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*NETworking... CRSP HCPI Exchange Project Phase II participants pause for a photo during a field trip at their South Africa workshop. see page 4*

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## A Bivalve Market Study in Pacific Mexico Targets Buyers' Concerns and Farmers' Opportunities

by Francisco Javier Martínez-Cordero, Quentin Fong, Eladio Gaxiola Camacho, Guillermo Rodríguez Domínguez and María Haws

The Aquaculture CRSP's Human Health and Aquaculture project has been studying the relationship between human health, environmental quality, and aquaculture development on the Pacific Coast of Mexico since 2004. One component of this work has involved research and extension aimed at increasing bivalve aquaculture and improving the quality of bivalves produced, particularly in the area of pre- and post-harvest sanitation. Bivalve (e.g. clams, oysters, scallops) culture offers tremendous potential in many parts of the developing world because of its relatively low costs and technological demands (Figure 1). Also, bivalve culture can be environmentally positive as bivalves do not require artificial feeds during the adult stages and as filter feeders offer an important environmental service in helping maintain water quality.

The Mexican government has prioritized bivalves and tilapia for aquaculture development. Partners in this project



Figure 1. Boca Camichin oyster farmers shucking locally grown oysters.

## Graduate Student Profile: Sunila Rai (AIT ,Thailand)

Sunila Rai 's interest in fish was not the only motivation for her to complete a graduate degree in aquaculture; another strong factor was the relatively small involvement of women in aquaculture in her home country of Nepal.

Sunila completed a Biology degree at Tribhuvan University in Nepal in 1991, a Master's Degree at Thailand's Asian Institute of Technology (AIT) under Dr. C. Kwei Lin, and recently a PhD degree with Dr. Yang Yi at AIT. She selected AIT because in her view it was the best institute for aquaculture in Asia. Her graduate work involved nutrient waste recycling through integration of intensive catfish cage culture with semi-intensive carp polyculture in ponds, followed by dissertation research involving the use of rice straw in producing carp. Her PhD dissertation is entitled "Use of Rice Straw as Substrate for Periphyton-Based Fish."



Sunila recently completed her PhD at Thailand's AIT.

The ACRSP was instrumental in supporting Sunila's graduate education. She was involved with ACRSP-funded projects in 1996 and from 2004-2007. She is grateful to have received ACRSP support, and was pleased that she was able to perform her research quickly and continuously, with assistance from her major professors. Her PhD advisor, Dr. Yang Yi, was an ACRSP host country principal investigator (HCPI) while at AIT. He is now an AquaFish CRSP HCPI at China's Shanghai Fisheries University.

*Sunila continued on Page 6*

## Goings-on in the Pond...



Congratulations! (and belated congratulations) to Rebecca Lochmann, President of the United States chapter of the World Aquaculture Society (WAS); Yang Yi, President of the Asian Pacific chapter of WAS; Kevin Fitzsimmons, Planning Committee for the World Aquaculture 2008 meeting in Busan, Korea; and Wilfrido Contreras-Sánchez, Planning Committee for the World Aquaculture 2009 meeting in Veracruz, Mexico.

The AquaFish CRSP HCPI Exchange Project on Tilapia and Cichlid Culture concluded its Phase II workshop series in Brazil (17 to 23 February 2008). The project brought together Host Country PIs from the AquaFish CRSP and the former Aquaculture CRSP to share information and experiences on tilapia/cichlid culture in different countries, focusing on successful techniques and practices. For more on this project see the full story on [page 4](#).

*Salud, Ambiente, y Acuicultura en la Costa Pacífica de México*, edited by Maria Haws *et al.*, was recently published by the Aquaculture CRSP. Final ACRSP publications include *Best Management Practices for Responsible Aquaculture* by Claude Boyd *et al.* and ACRSP Translated Abstracts: 1997-2007 (translations by Suyapa Triminio Meyer *et al.*). To download or order these and other CRSP publications, visit the ACRSP publications web site. <http://pdacrsp.oregonstate.edu/pubs/>

The AquaFish CRSP welcomes its new student employees Ramkumar Sevanan, Lisa Reifke, and Stephanie Misola.



...BIVALVE Continued from Page 1

include the Research Center for Food and Development/Mazatlan (CIAD), Fisheries Industry Technology Center/University of Alaska Fairbanks, Autonomous University of Sinaloa, and the Pacific Aquaculture and Coastal Resources Center at the University of Hawaii Hilo, in close partnership with the oyster growing cooperatives in Nayarit and Sinaloa, Mexico.

The State of Nayarit has been home to small-scale oyster farmers since 1986. These farms are operated by families and cooperatives and utilize the native oyster species, *Crassostrea corteziensis*, also called the “Pleasure Oyster” in Spanish because of its legendary aphrodisiac qualities. Like many small farmers, the oyster cooperatives are working to improve the quality of their product, expanding marketing outside the immediate community, and developing value-added products such as oyster pâté (Figure 2). In Sinaloa State, groups of oyster farmers have been established and new groups are beginning to grow oysters as an alternative livelihood.



Figure 2. A typical shellfish open air restaurant.

A marketing study was carried out as part of a multi-activity effort conducted with the beneficiaries (farmers) to help them successfully produce and commercialize their oysters. As selling to local buyers was considered among the most feasible options given the production volume and marketing abilities of the local farmers, the study focused on information from the demand side, specifically the market segment of local buyers and consumer preferences.

The results show that selling directly to local buyers (restaurants and mobile kiosk owners) is the best marketing strategy for the farmers to follow, considering their current low production capacities. The study also revealed characteristics of the local market: preferences for local regional oysters, and demand for a product high in quality (size) and safety, with consistent year-round supply (Figure 3). Farmers are advised to take advantage of a possible 0.50 to 1.00-peso increase in price per piece that buyers will pay when the above characteristics are met. With products that include these characteristics,

a long-term commercial relationship that is based on trust and communication can be established between farmers and local buyers.

Although some major wholesale seafood markets were evaluated, these were not recommended to farmers due to the reduced margin profit in the wholesale markets of La Viga and Zapopan. Farmers might also find it difficult to sustain the high-volume supply of oysters that these markets demand. Based on information from one-on-one interviews between researchers and survey respondents, the timing may be right for farmers to develop relationships with buyers and markets that can guarantee the current price premium. The local market has the capacity to absorb current and near-future production, but in a few more years, there may be more products in the market, and the price elasticity of demand may turn negative.

Oyster Product Attributes	Average Score
Consistency in Supply	10.00
Uniformity in Size	10.00
Water Quality at Product Origin	10.00
Price	9.73
Mode of Transportation	9.64
Meat Fill	9.45
Oyster Size	9.36
Product Origin	9.00
Shape of Oyster	8.18

Figure 3. Ranking of oyster attributes by local buyers.



# Phase II of the CRSP “Host Country Principal Investigator Exchange Project” Concludes

by Jim Bowman

Building on the success of the original Host Country Principal Investigator (HCPI) Exchange Project conducted by the Aquaculture CRSP in 2005 and 2006, the AquaFish CRSP conducted follow-on activities in four additional countries in 2007 and 2008: South Africa, Ghana, Vietnam, and Brazil. Workshops were held in South Africa and Ghana between 22 October and 2 November 2007, Vietnam was visited from 6 to 10 December 2007, and the final workshop occurred in Brazil during 17 to 23 February 2008.

Each workshop included a seminar organized by the CRSP host institution’s Principal Investigator (PI), followed by a tour of that institution’s aquaculture research facilities. In South Africa, Lourens De Wet and Khalid Salie (Stellenbosch University) hosted the workshop. Steve Amisah (Kwame Nkrumah University of Science and Technology, Kumasi) hosted the Ghana workshop. Nguyen Thanh Phuong (Can Tho University) hosted the workshop in Vietnam. Maria Célia Portella (Aquaculture Center, State University of São Paulo, Jaboticabal) hosted the group in Brazil.

In South Africa the workshop dovetailed with Aquaculture Africa, the 8th conference of the Aquaculture Association of Southern Africa (AASA), held in Cape Town from 22 to 25 October 2007, and in Brazil a special two-day seminar on

Brazilian tilapia culture was organized by Dr. Portella to kick off the CRSP HCPI workshop.



*Vietnam workshop host Nguyen T. Phuong describes the facilities and functions of Research Institute for Aquaculture #2, Tien Giang Province, during the Phase II visit in December, 2007.*

Each workshop also included a minimum of three days of field visits, during which participants were able to observe tilapia culture technologies and practices that are currently being implemented in each country. Each workshop offered extensive opportunities for discussion with farmers, extension agents, and other government officials, processors, and others regarding constraints faced, solutions considered or investigated, and the most successful technologies that have been developed. Phase II of the Exchange Project differed from Phase I in two significant ways: 1) a mentoring approach was used, in which Phase I PIs representing Thailand, the Philippines, Mexico, Honduras, and Kenya participated in each Phase II workshop, using their experience to assist Phase II participants and broaden the benefits of Phase II; and 2) the scope of interest was widened to include aspects of aquaculture beyond pure production concerns, i.e., to include value-chain



*Remedios Bolivar (CLSU, Philippines) and Wilfrido Contreras-Sánchez (UJAT, Mexico), CRSP project mentors (left), listen to an explanation about the hatchery facilities at the UNESP Aquaculture Center in Jaboticabal, São Paulo, Brazil.*

...HCPI Continued from Page 4

components such as harvesting, transportation, processing, and marketing.

Without exception, participants in both phases felt that the workshops benefited them enormously in terms of providing them with new information that they could take home regarding the culture, harvesting, processing, and marketing of tilapia and other native cichlids.



## Notices of Publication

Notices of Publication announce recently published work carried out under CRSP sponsorship. To receive a full copy of a report, please contact the author(s) directly. Abstracts are also available online on the Research Reports page at <http://pdacrsp.oregonstate.edu/pubs/>.

### EFFECTS OF ALPHA-LIPOIC AND ASCORBIC ACID ON THE MUSCLE AND BRAIN FATTY ACIDS AND ANTIOXIDANT PROFILE OF THE SOUTH AMERICAN PACU *PIARACTUS MESOPOTAMICUS*

Sofia Trattner & Jana Pickova  
Department of Food Science  
Swedish University of Agricultural Sciences  
Uppsala, Sweden

Kwan H. Park  
Department of Aquatic Life Medicine  
College of Ocean Science and Technology  
Kunsan National University, Republic of Korea

Jacques Rinchar  
Department of Environmental Science and Biology  
State University of New York College at Brockport  
Brockport, NY USA

Konrad Dabrowski  
School of Natural Resources  
Ohio State University  
Columbus, OH USA

07-225

The effects of dietary alpha-lipoic acid (LA) and vitamin C on the fatty acid (FA) composition in the brain and muscle and vitamins E and C levels in the brain were studied in the fish *Piaractus mesopotamicus*. A two-factorial design, where diets were devoid or supplemented with ascorbate (500 mg AA kg<sup>-1</sup>) and/or lipoic acid (1000 mg kg<sup>-1</sup>), was used. The levels of eicosapentaenoic acid (20:5n – 3, EPA) increased (P <

0.01) in muscle polar lipids (PL) in LA groups (6.93% ± 0.43 vs. 5.83% ± 0.40 and 6.68% ± 0.53 vs. 6.00% ± 0.39), and the same trend was also seen in the brain, however not significant. These changes are suggested to be caused by a change in lipid metabolism rather than being a direct effect of protection by LA against lipid peroxidation. No interaction of vitamin C and LA neither effects of LA on vitamin E (15.1–19.2 mg alpha-tocopherol g<sup>-1</sup> tissue) or vitamin C (total AA, 41.7–89.8 µg g<sup>-1</sup> tissue) in brain was detected.

This abstract was excerpted from the original paper, which was published in *Aquaculture*, Vol. 273(1): 158-164 in November 2007.

### ECONOMIC ANALYSIS OF NILE TILAPIA PRODUCTION IN GHANA

Aloyce R. Kaliba  
University of Arkansas at Pine Bluff  
Pine Bluff, AR USA

Steve Amisah  
Kwame Nkrumah University of Science and Technology  
Kumasi, Ghana

Linus Kumah  
Ministry of Fisheries  
Accra, Ghana

Kwamena K. Quagraine  
Purdue University  
West Lafayette, IN USA

07-226

Economic profitability of Nile tilapia (*Oreochromis niloticus*) production in Ghana was analyzed using a dynamic model that simulates individual fish growth and takes fish population dynamics in the pond into account. The results suggest that the current practiced mixed-sex tilapia culture with catfish predation was economically sustainable. However, to increase returns on investments, extension efforts should be geared towards developing a Nile tilapia production system that is based on a hand-sexed all-male tilapia culture. Other fundamentals include pond studies to determine optimal pond size, availability of affordable feed and quality fingerlings. Under an improved production system, profits are high enough to justify investment through borrowed capital.

This abstract was excerpted from the original paper, which was published in *The Quarterly Journal of International Agriculture*, Vol. 46(2): 105-117 in 2007.

## Notices of Publication, continued

### ECONOMIC PROFITABILITY OF NILE TILAPIA (*Oreochromis niloticus* L.) PRODUCTION IN KENYA

Aloyce R Kaliba  
Department of Economics and Finance  
Southern University and A&M College  
Baton Rouge, LA USA

Charles C Ngugi  
Department of Fisheries and Aquatic Sciences  
Moi University  
Eldoret, Kenya

John Mackambo  
Department of Biological Sciences  
Moi University, Eldoret, Kenya

Kwamena K Quagraine  
Department of Agricultural Economics, Purdue University  
West Lafayette, IN USA

07-227

Economic profitability of Nile tilapia production in Kenya was analyzed using a model that simulated individual fish growth and took fish population dynamics in the pond into account. The results suggest that the currently practiced mixed-sex tilapia culture is economically unsustainable. It is suggested that research and extension efforts be geared towards developing monosex Nile tilapia production systems. Nile tilapia culture with African catfish predation should be viewed as an intermediate step towards all-male Nile tilapia culture. This will allow accumulation of both physical and human capital to support all-male tilapia culture. Under all-male culture, economic returns are high enough to justify investment in Nile tilapia culture using borrowed capital. However, the success of monosex culture will depend on the availability and affordability of quality fingerlings and low-cost fish feeds. The results have a wide application in Sub-Saharan Africa where mixed-sex Nile tilapia culture is common.

*This abstract was excerpted from the original paper, which was published in Aquaculture Research, Vol. 38(11): 1129-1136 in August 2007.*

*Sunila continued from Page 2*

Sunila is proud of her accomplishments in aquaculture research, and plans to continue working in national and regional fisheries and aquaculture programs, expanding on Nepal's extensive work in carp production. She also hopes to encourage other women with interests in fish and aquatic resource management to become part of the growing number of Asian women involved in aquaculture research.

### POTENTIAL EFFECT OF AQUACULTURE PROMOTION ON POVERTY REDUCTION IN SUB-SAHARAN AFRICA

Aloyce R. Kaliba  
Department of Economics & Finance  
Southern University and A & M College  
Baton Rouge, LA USA

Charles C. Ngugi & John M. Mackambo  
Moi University  
Nairobi, Kenya

Kajitanus O. Osewe  
Kingolwira National Fish Farm  
Morogoro, Tanzania

Ephraim Senkondo & Berno V. Mnembuka  
Sokoine University of Agriculture  
Morogoro, Tanzania

Steven Amisah  
University of Science and Technology  
Kumasi, Ghana

07-228

There is a policy of increased support of aquaculture development in Sub-Saharan Africa. In the region, aquaculture expansion has the potential to create new jobs and improve food security among poor households. Three computable general equilibrium models were used to estimate the effects of aquaculture expansion and increased input productivity on poverty reduction in Ghana, Kenya, and Tanzania. The results suggest that there will be positive effects on per capita income for all households in Ghana and Kenya. In Tanzania some rich households will experience income loss, because of resource shift from other sectors to aquaculture. Because of reduction in poverty associated with price reductions, and increases in minimum income associated with income expansion, the poverty gap decreased in all household groups. Because of high sectoral linkages, aquaculture development is a potential candidate for sector-specific policy support to address poverty reduction in Sub-Saharan Africa.

*This abstract was excerpted from the original paper, which was published in Aquaculture International, Vol. 15(6): 445-459 in December 2007.*



## Upcoming Meetings and Events...

The AquaFish CRSP is proud to support workshops and meetings designed to facilitate increased knowledge and communication in aquaculture. Meetings and workshops coming up in 2008 include:

- **Ecology, Ethology and Evolution of Fishes (EEEF) 2008 Conference**  
29 June - 3 July 2008 at Boston University in Boston, MA USA  
<http://www.bu.edu/eeef/>  
See **Meeting Highlight** below
- **IIFET 2008 - Achieving a Sustainable Future: Managing Aquaculture, Fishing, Trade and Development**  
22-25 July 2008 in Nha Trang, Vietnam  
<http://www.ntu.edu.vn/iifet2008/>
- **8th Annual International Symposium on Tilapia in Aquaculture (ISTA)**  
12-14 October 2008 in Cairo, Egypt  
<http://ag.arizona.edu/azaqua/ista/ISTA8/ISTA8.htm> or [www.ista8-egypt.com](http://www.ista8-egypt.com)

## Meeting Highlight...

A special symposium session, "Tilapia and Other Cichlids" will be held during the 2008 Biennial EEEF meeting. Cichlids have been the subject of studies of ecology, ethology, and evolution for more than 50 years. Tilapias are among the primary fish species in tropical aquaculture; other cichlids are major subjects for conservation.

Two senior authorities on cichlid fishes will highlight the symposium: Miles Keenleyside will serve as Invited Session Chair for this symposium; Karel Liem is the Invited Keynote Speaker. The proceedings of this symposium, with additional invited review and original research articles, will be published as a volume in the Fish and Fisheries monograph series, edited by David Noakes. The published proceedings will emphasize the importance of cichlids, primarily tilapias, to commercial aquaculture. There will also be attention paid to increasing concerns about the

potential impacts of tilapias as introduced species on native cichlids. The cichlids are perhaps the primary example of extreme diversity among freshwater fishes, and this aspect of cichlid biology will also be addressed in the monograph. There will be a number of invited and contributed papers dealing with the highly complex social behavior - especially reproductive and parental behavior - in cichlid fishes in the published proceedings.



## Poetry Corner

### The Oyster Gatherer

by Thorpe Moeckel

He dances the flats, gleaner of tides  
in yellow knee highs, snatches  
the creatures that spit & cough, rugged  
razors of lavender, sphagnum, peach --

throws out the sprung ones,  
mudders, black hearts sliding  
into rockweed, kelp, & knotted wrack.  
Each winter, when the Gulf

bottoms out, he goes, salt-licked  
& nerve-numb, legs tireless reeds --  
sea ducks further out  
towards Winnegance, the sun

low & glowing off vacant  
summer homes. It's work,  
the way love is, being a friend,  
building a house,

or after the shucking, chopping  
garlic & lime. He's learned  
to see past reflections --  
birch, white pine, sky --

to mud & clay, what's there.  
Now the clatter & drainage  
of his perforated spackle bucket  
filling up: listen, listen.

The Oyster Gatherer is from *Odd Botany*, Silverfish Review Press, 2002.



AquaFish CRSP  
Oregon State University  
418 Snell Hall  
Corvallis OR 97331-1643 USA  
<http://pdacrsp.oregonstate.edu>



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Program Director: Dr. Hillary S. Egna  
*Aquanews* Editor: Dr. Kara Warner

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