international educational organization, offering baccalaureate degrees related to agriculture, social development, and the environment. The institute is located about 35 kilometers southeast of Tegucigalpa, the capital of Honduras.


An interest in water quality issues and pond soil research brought Zelaya to Auburn University to study under the direction of Dr. Claude Boyd. Dr. Boyd has conducted extensive research on the dynamics of pond aquaculture, including ecology and utilization of aquatic weeds, pond liming and fertilization, water quality and aeration, pond bottom soils management, and hydrology of ponds. His teaching has focused on graduate training in water quality management. Zelaya's Master's project will involve evaluating how efficient a water recirculation system is in improving the water within a production system, as well as the effluent system that returns water to the environment.

Zelaya's research topic supports his more general objective of developing aquaculture systems that are integrated with the environment. With regard to aquacultural research, Zelaya concedes that significant gains have been made in the area of production through

refinement of techniques and better science, but maintains that the current challenge facing the industry is to increase productivity without compromising the environment. He points out that as the aquaculture industry grows, it may come under greater scrutiny and regulation if it does not adequately address some of the problems traditionally encountered by large-scale agriculture systems, such as point and nonpoint discharge of wastes. Through his Master's program, Zelaya hopes to receive training that can be directly applied to the development of what he calls "ecologically responsible aquaculture."

In the Fall 1998 issue of *Aquanews* we reported on the devastating effects of Tropical Storm Mitch in Honduras. Zelaya was in Honduras at the time and recounts the days that followed the torrential rains of 30–31 October 1998. "Everything was gone from one day to the next. It was incredible. I was working for Granjas Marinas then and everything in our operation was destroyed. Ponds were unusable due to excessive erosion or large deposits of mud. There was nothing to stock and nothing to harvest since everything had been washed away. I cannot speak for the rest of the country, but it took our farm months to recover. Our daily routine of

harvesting and processing was replaced with cleaning up the remains of the farm, which was inaccessible for a long time since the roads had also been washed away. It was hard to imagine how the country would overcome such devastation. Thankfully, we received a lot of financial relief from other countries. We alone did not have the resources to rebuild the country."

Zelaya considers himself privileged to be in the United States, a country he describes as having "a very well organized infrastructure," particularly in his field, "as shown by the number of institutions conducting aquacultural research and the number of researchers leading the world in the development of eco-friendly techniques. It's a privilege for me to be working with some of the top aquacultural researchers in the world, right here at Auburn University. Auburn has excellent faculty and facilities for training in warmwater aquaculture. I am also very happy to be associated with the PD/A CRSP. Their work helps strengthen the worldwide network of aquacultural researchers by providing a common framework of data and studies that address the most pressing issues in warmwater aquaculture." 



XENA CUMMINGS

CRSP Graduate Student Oscar Zelaya

Comings and Goings in the Pond

The PD/A CRSP welcomes two new Board of Directors (BOD) members and bids farewell to the outgoing chair. Russell Moll represented The University of Michigan (UM) on the Board for three years, most recently as chair. Moll continues as Director of the Michigan Sea Grant College Program. He also serves as Director of the Cooperative Institute for Limnology and Ecosystems Research and as associate research scientist with both the Center for Great Lakes & Aquatic Sciences and UMs School of Natural Resources & Environment. The CRSP sincerely thanks Moll for three years of



XENA CUMMINGS

*Departing BOD Chair
Russell Moll*

service and leadership.

Dennis Balogu is the incoming chair of the BOD. He recently replaced Shadrach Okiror as BOD member representing the University of Arkansas at Pine Bluff. Professor of animal agriculture and project leader of the Small Ruminant Animal Research Unit, Balogu received his Ph.D. in animal nutrition and physiology from Mississippi State University, conducting research on silage fermentation.

He has been involved in international agriculture research and training projects sponsored by USAID, FAO, UNDP, the World Bank, and UAPBs International Affairs office.

T.H. Lee Williams is the newest member of the Board, representing University of Oklahoma. Williams already wears many hats, serving as Vice President for Research, Dean of the Graduate College, Professor of geography, and coordinator for a program promoting K-12 geography education in Oklahoma. Additionally, he directs a program for Oklahoma universities that helps build and support competitive research programs and promotes the role and value of research. His doctorate in geography, earned at University of Bristol, involved developing models to predict the spectral reflectance of vegetation canopies in satellite images. We look forward to the advice and guidance that Balogu and Williams can offer the CRSP in the coming years.



*New Board Member
T.H. Lee Williams*

We regret the loss of S.M Kinyali, faculty member in the department of soil science at the University of Nairobi, who died on 23 January 2000. Kinyali was a CRSP cooperator on the Kenya project's Effluents/Pollution research and served as thesis advisor to Bernard Meso.

The CRSP welcomes Nancy Gitonga as the new CRSP host country principal investigator in Kenya. Following the retirement of Fred Pertet, Gitonga has taken over as Interim Director of the Kenyan Fisheries Department. She holds a Master's degree in food science and technology from Loughborough University in the United Kingdom. Her thesis was entitled "Investigation into post-harvest losses of cured Nile perch (*Lates niloticus*) in Kenya." Gitonga has both participated in and facilitated activities on topics from fishery sector development and fish processing to leadership and integrated coastal management.

We note with regret the departure from the CRSP of Viji Sreenivasan, Financial Manager with the Program Management Office at Oregon State University. Though only with the CRSP for about a year, Viji had previously worked on program accounts for OSU, and her existing contacts within the university community often proved valuable in handling CRSP affairs. Viji said her decision to leave for personal reasons was difficult but necessary. We wish her only the best and thank her for her service and her friendship. Finally, we remain guardedly optimistic about receiving that postcard from India any day... 🇮🇳



KRIS MCELWEE

*Viji Sreenivasan, outgoing
PD/A CRSP Financial
Manager*

CRSP Accomplishments Spotlited at Capitol Hill Event

The Pond Dynamics/ Aquaculture CRSP joined with the CRSP Council in presenting an exhibit entitled "CRSPs—A Vital Link between US Universities and Developing Countries" at the third annual exhibition and reception on Capitol Hill. Sponsored by the National Association of State Universities and Land-Grant Colleges (NASULGC), the exhibition and reception was held on March 7, 2000, in Washington, D.C. This event offered a splendid opportunity for members of the US Congress and staff to learn more about the dividends being reaped from federal investments in agricultural research and education.

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Get a Grip on Pond Management before It Gets a Grip on You

by Marcos J. De Jesus

Southern Illinois University at Carbondale

PD/A CRSP Peru Site Project

The summer of 1999 brought a spine-tingling episode into the lives of the field workers at the IIAP-Quistococha aquaculture research station in Iquitos, Peru. The "incident" added a mystical twist to an otherwise customary day at this facility. A PD/A CRSP aquaculture study was underway, and routine maintenance to control macrophytes was being conducted in the research ponds. Field technicians soon discovered just how gripping pond management could be.

Pond 14 is a long shallow pond at the edges of the research facility. It is adjacent to a small area of



swampland that serves as excellent habitat for a variety of wetland species. The swampy conditions extended over the water levee into the pond. As workers manually worked the roughage with their machetes, they approached the levee by the swamp. As one worker waded towards a small patch of grass he felt something slide between his legs. Frozen in place, he yelled to his mates: "Boa! *Aqui hay*

una boa negra!" The worker warned his mates of the presence of what we know as an anaconda. They decided to cautiously continue their work, but in a matter of minutes, the same worker had a second encounter with the reptilian beast. The snake slithered up one of the worker's legs and wrapped itself around his waist up to his chest and around his shoulder. Fortunately, the snake didn't strike its victim with an initial bite as it normally does to subdue its prey. That was of little consolation to the entangled victim as the anaconda exerted a suffocating grip and slapped him down into the depths of the pond.

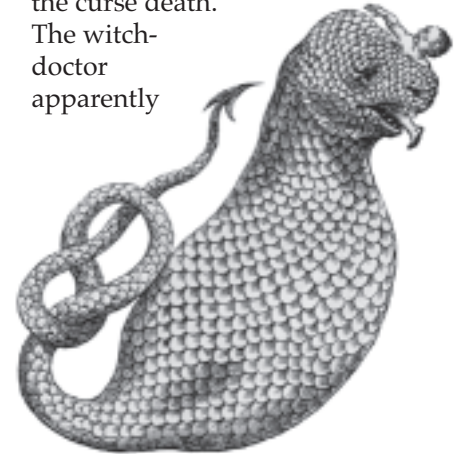
Miraculously, the worker managed to struggle to his feet and attempted to slash the animal with his machete. His attempt to sever the animal proved futile as the snake's muscles were so tense the blade bounced off as if it had struck a steel-belted tire.

The worker was pulled under two more times before the snake elected to release him. His co-workers pulled him to the bank. He suffered several bruises around his body, chest pains, and a tad bit of anxiety. Witnesses estimated the anaconda to range between 12 and 15 feet in length.


The story does not end here for this creature is believed by the locals to possess mystical powers. The victim sought the aid of a witch

doctor to dispose of any curses he might have gotten from the animal, and in particular, the curse death.

The witch-doctor apparently




knew what to do for the man quickly recovered and now continues his labor at the facility. However, he and others have shown little inclination to enter pond 14.

In the Amazon, the anaconda is believed to possess mystical powers that affect the people it encounters. They also believe that its body parts bring luck and are a medicinal source for an array of human ailments. This makes the snake more valuable dead than alive. The predator is very important to the ecosystem surrounding the facility, and it clearly deserves to thrive in its environment. Aquaculturists must learn to effectively manage their ponds to prevent unwelcome incidents such as the one described above. The snake has not been seen since. Perhaps it is waiting for the pond to be choked with weeds again. 

Capitol Hill Event

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Director Hillary Egna attended the event representing the PD/A CRSP. The CRSP Council presented a display demonstrating the many development activities and achievements of the nine CRSPs. These programs link US land-grant universities with international research institutions around the world and provide mutual benefits

to the US as well as other participating countries. The CRSPs focus their research on nutrition and income generation through improved food production and natural resource management in the developing countries of Africa, Latin America and the Caribbean, and Eurasia, while making important contributions to agriculture and agribusiness in the US. The pictures and captions in the display represented some of the benefits and activities of the CRSPs. 

Lockhart Thesis Analyzes Kenyan Fish Farmers' Perceptions

Malkia Lockhart, profiled in the Summer 1998 issue of *Aquanews*, successfully defended her thesis on 30 August 1999 and received a Master of Science in Sociology in the Interdepartmental Graduate Program from Auburn University. Her major professor, Joe Molnar, is currently working on CRSP Adoption/Diffusion research activities in Honduras and Peru.

FARMER PERCEPTIONS OF CONSTRAINTS ON AQUACULTURE DEVELOPMENT IN CENTRAL KENYA: MARKET, HOUSEHOLD, AND RESOURCE CONSIDERATIONS (abstract of Malkia Lockhart's MS thesis)

The USAID sponsored Pond Dynamics/Aquaculture Collaborative Research Support Program has conducted studies establishing baseline data on physical, chemical and biological processes as they relate to fish growth. The Sagana, Kenya research site (the fifth PD/A CRSP site) focuses on tilapia (*Oreochromis niloticus*) as an aquaculture enterprise with high potential to augment the array of alternatives available to local farmers. Kenya is the fifth site following research in Honduras, the Philippines, Thailand, and Rwanda. Tilapia culture is a relatively new enterprise in the dry, highland areas of Kenya's Central Province, compared to the wet jungles of Western Kenya and the Lake Victoria area. The purpose of this study is to examine fish farmer experiences of market, household, and resource constraints as they bear on their perception of the prospect for tilapia culture in Kenya. Data were obtained from interviews with 51 active Kenyan fish farmers from five districts in Central Province during winter 1998. Tilapia farmers were identified through referrals from Kenyan Fisheries Department personnel, knowledgeable local individuals and fish farmers who knew of neighbors raising tilapia. The results profile farmer perceptions of constraints on aquacultural development and how these considerations bear on expectations for success of the enterprise. Results show that age and resource proximity are significant variables in farmers perceptions of market, household, resource constraints and their commitment to sustained participation in the enterprise. Extension contact was the strongest source of enterprise commitment. Extension agents may provide information and technical assistance to the farmers, while at the same time reinforcing the farmers' interest in continuing the enterprise. Fish farming can provide protein, calories, income, and employment, but certain conditions must be present for aquaculture to reach its potential in Kenya and in other parts of rural Africa. Markets must provide fingerlings, seeds stock and opportunities to realize income. Households must have the knowledge and technical support necessary to manage the enterprise. Resources, primarily water and land, are baseline conditions enabling the sustained practice of fish culture.

500 Years of Aquaculture in Hawaii

by Kris McElwee

Eommunities, school groups, and researchers on a group of islands in the Pacific Ocean are looking to the past for clues to their cultural heritage and effective natural resource management. In spite of regulatory obstacles, several projects are trying to revitalize fishponds built and used by ancient Hawaiians.

The earliest true aquaculture in Oceania was practiced on the islands of Hawaii, at least 600 years ago. Extensive fish farming in fresh, brackish, and salt water was an important component of the social and agricultural structure of the islands. Although yields were relatively low, the technologies were simple,

reliable, and sustainable. Freshwater aquaculture may have developed fortuitously by migration of fish into irrigation channels; taro fields were stocked with freshwater-tolerant oceanic species such as mullet along with one of the few Hawaiian freshwater species, the goby. Closer to the ocean, brackish- to saltwater ponds

were set off from the sea by walls of massive stones and coral. Some of these saltwater ponds functioned like the fish traps common on other Pacific islands.

Several modern principles of natural resource management are exemplified by the indigenous aquaculture practices of ancient Hawaii. For example, religious beliefs mandated that no animal, human, or domestic wastes be added to fishponds. This may have limited productivity, but



KRIS MCELWEE

Ancient fish pond at City of Refuge on the Big Island of Hawaii

CRSP Researcher Presentations

Aquaculture America 2000, "Unmasking the Marvels of Aquaculture," took place 2–5 February 2000 in New Orleans, Louisiana, following the PD/A CRSP annual meeting. CRSP researchers at Aquaculture America 2000 presented the following talks:

- W.M. Contreras-Sánchez, M.S. Fitzpatrick, and C.B. Schreck, Masculinization of Nile tilapia by immersion in trenbolone acetate.
- M.S. Fitzpatrick, W.M. Contreras-Sánchez, and C.B. Schreck, Methyltestosterone persists in the environment after use for masculinizing Nile tilapia.
- C. Craven and H.S. Egna, The Pond Dynamics/Aquaculture CRSP–developed technologies: Domestic rewards and returns.
- D. Valderrama and C.R. Engle, Risk analysis of shrimp farming in Honduras.
- J.J. Molnar, F. Alcántara, and S. Tello, Sustaining small-scale aquaculture in the Peruvian Amazon: Producer perceptions of constraints and opportunities. (*Not presented due to author's illness.*)

Other CRSP researchers who presented or co-authored papers on non-CRSP-funded research include Claude Boyd, Konrad Dabrowski, Kevin Fitzsimmons, Chris Kohler, Rebecca Lochmann, Leonard Lovshin, Ron Phelps, Tom Popma, Jacques Rinchar, and Yang Yi. Also attending the meeting were Jim Bowman, Gabriel Márquez, and Marcos De Jesus.

Claude Boyd of Auburn University presented the keynote address on sustainable aquaculture practices

at the National Aquaculture Symposium, 22–24 November 1999, organized by Universiti Sains Malaysia in Penang. Boyd also presented results of PD/A CRSP soils research.

Kwei Lin and Yang Yi attended the First International Symposium on Cage Aquaculture in Asia, 2–6 November 1999 in Tungkuang, Taiwan, and presented the following papers:

- Yang Yi and C.K. Lin. Integrated cage culture in ponds: Concepts, practice and perspectives.
- Z.W. Wu, J.W. Guo, and Yang Yi. Current status and sustainability of cage culture in reservoirs: A case study in China.
- C.K. Lin and K. Kaewpaitoon. An overview of freshwater cage culture in Thailand.

Marcos De Jesus and Fernando Alcántara attended "Development of Aquaculture in the Amazon" in December 1999, hosted by IAP and sponsored by Brazilian, German, Argentinean, and international organizations. The following presentations summarized CRSP findings:

- F. Alcántara, Status of aquaculture in the Peruvian Amazon.
- F. Alcántara et al., Performance of *Piaractus brachyomus* and *Colossoma macropomum* stocked in ponds at different densities in Iquitos, Peru.
- K. Dabrowski et al., Preliminary assessment of gamete quality of *Piaractus brachyomus* cultured in ponds in Iquitos, Peru. (presented by De Jesus)

it also maintained pollution-free waters. Overfishing and wasteful consumption were also considered offensive to the gods. In traditional Hawaiian culture, the land and ocean and everything within them belonged to the gods. Kings oversaw these resources, with subdivisions that were essentially wedges of land running from upland to the sea administered by chiefs. Thus, land management on a watershed basis was practiced on Hawaii hundreds of years before Western resource managers recognized the importance of managing across political boundaries.

Western influences arrived with the explorer Captain Cook in 1778, and disease led to an 80% decrease in population in first 100 years. Changes in land tenure, social and economic structure, and the decline of the Hawaiian religion also led to a decline in traditional aquaculture. By 1985, fish production from aquaculture had fallen to less than 1% of what it was before European contact. The labor-intensive renovation and maintenance of the fishponds cannot be justified economically. However, members of communities on Molokai and other islands are interested in fishpond renovation to revive the qualities associated with ancient aquaculture: cooperative effort, traditional values, cultural continuity, and self-sufficiency.

Sadly, modern coastal land use planning regulations have made it almost impossible to restore ancient fishponds. Six to twenty individual permits may be required from national, state, and county agencies. Getting these permits requires more time, money, and bureaucratic tolerance than most prospective fishpond restorers have. If the permit process can become as integrated as the traditional aquaculture practices, a revitalization of Hawaiian aquaculture ponds may become a reality.

KUDOS

- Remedios Bolivar, Philippines host country principal investigator, received the award for best doctoral dissertation from Central Luzon State University and was recently promoted to Assistant Director of the Freshwater Aquaculture Center.
- Wes Wood, principal investigator from Auburn University on the Kenya project, has been named an adjunct graduate faculty member at University of Nairobi.

¡Anuncio de Publicación!

A new, Spanish-language edition of a 1994 Auburn University publication entitled *Development of Semi-Intensive Aquaculture Technologies in Honduras* is now available. The 48-page *Desarrollo de Tecnologías de Acuicultura Semi-Intensiva en Honduras* contains a summary of three consecutive CRSP-funded aquacultural research projects carried out from 1983 to 1993 at the El Carao National Fish Culture Research Center in Comayagua, Honduras. The research described in the report was a collaboration between the International Center for Aquaculture and Aquatic Environments (ICAAE), Auburn University, and the Dirección General de Pesca y Acuicultura, Secretaría de Recursos Naturales. The Spanish-language translation and publication is the result of a collaborative agreement between the CRSPs Information Management and Networking Component at Oregon State University and ICAAE. The summary of the original report can be viewed on the web at <www.ag.auburn.edu/dept/faa/pub39.html>.



To order the new Spanish-language edition of this publication, email us at crsp.mail@orst.edu or send your request to:

Publications
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Poisson à la Braise (Grilled Fish)

2 whole tilapia, cleaned, head on
½ onion, chopped
2 T tomato paste
1 lemon
1 T piment (hot pepper sauce)
½ cup vegetable oil
1 stalk lemon grass, chopped
salt

Prepare fish:

Cut slits diagonally on both sides of the fish. Rub with salt. Squeeze lemon over and inside the fish. Place pieces of lemon grass in the slits.

Make sauce:

Combine onion, piment, tomato paste, and oil.

Begin cooking:

Brush the sauce mixture over the fish and place fish on the grill. Grill the fish on one side, brushing occasionally with the mixture. Turn once to grill other side. Remove from grill when flesh flakes with a fork.

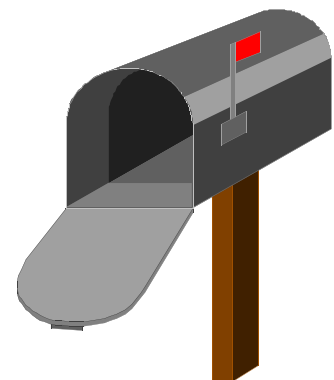
Serve with beer and a baguette.

Photo and recipe submitted by Donald Bailey, from the University of the Virgin Islands, Agriculture Experiment Station Aquaculture Program



We Want Your Opinion!

In this issue of *Aquanews* we've included a card to get a feel for the way in which the work of the CRSP affects our readers. We welcome any comments you have on the way the PD/A CRSP has helped you. And feel free to mention how you think we could serve you better. Please return the card with your comments. Readers in the US can just drop the postcard in a mailbox; postage is prepaid. Outside the US, you'll have to affix postage. Alternately, send us an email at crsp.mail@orst.edu. We look forward to hearing from you! 🐟




PD/A CRSP Website Gets a New Look

by Heidi Furtado

Come check out the new face of the PD/A CRSP homepage. The new homepage has been organized for easier access. A search engine has been added, along with new links. There is also a text version that will accommodate more users. Just visit us, using our new and shorter URL, at <pdacrsp.orst.edu> to:

- find out more about the research being conducted through PD/A CRSP publications;
- read the web version of EdOp Net, a monthly newsletter with education, training, and employment opportunities; and
- access CRSP Data Tools, including the Central Database—the largest public aquaculture clearinghouse of standardized experiment results—and POND®—a CRSP-developed decision support system for pond management strategies.

The website will be continually updated with new information, so we encourage repeat visitors. 



Tilapia Talk

Need advice on streamlining a tilapia production system? Have questions about what to feed tilapia? Want to share ideas on industry trends?


Then add your name to the TILAPIA ONELIST and join one of the largest Internet-based tilapia mailing lists. Founded by AquaSol, Inc. last August, the TILAPIA

ONELIST serves as a global platform for discussion between knowledgeable professionals who are actively involved in the culture, processing, or marketing of farm-raised tilapia. Recent submissions have generated lively discussions concerning reproduction control, the fate of hormones used in aquaculture, and emerging tilapia markets. Once registered, members can read and post messages either through email or by visiting the TILAPIA ONELIST website.

There are three ways to read posted messages:

- Individual Email Option - Messages are delivered one at a time to your email inbox. This is the best option if you want to keep up on the latest posts immediately.
- Daily Digest Option - Messages are delivered in batches of 25 or daily, whichever comes sooner. This is the best option if you want to receive fewer mail messages and don't need up-to-the-minute posts in your inbox.
- No Mail / Web Only Option - This option puts email message delivery on hold, for example while you are on vacation. This option also permits you to read messages at the ONELIST website.

Members can post messages through the website or via email, either by replying to delivered messages or addressing a new message to <tilapia@onelist.com>.

Registration is free, easy, and only takes a couple of minutes. To join, visit the TILAPIA ONELIST website at <onelist.com/group/tilapia.html>. 

Technical Committee Update

The Technical Committee (TC) session at the PD/A CRSP Annual Meeting, held 31 January–2 February 2000, in New Orleans, Louisiana, was highlighted by TC elections. The new composition of the group is listed below. We thank the new and continuing TC members for taking the time to serve as advisors to the program.

Technical Committee

* - newly elected

Name	Institutional Affiliation	Specialization
<i>Co-Chairs</i>		
John Bolte	Oregon State University	
*Jim Diana	The University of Michigan	
<i>Materials & Methods Subcommittee</i>		
Doug Ernst	Oregon State University	Environmental Effects
Claude Boyd	Auburn University	Production Optimization
*Freddy Arias	Escuela Agrícola Panamericana	Social & Economic Aspects
<i>Technical Progress Subcommittee</i>		
Joe Molnar	Auburn University	Social & Economic Aspects
*Wilfrido Contreras	Oregon State University	Production Optimization
*Amrit Bart	Asian Institute of Technology	Environmental Effects
<i>Work Plan & Budget Subcommittee</i>		
Kevin Fitzsimmons	University of Arizona	Environmental Effects
Tom Popma	Auburn University	Production Optimization
*Carole Engle	University of Arkansas at Pine Bluff	Social & Economic Aspects
<i>External At-Large Members</i>		
Marc Verdegem	Wageningen Agricultural University, Netherlands	
*Damon Seawright	US Tilapia Industry	
<i>Ex-Officio Members</i>		
Hillary Egna	Oregon State University	
Cormac Craven	Oregon State University	
Harry Rea	US Agency for International Development	



Jim Diana



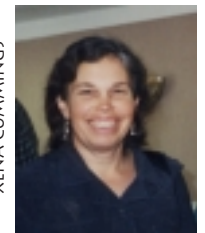
Amrit Bart



Damon Seawright



Wilfrido Contreras



Carole Engle

Western Regional Aquaculture Expo 2000

by Matt Niles

Several current and former PD/A CRSP researchers participated recently in the Western Regional Aquaculture Expo 2000, an event sponsored by the California Aquaculture Association. CRSP researcher Claude Boyd was the keynote speaker at the conference held in Desert Hot Springs, California, February 27–March 1.

Boyd's keynote address focused on the environmental effects of aquaculture and the need for aquaculture producers in the United States to adapt to increasing government scrutiny and changing public perceptions of the aquaculture industry. Additional conference topics ranged from aquaculture basics such as site selection and disease prevention to the marketing and transportation of aquaculture products.

Kevin Fitzsimmons, CRSP researcher from the University of Arizona, gave a presentation on aquaculture

principles in the first session of the conference in addition to a technical discussion on thick-film biofiltration methods during a session focusing on technologies of intensive aquaculture operations. Raul Piedrahita, another CRSP researcher from the University of California, Davis, also participated in this session, delivering a presentation entitled "Solids removal in intensive aquaculture systems."

There was also a session devoted entirely to pond dynamics, which included additional presentations by Boyd and a presentation by former CRSP researcher Chris Knud-Hansen. Boyd began the session with an overview of the PD/A CRSP, describing current research priorities and goals. He also gave an overview of his own pond soil research, describing the interaction of sediments and water in pond aquaculture systems. Chris Knud-Hansen delivered a talk entitled "An ecological approach to optimize pond fertilization," in which simple,

ecologically sound principles of pond fertilization developed by the CRSP were discussed. 🐟



PD/A CRSP researcher Claude Boyd

Fishellaneous Items

Angara Predicts Fish Self-Sufficiency

Last week, following the announcement of the Philippines' increased fisheries output, Philippine Agriculture Secretary Edgardo Angara said that the country would be self-sufficient in fish and could even expect a surplus by 2004.

Leading on from the Bureau of Agricultural Statistics (BAS) figures, which reveal that the country's fishery output rose 3.7% to 2.86 million metric tons (MT) in 1999, Angara said in a statement that for the year 2000 alone, the fishery production target throughout the country is 3 million metric tons.

Angara tasked the Bureau of Fisheries and Aquatic Resources to help spur fish production throughout the country not only in municipal and commercial fishing but also in aquaculture, the country's largest fish producing sector.

Fish is the number one source of protein in the Philippines. In the drive towards fish self-sufficiency, the government is pushing to the maximum the production of milk fish and tilapia, which are considered as the Filipinos' staple fish today.

Source: *Fish Info Service*, <www.sea-world.com>, 31 January 2000. Reprinted with permission.

Vietnam Focuses on Aquaculture

Throughout the coming year, the Government of Vietnam will channel scientific and technological activities into serving agricultural and rural development, reports the Vietnam News Agency.

The aim for 2000 is the creation of new high-quality and high-yield strains of plants and animals using scientific and technological advancements and developments. Special attention will be paid to using such advancements to benefit socio-economic development in rural and mountainous areas.

The government stressed the importance of continuing research with the ultimate goal of developing aquaculture and studying measures to mitigate and prevent damage by natural calamities.

During 2000, the Ministry of Science, Technology and Environment will promote the application of international-standard quality control systems. The department has received a budget of approximately US\$90 million for this year.

Source: *Fish Info Service*, <www.sea-world.com>, 19 January 2000. Reprinted with permission.

Prevention of Tilapia Spread Given Top Priority in Australia

The Department of Primary Industries (DPI) and local catchment associations have joined forces to try and prevent the spread of tilapia into the Mitchell catchment.

DPI Fisheries officers, Mitchell River Catchment Group secretary, Denis Rose, and Barron River Catchment Group secretary, Graham Dalip, are currently developing a pilot regional plan for the Barron and Mitchell catchments.

DPI principal fisheries scientist freshwater, Dr. Peter Jackson, said although it was difficult to establish the exact effects of tilapia on river systems, it was important to stop them invading new areas, particularly large relatively pristine catchments like the Mitchell.

"Once they enter a system it is very difficult and expensive to get rid of them and therefore preventing their spread into new areas is extremely important," he said.

Dr. Jackson said a number of options for dealing with the pest fish problem were discussed and it was acknowledged that eradication was not really viable at this stage.

He said risk minimisation currently seemed to be the only option and the group was looking at a number of ways in which this could be achieved.

"One of the first things we have to do is survey the area and see how much the fish have spread since 1997 when

the last survey was conducted," Dr. Jackson said.

However, one of the priority actions identified by the meeting was the development of an education and extension programme for the area.

DPI has already distributed brochures and posters outlining the dangers of tilapia as part of its statewide public education programme.

The Atherton Environmental Education Centre's, Neville Simpson, is also developing an Aquatic Invaders pest fish education module for DPI to trial in some tableland primary schools.

Dr. Jackson said one of the most important messages was that tilapia should never be used as bait, either live or dead.

"Juvenile tilapia of the species *Oreochromis mossambicus* (the main type found in Queensland) survive in the female's mouth for days after the parent has died so using them as bait (live or dead) can spread them to uninfested areas," he said.

Dr. Jackson said people could be fined up to A\$150,000 for possessing tilapia or other noxious fish.

Source: *Fish Info Service*, <www.sea-world.com>, 25 January 2000. Reprinted with permission.

CRSP Co-Sponsors ISTA V

The PD/A CRSP is pleased to be a co-sponsor of the Fifth International Symposium on Tilapia Aquaculture (ISTA V) which will take place 3–7 September 2000 at the Sofitel Rio Palace, Rio de Janeiro, Brazil. ISTA V will focus on the rapid advances in large-scale commercial farming and the development of international markets. The symposium will include a trade show, which will provide a forum for industry suppliers, seafood marketers, and the aquaculture press to meet directly with researchers and producers. Field trips are being organized to nearby aquaculture sites.

CRSP Sponsorship Opportunity

The PD/A CRSP will provide an opportunity for scholars from existing

and previous PD/A CRSP host countries (Mexico, Honduras, Guatemala, Nicaragua, Panama, Peru, Egypt, Rwanda, Kenya, Thailand, the Philippines, and Indonesia) to attend and present papers. ISTA V conference organizers will be coordinating the review and selection process.

Prospective conference presenters must submit abstracts to the ISTA V coordinators by 30 April 2000. Those interested in being considered for the CRSP sponsorship must include a request for financial assistance at the same time. All submitters will be notified by 1 June whether their abstracts have been accepted.

Applicants whose abstracts are accepted for oral presentation are eligible for the sponsorship opportunity. In addition, sponsorship applicants must be from a PD/A CRSP host country (see above) and have no

other available means of support for participating in the conference.

Submitting Your Abstract

To present at the conference, submit a brief abstract to:

Kevin Fitzsimmons
ISTA V
University of Arizona
2601 E. Airport Drive
Tucson AZ 85706 USA
Phone: 520-626-3324
Email: <kevfitz@ag.arizona.edu>

Additional information about ISTA V is available on Internet at <ag.arizona.edu/azaqua/ista/announce.htm>. Conference organizers ask for electronic files submitted on disks which can be virus checked (no faxes and no email attachments).

IIFET 2000 Conference

The tenth biennial conference of the International Institute of Fisheries Economics & Trade (IIFET 2000) will take place 10–13 July 2000 at Oregon State University in Corvallis, Oregon, USA. The conference theme, Microbehavior and Macroresults, reflects the relationship of individual behavior to the aggregate consequences of that behavior. A tentative list of conference topics includes: fishery



biology and the social sciences; aquaculture: past, present, and future; fisheries in economic development; issues in international trade; consumer demand for seafood; seafood market behavior; and seafood consumption and human health.

The PD/A CRSP is a co-sponsor of this event, providing an opportunity for scholars from host countries in which the CRSP is presently active (Mexico, Honduras, Peru, Kenya, Thailand, and the Philippines) to attend and present.

The early registration deadline for the conference is 30 April 2000. If you are not an IIFET member and wish to receive further information by email or regular mail, please contact the following address with your postal and email addresses: Debi Mandigo, Department of Agricultural and Resource Economics, Oregon State University, Corvallis, OR 97331-3601 USA

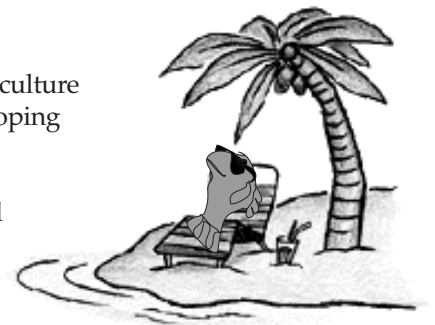
Fax: 541-737-2563

Email: Debi.Mandigo@orst.edu

A \$500 prize will be presented for the best student paper. For details, please visit the website <osu.orst.edu/Dept/IIFET/2000> or contact Ann.L.Shriver@orst.edu, or write to the address above.

AQUA 2000 Conference

AQUA 2000, an international conference and trade show with the theme “Responsible Aquaculture in the New Millennium” will be held 2 to 6 May 2000 in Nice, France. The meeting is jointly organized by the European Aquaculture Society (EAS) and the World Aquaculture Society (WAS). Sponsors include the European Union, the FAO, and IFREMER. On schedule are over 770 oral and poster presentations from attendees from 60 countries. Among the technical sessions planned are Pond Culture, hosted by CRSP researcher Claude Boyd; Aquaculture Engineering, hosted by CRSP researcher Raul Piedrahita; Aquaculture Networking and Communication; Cooperative Aquaculture Research in Developing Countries; Fish Nutrition; Fish Reproduction; and Socio-Economics and Legislation. Kwei Lin, CRSP researcher in Thailand, is a member of the AQUA 2000 Programme Committee.



More information about the conference, including registration materials, can be obtained at the EAS website <www.easonline.org> or at the WAS site <www.was.org/meetings/france/default.htm>.

Upcoming Conferences and Expositions

Date	Topic/Title	Event Location	Contact Information
April 11-13	OSU-Surimi Technology School 2000	Astoria, Oregon, USA	Oregon State University Seafood Laboratory; Phone: 503-325-4531; Fax: 503-325-2753; Email: jae.park@orst.edu
May 2-6	Aqua 2000	Nice, France	WAS Conference Manager, World Aquaculture Society, 21710 7th Place West, Bothell, WA 98021; Phone: 425-485-6682; Fax: 425-483-6319; Email: worldaqua@aol.com
May 9-11	Aquavision 2000	Stavanger, Norway	Phone: 47-51-88-59-02; Fax: 47-51-58-43-68; Email: vidar.julien@skretting.no
May 9-11	European Seafood Exposition	Brussels, Belgium	Phone: 207-842-5599; Email: registration@divcom.com
May 10-13	Acuicultura 2000	Havana, Cuba	Email: CPAM@fishnavy.inf.cu
May 21-25	9th International Symposium on Nutrition and Feeding in Fish	Miyazaki, Japan	Fax: 81-3-5463-0553; Email: take@tokyo-u-fish.ac.jp
May 25-26	Seafood Sustainability in a Changing Climate	Victoria, BC, Canada	University of Victoria; Phone: 250-472-4291; Fax: 250-721-7217; Email: rjlee@uvic.ca
May 28-31	Aquaculture Canada 2000	New Brunswick; Canada	Phone: 506-858-4321; Fax: 506-858-4541; Email: AAC2000@umoncton.ca
May 30-Jun 1	Fishery 2000	Guangzhou Province, Canton, China	Phone: 852-2851 8603; Fax: 852-2851 8637; Email: topreput@hkabc.net
June 15-18	2000 Taipei International Food Show	Taipei, Taiwan	Phone: 886-2-2725-1111; Fax: 886-2-2725-1314
June 15-18	IFAF 2000	Izmir, Turkey	Phone: 31-30 295-5321; Fax: 31-30 295-5585; Email: molhd@jaarbeursutrecht.nl
June 21-25	Atlantic Aquaculture Exposition, Conference, & Fair	New Brunswick, Canada	Phone: 506-658-0018; Fax: 506-658-0750; Email: show@nbnet.nb.ca
June 21-25	"Modern means for reproduction and use of aquatic bioresources"	St. Petersburg, Russia	Phone: 095-923 82 90; Fax: 095-925 47 31
July 3-6	The 4th Asia-Pacific Conference on Algal Biotechnology	Hong Kong, China	Phone: 852-2559-9973; Fax: 852-2547-9528; Email: algae@icc.com.hk
July 10-13	IIFET 2000	Corvallis, Oregon, USA	Debi Mandigo, Dept. of Ag. & Resource Economics, Oregon State University, Corvallis, OR 97331-3601; Phone: 541-737-1414; Fax: 541-737-2563; Email: Debi.Mandigo@orst.edu; Website: <osu.orst.edu/Dept/IIFET/2000>
July 12-14	2nd Japan Int'l Seafood and Technology Expo 2000	Tokyo, Japan	Phone: 81-3-5775-2855; Fax: 81-3-5775-2856; Email: kazexhb@sannet.ne.jp
July 15-22	Genetics in Aquaculture VII	Townsville, Australia	Phone: 07-4781-6219; Fax: 07-4781-5822; Email: genaqua@aims.gov.au
July 20-23	3rd International Conference on Recirculating Aquaculture	Roanoke, Virginia, USA	Dr. George Libey, Recirculating Aquaculture Conference 2000, Virginia Tech, Blacksburg, VA 24061; Phone: 540-231-6805; Fax: 540-231-9293; Email: CFAST@vt.edu

Upcoming Conferences and Expositions (cont.)

Date	Topic/Title	Event Location	Contact Information
July 23–26	International Congress on the Biology of Fish	Aberdeen, Scotland	Don MacKinlay; Phone: 604-666-3520; Email: MacKinlayD@pac.dfo-mpo.gc.ca; Website: <www.fishbiologycongress.org>
August 20–24	130th American Fisheries Society Annual Meeting	St. Louis, Missouri, USA	Betsy Fritz; Phone: 301-897-8616/212; Email: bfritz@fisheries.org
September 3–5	5th International Symposium on Tilapia in Aquaculture	Rio de Janeiro, Brazil	Phone: 021-553-1107; Fax: 021-553 3487
September 29–October 5	International Marine Biotechnology Conference (IMBC) 2000	Townsville, Queensland, Australia	Phone: 61-7-4781-6219; Fax: 61-7-4781-5822; Email: imbc_2000@aims.gov.au
October 5–7	III Simposium Internacional de Acuicultura	Sinaloa, Mexico	Phone: 52-67-172720; Fax: 52-67-146705; Email: terramar@pacificnet.com.mx
October 25–28	4th Latin American Aquaculture Congress & Exhibition	Atlapa, Panama	Email: camaricultura@gfce.com
October 31–November 3	Third World Fisheries Congress	Beijing, China	Phone: 86-10-64194233; Fax: 86-10-64194231; Email: scfish@agri.gov.cn
November 1–4	Marketing Live Aquatic Products 2000	Annapolis, Maryland, USA	Phone: 302-645-4060; Fax: 302-645-4007; Email: ewart@udel.edu
November 9–12	AgAsia 2000	Bangkok, Thailand	Email: agasia@reedtradex.co.th
November 14–17	FISHERY 2000	Jakarta, Indonesia	Phone: 852-2851-8603; Fax: 852-2851-8637; Email: topreput@hkabc.net
November 19–22	V International Symposium on Aquaculture Nutrition	Yucatan, Mexico	Phone: 52-99-812973; Fax: 52-99-812334; Email: sinav@kin.cieamer.conacyt.mx
January 21–25, 2001	Aquaculture 2001	Orlando, Florida, USA	WAS Conference Manager, World Aquaculture Society, 21710 7th Place West, Bothell, WA 98021; Phone: 425-485-6682; Fax: 425-483-6319; Email: worldaq@aol.com
August 19–23, 2001	131st American Fisheries Society Annual Meeting	Phoenix, Arizona	Betsy Fritz; Phone: 301-897-8616/212; Email: bfritz@fisheries.org

The Development Record and the Effectiveness of Foreign Aid

The US Agency for International Development recently issued, under the above title, a study prepared by Michael J. Crosswell which argues that widespread development progress over the past three decades provides powerful circumstantial evidence for the effectiveness of foreign aid.

The report examines the record of 90 countries (with a total current population of about 3 billion) which received US foreign aid during the period 1962–90 and concludes that 57 of the 90, embracing nearly 2.4 billion people, have been able to sustain economic growth at meaningful rates for a reasonably long period of time.

This growth has almost always resulted in declines in the proportion of the population below the poverty line. The improvement in social indicators, such as infant mortality and illiteracy, further substantiates the decline in poverty.

This publication is available from the Office of Legislative and Public Affairs, USAID, 1300 Pennsylvania Ave., N.W., Washington, DC 20523, (202) 712-4810

Workshops and Short Courses

Date	Title/Topic/Site	Contacts
Year-round	Various courses and study tours tailored to meet the training needs of a specific group or agency / Asian Institute of Technology, Thailand	Training and Consultancy Unit (TCU), Aquaculture and Aquatic Resources Management Program, Asian Institute of Technology, PO Box 4, Klong Luang, Pathumthani 12120, Thailand; Phone 66-2-524-5219; Fax: 66-2-524-5484; Email: tcuaasp@ait.ac.th; Website: <www.agri-aqua.ait.ac.th/tcu>
April 7	Backyard Aquaculture / ACTED, Florida	Aquaculture Center for Training, Education, and Demonstration (ACTED) Contact: Harbor Branch Oceanographic Institution, 5600 US Hwy 1 North, Ft. Pierce, FL 34946; Phone: 561-465-2400; Fax: 561-465-2446; Website: <www.aquaculture-online.org>
April 10-11	Spiny Lobster Culture / ACTED	ACTED (see above)
April 26-28	Opportunities in Aquaculture / ACTED	ACTED (see above)
May 1-12	Inland Aquaculture Study Tour / Asian Institute of Technology, Thailand	Training and Consultancy Unit (see above)
May 8-11	Shrimp Maturation Techniques / ACTED	ACTED (see above)
May 12-20	Shrimp Hatchery Operations / ACTED	ACTED (see above)
May 22-24	Live Feeds Culture / ACTED, Florida	ACTED (see above)
May 26	Shrimp Farming Opportunities / ACTED	ACTED (see above)
June 5-30	Hatchery Management For Finfish / Asian Institute of Technology, Thailand	Training and Consultancy Unit (see above)
June 12-23	Advanced Techniques in Marine Finfish / ACTED	ACTED (see above)
June 24	Fish Processing Technology / ACTED	ACTED (see above)
June 25-July 1	Aquaponics and Tilapia Aquaculture Short Course / University of the Virgin Islands / St. Croix, U.S. Virgin Islands	James Rakocy, RR 2, Box 10,000, Kingshill, VI 00850; Phone: 340-692-4020; Email: jrakocy@uvi.edu; Website: <rps.uvi.edu/AES/Aquaculture/UVIShortCourse.html>
July 13-14	Queen Conch Culture / ACTED	ACTED (see above)
July 17-August 4	Practical Aquaculture Techniques / ACTED	ACTED (see above)
July 25-29	Recirculating Aquaculture Systems / ACTED	ACTED (see above)
August 14-18	Intensive Shrimp Culture / ACTED	ACTED (see above)
August 14-September 8	Advances In Tilapia Fry Production And Grow-Out / Asian Institute of Technology, Thailand	Training and Consultancy Unit (see above)
September 15	Backyard Aquaculture / ACTED	ACTED (see above)
September 19-21	Opportunities in Aquaculture / ACTED	ACTED (see above)
September 22	Marine Aquarium Keeping / ACTED	ACTED (see above)
October 13	Shrimp Farming Opportunities / ACTED	ACTED (see above)
October 16-20	Hard Clam Aquaculture / ACTED	ACTED (see above)
October 23-27	Bivalve Hatchery Operations / ACTED	ACTED (see above)
Year-round	Training and Research in Fisheries and Stock Management / Wageningen Agricultural University, the Netherlands	G. van Eck, Dept of Fish Culture & Fisheries, PO Box 338, 6700 AH Wageningen, The Netherlands; Phone: 31-8370-8330; Fax: 31-8370-83937; Email: gerrie.van.eck@alg.venv.wau.nl
Year-round	Tropical Aquaculture Advanced Training in a Third World Country / Escuela Agricola Panamericana (EAP), Honduras, and Asian Institute for Technology, Thailand	Zentralstelle fuer Ernährung und Landwirtschaft (ZEL) Feldafing / Zschortau, Deutsche Stiftung fuer Internationale Entwicklung (DSE), D-82336 Feldafing, Germany; Phone: 49-8157-38-0; Fax: 49-81-57-38-227

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You can also access CRSP publications electronically at
<pdacrsp.orst.edu/pubs/publications.html>.

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AQUANEWS

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<pdacrsp.orst.edu>

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