

AQUANEWS



Sustainable Aquaculture
for a Secure Future

AQUAFISH COLLABORATIVE RESEARCH SUPPORT PROGRAM NEWSLETTER

Volume 22, Number 2/Spring 2007

Contact us at aquafish@oregonstate.edu

ISSN 1062-4996

Visit *Aquanews* archives at <http://pdacrsp.oregonstate.edu>

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Trout on display at recent Pond School Workshop; see page 4 (photo by Nada Mohamed)

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AquaFish CRSP Looks Forward to New Projects, New Host Countries

USAID awarded Oregon State University (OSU) a new Aquaculture & Fisheries Collaborative Research Support Program (CRSP) award beginning in October 2006. The new AquaFish CRSP grant - the name reflects the emphasis on fisheries research and outreach in addition to aquaculture work - is directed by Dr. Hillary Egna and her management staff at OSU.

A request for proposals resulted in nineteen research and outreach proposals focusing on the four AquaFish CRSP programmatic themes: Improved Health and Nutrition, Food Quality, and Food Safety of Fishery Products; Income Generation for Small-Scale Fishers and Farmers; Environmental Management for Sustainable Aquatic Resources Use; and Enhanced Trade Opportunities for Global Fishery Markets. After external NSF-style peer reviews, external panel reviews, and additional USAID and programmatic reviews, six finalists were selected to receive awards.

Recently, the six lead US Principal Investigators (PIs) and six Host Country PIs from each finalist group met with AquaFish CRSP management staff and USAID staff in Washington D.C. Topics of discussions centered on optimizing outreach and dissemination strategies, and identifying and measuring impact indicators. The group also discussed environmental compliance and gender strategies in order to recognize and support the role of women in aquaculture and fisheries within each host country.

The six awards seek to enhance aquaculture and fisheries health, environment, and economic impacts through research and outreach projects in Latin America, Africa, and Asia. Guyana is a new host country (not involved under the previous Aquaculture CRSP grant); addition of more host countries is one goal of the AquaFish CRSP, which will issue another request for proposals in 2009.

See [page three](#) for a list of the AquaFish CRSP award finalists. The lead US universities will also involve other subcontracting US institutions, including the University of Rhode Island, Louisiana State University, Texas Tech University, Virginia Tech University, and the University of Arkansas at Pine Bluff, along with other collaborators

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Benefits of Aquaculture CRSP Research in Bangladesh

by Md. Abdul Wahab, Yang Yi, and James S. Diana

Aquaculture contributes 46 percent of the total fish production of 2.2 million tons in Bangladesh. It is vital to the national economy in terms of nutrition, income, employment generation, and foreign exchange earning. Polyculture of four to seven species of Indian major carps and Chinese carps in manured and/or fertilized ponds forms the main aquaculture technology, with an average production of only 2,800 kg/ha.

Dr. Hillary Egna (Oregon State University, USA), the director of Aquaculture CRSP (ACRSP), initiated expansion of ACRSP to Bangladesh in 2000, followed by Dr. Yang Yi (Asian Institute of Technology, Thailand) and Prof. Md. Abdul Wahab [Bangladesh Agricultural University (BAU), Mymensingh, Bangladesh]. From a field visit in March 2001, it became clear that many non-governmental organizations (NGOs) were engaged in promoting aquaculture development along with the government. However, different NGOs and government organizations often recommended different fertilization regimes to rural farmers, and these did not seem to increase yields, but rather created confusion among the users.

Both over- and under-fertilization cause adverse effects on water quality, fish production, pond effluents, and economic returns. Therefore, Dr. Yang Yi proposed that the first ACRSP work in Bangladesh would evaluate the performance of different fertilization regimes and compare NGOs' fertilization regimes with that developed by CRSP in Thailand at BAU. The results of this experiment recommended appropriate fertilization strategies for fish farmers in Bangladesh. With this view, the ACRSP research team at BAU implemented both on-



Farmers harvesting fish from a fertilization regime test farm in Bangladesh (photo by Md. Asaduzzaman)

... BANGLADESH Continued on page 7

Goings-on in the Pond...



Enter the **contest** for a slogan for the new AquaFish CRSP! The current ACRSP slogan, "Sustainable Aquaculture for a Secure Future," will be included in the line-up, but we encourage your ideas! Please send your new slogan concept to aquafish@oregonstate.edu by 20 August, and include **Slogan** in the subject line. The winner receives a **free CRSP tee shirt!**

AquaFish CRSP wishes a fond farewell to its student employees Beth Kerrigan and Nada Mohamed, who are looking forward to their international travels this summer. We thank them for their service and wish them the best.

The upcoming CRSP Council Meeting will be hosted by the AquaFish CRSP and Oregon State University in Portland, OR, USA on 1-3 August 2007.

Oregon State University celebrated Earth Day on its Corvallis, Oregon campus with a Community Fair on 24 April 2007. Members from conservation and environmental groups displayed booths and distributed information. The AquaFish CRSP joined the fun with a photo booth and an interactive game to foster interest in international aquaculture. To receive a complimentary copy of the Tantalizing Tilapia Recipe booklet distributed at the fair, send an e-mail to aquafish@oregonstate.edu.



AquaFish CRSP student employees Nada Mohamed (left) and Shayna Eberle (right) engage fair attendees with games and information on CRSP activities at OSU's Earth Week Community Fair.

Graduate Student Profile: Emmanuel Vera Cruz

Emmanuel Vera Cruz first became interested in aquaculture as a high school student in the Philippines. From Emmanuel's point of view, "the Philippines are gifted with an abundance of available land and water resources ideal for many types of aquaculture. However, the conflicts between aquaculture and other forms of agriculture have slowed growth and limited the resources available to aquaculturists. In addition, the development of disease and pollution of important bodies of water caused by poor aquaculture practices and industrial contaminants also suppress[ed] aquaculture's popularity and productivity in the region." Therefore, he chose to learn more about aquaculture, and the science involved in advancing this field.

Emmanuel earned an undergraduate degree in Inland Fisheries at Central Luzon State University in the Philippines in 1984. More recently he was supported by the Aquaculture CRSP to pursue a Ph.D. in Biology from Florida International University (FIU) under Dr. Chris Brown, who characterizes Emmanuel as



Drs. Brown and Vera Cruz at Emmanuel's graduation from Florida International University

"just a superb and scholarly chap." Emmanuel's dissertation research, entitled "Insulin-like Growth Factor-I Gene Expression as a Growth Indicator in Nile Tilapia *Oreochromis niloticus*" centered on the use of hepatic insulin-like growth factor-I (IGF-I) as a growth indicator in Nile tilapia reared under laboratory conditions. Emmanuel is excited about the potential applications of his research. "If hepatic and/or circulating IGF-I gene expression can be proven to be an efficient rapid and short-term indicator of growth in this species of fish, then we can save time and money in growth evaluation studies." He hopes his work will contribute to research-based successes in aquaculture in the Philippines, namely improved design of aquaculture facilities, formulation of feeds and culture of live foods, disease prevention and control, and genetic improvement of farmed fish like tilapia.

After graduating from FIU in December 2006, Emmanuel is now back at Central Luzon State University at the College of Fisheries and Freshwater Aquaculture, where he plans to continue the application of biotechnological research to Nile tilapia and other species of freshwater fish economically important in his home country.

See the Notices of Publications section (page 5) for an excerpt from a recent publication on Emmanuel's research with Chris Brown.



AquaFish CRSP 2007 Award Finalists

Lead US PI... Title

Robert Pomeroy (University of Connecticut at Avery Point)... "Development of Alternatives to the Use of Freshwater Low Value Fish for Aquaculture in the Lower Mekong Basin of Cambodia and Vietnam: Implications for Livelihoods, Production and Markets"

Russell Borski (North Carolina State University)... "Improved Cost Effectiveness and Sustainability of Aquaculture in the Philippines and Indonesia"

James S. Diana (University of Michigan)... "Improving Sustainability and Reducing Environmental Impacts of Aquaculture Systems in China, and South and Southeast Asia"

Kevin Fitzsimmons (University of Arizona)... "Developing Sustainable Aquaculture for Coastal and Tilapia Systems in the Americas"

Kwamena K. Quagrainie (Purdue University)... "Improving Competitiveness of African Aquaculture through Capacity Building, Improved Technology, and Management of Supply Chain and Natural Resources"

Maria Haws (University of Hawaii at Hilo)... "Human Health and Aquaculture: Health Benefits through Aquaculture Sanitation and Best Management Practices"



Recent Workshop: Pond School

by Nada Mohamed

The second annual Pond Workshop was held on 5 May 2007 at Oregon State University (OSU) in Corvallis, Oregon, USA. The workshop, entitled “Pond School 2007: Creating and Maintaining Healthy Ponds” was sponsored by the Oregon Aquaculture Association and the OSU Extension Service, with additional support from the Aquaculture CRSP.

The daylong event attracted attendees from around Oregon with interest in ornamental, recreational and commercial fishponds. Speakers came from OSU, The Oregon Department of Fish and Wildlife, The Oregon Water Resources Department, The US Fish and Wildlife Services, Portland State University and private businesses around the US Pacific Northwest. Guests attended sessions on Pond Ecology, Fish & Pond Management, Ornamental Ponds and Fish, and Pond Building and Retrofitting.

Dr. Jim Bowman, AquaFish CRSP Outreach and Education Coordinator and Assistant Professor in OSU’s Fisheries and Wildlife Department, gave two presentations and was instrumental in organizing the workshop. Bowman observed, “this year’s program was quite an improvement on our first workshop [held last year]. We had more speakers and attracted a larger audience. We were pleased about the number of participants who came and about the enthusiasm they exhibited.” Information about Pond School may be found at www.oregonaquaculture.org.



Simon Seah and Neil Lucht of Pacific Water Gardens (Molalla, OR) display pond filtration units at OSU’s Pond School 2007.

Recent Workshop: Supporting Tilapia Culture in Central America

by Suyapa Triminio Meyer and Daniel E. Meyer

The Aquaculture CRSP team of the Central America Project – including Daniel Meyer, Joseph Molnar, Bill Tollner, Patricio Paz and Suyapa Triminio Meyer – travelled from Honduras and the USA to Panama and Costa Rica to present two training courses from 3 to 9 May 2007. The workshops were hosted by Universidad Católica Santa María La Antigua (USMA) in David, Panama, and Colegio Universitario para el Riego y el Desarrollo del Tropicó Seco in Cañas, Costa Rica.

In each country, the course participants included government officials, extension personnel from local NGOs, farmers from different backgrounds, students and teachers at universities, and representatives of companies providing aquaculture services and inputs. Each three-day course on tilapia culture covered topics such as required conditions for successful tilapia culture, biology, grow-out, pond management, reproduction, water quality, costs and record keeping, and marketing of tilapia. An extension techniques presentation as a tool for diffusion of the acquired knowledge to other farmers was included. In addition, a one-day Pond Design and Construction course presented the use of a computer model developed at the University of Georgia by Bill Tollner that can be utilized not only for aquaculture pond construction, but for water harvesting and watershed reservoir management. Participants and host institutions received training materials in printed and digital format produced by CRSP supported project team members.



Gualaca Aquaculture Station in the Chiriqui province of Panama

...**WORKSHOP** Continued on Page 7

Notices of Publication

Notices of Publication announce recently published work carried out under Aquaculture CRSP sponsorship. To receive a full copy of a report, please contact the author(s) directly.

APPLICATION OF MICROBIAL PHYTASE IN FISH FEED

Ling Cao, Weimin Wang, Chengtai Yang, Zhi Luo, Dapeng Li
Huazong Agricultural University
Wuhan, Hubei PR China

Yi Yang, Amaratne Yakupitiyage
Asian Institute of Technology
Klong Luang, Pathum Thani Thailand

James S. Diana
University of Michigan
Ann Arbor, MI USA

07-220

Phytate is the main storage form of phosphorus (P) in many plants, but phytate-bound P is not available to monogastric or agastric fish animals. Phytase, an enzyme specific to hydrolyze indigestible phytate, has been increasingly used in fish feed during the past two decades, mainly in response to heightened concerns over P pollution to the aquatic environment. Since global phosphate reserves are not renewable, phytate-P as an alternative and economical P source can be effectively converted to available-P by phytase. The capability of this enzyme to enhance bioavailability of P and reduce P load is well documented. Phytase supplementation also leads to improved availability of other minerals and trace elements. Nevertheless, there is still no consistent conclusion that phytase could enhance protein and energy utilization. Studies in amino acid digestibility after phytase supplement are mutative and the underlying mechanisms have not been fully understood. Because phytase is very sensitive to pH and temperature, the utilization of phytase in fish feed is still on its first stage compared with that of in poultry and swine feed. A wide variety of phytases were discovered and characterized in order to find the optimum enzyme which is stable in application, resistant against high temperatures, dust-free, and easy to handle. Initial steps to produce phytase in transgenic plants and fish animals are also undertaken. In this review, the authors focus on comparing properties of phytase from different sources, examining the effects of phytase on P utilization and aquatic environment pollution,

meanwhile providing commercial potentiality and impact factors of phytase utilization in fish feed.

This abstract was excerpted from the original paper, which was published in Enzyme and Microbial Technology, Vol. 40: 497-507 in March 2007.

THE INFLUENCE OF SOCIAL STATUS ON THE RATE OF GROWTH, EYE COLOR PATTERN AND INSULIN-LIKE GROWTH FACTOR-I GENE EXPRESSION IN NILE TILAPIA, *OREOCHROMIS NILOTICUS*

Emmanuel M. Vera Cruz
Central Luzon State University
Science City of Muñoz 3120, Philippines

Christopher L. Brown
Florida International University
North Miami, Florida 33181, USA

07-221

Many aspects of teleost physiology are subject to regulation by social interactions. To evaluate the relationship of social status with growth, eye color pattern and hepatic Insulin-like Growth Factor-I (IGF-I) mRNA expression, 30 *Oreochromis niloticus* were isolated for 10 days and were used in a social pair study. Results revealed that growth of both dominant (except 1 day after social interaction) and subordinate individuals was suppressed, but growth suppression was greater in the subordinates. The dominant fish completely inhibited the feeding of the subordinate individuals during and 1 day after they were introduced into the aquaria together. After that, a pattern of highly aggressive attacks by dominant fish only partially inhibited feeding by the subordinates. Differential alterations in growth rate between dominants and subordinates were attributed more to behavioral changes (i.e., feeding) as transduced by physiological regulators (i.e., IGF-I level and possibly serotonin and/or neuropeptide Y) but may also be due to changes in metabolism. The fish's relative position in the social hierarchy consistently influenced the levels of IGF-I mRNA in the liver and the eye color pattern. Lower social status depressed hepatic IGF-I levels while dominant status stimulated hepatic IGF-I production, possibly in response to inhibition of somatostatin release in the hypothalamus, leading to greater secretion of pituitary growth hormone (GH). A significant positive association was detected between the IGF-I mRNA expression of the dominant fish and the level of aggression (number of attacks) during the encounter. Social status also influenced the eye color pattern of the fish. During aggressive interactions,

...NOP Continued on Page 6

Aquaculture CRSP Outreach Activities in Kenya

by Jim Bowman and Charles Ngugi

Morris Omuhaya operates two ponds near Kakamega in Western Kenya, one built in 1996 (200 m²) and one in 1998 (242 m²). Through Aquaculture CRSP outreach activities in his area, Mr. Omuhaya's farming capabilities have expanded from subsistence farming to income generation. He has utilized inputs including fertilizers (diammonium phosphate and urea), feeds [dairy meal, pig finisher, omena (fishmeal) dust and lake shrimp], fingerlings (tilapia and African catfish), labor (feeding and harvesting) and a water reservoir.

Mr. Omuhaya received training by participating in on-farm trials conducted by the ACRSP in 2001 and 2002. The trials tested the applicability of methods developed in CRSP-sponsored experiments at Kenya's Sagana Aquaculture Centre (formerly Sagana Fish Farm) to the management of ponds run by local farmers. The subsequent benefits to Mr. Omuhaya's operation are best described by Morris himself: "Between 1996-1999... the biggest fish I could produce was 100-150 grams after 12-14 months. Now I am proud to say that I can produce 300-400 grams of tilapia and 6-8 kg of [catfish] in 6 months. This came about after being lucky to be selected for on-farm trials... Fish farming is now a business enterprise for me and my family. I can now eat [fresh] fish with my family and the community can now buy fish from [my farm]. Fish farming has now become my major source of income. The frequent visits by these officers (lecturers from the Kenya Department of Fisheries and Moi University) have even made me become a trainer of other fish farmers in this region of Western Kenya."

The continuing impacts of the skills Mr. Omuhaya gained through his participation in the on-farm trials are illustrated in the following table, where the net value (Kshs) of crops in his two ponds are compared over a three-year period.

Date of Harvest	2002	2003	2004
Duration of Growth	9 months	6 months	6 months
Net value/ month/pond	1103	1809	2544
Net value/ha/ year	149,729	245,566	345,339
% increase in net annual value	-	64%	130%

Upcoming Meetings and Events...

ACRSP is proud to support workshops and meetings designed to facilitate increased knowledge and communication in aquaculture. Meetings and workshops coming up in 2007-08 include...

- **8th Symposium of Central American Aquaculture**, 22-25 August 2007 in Tegucigalpa, Honduras
contact andahn@hondutel.hn
- **8th Asian Fisheries Forum**, 20-23 November 2007 in Kochi, India
www.8aff2007.org
- **World Aquaculture Society Meeting** 19-23 May 2008 in Busan, Korea
www.was.org.
Notes and photos from the Aquaculture CRSP annual meeting and session at the 2007 World Aquaculture Society meeting are available at <http://pdacrsp.oregonstate.edu>.

...NOP Continued from Page 5

most of the fish (22 out of 24) displayed decreased eye darkening. At the later part of the encounter, all subsequent subordinates displayed eye-darkening patterns which acted as a social signal announcing social submission. After the encounter dominant fish had paler eye color pattern than subordinates.

This abstract was excerpted from the original paper, which was published in Hormones and Behavior, Vol. 51(5): 611-619 in May 2007.

Poetry Corner

The following is an excerpt from MFK Fisher's book *Consider the Oyster* (1941)...

An oyster leads a dreadful but exciting life. Indeed, his chance to live at all is slim, and if he should survive the arrows of his own outrageous fortune and in the two weeks of his carefree youth find a clean smooth place to fix on, the years afterwards are full of stress, passion and danger.

He — but why make him a he, except for clarity? Almost any normal oyster never knows from one year to the next whether he is he or she, and may start at any moment, after the first year, to lay eggs where before he spent his sexual energies in being exceptionally masculine...

...**BANGLADESH** Continued from Page 2

station and on-farm trials with direct participation of NGOs and rural farmers during 2002 and 2003 in collaboration with AIT and the University of Michigan.

The ACRSP fertilization regime resulted in the highest fish production, followed by that of BAU. However, benefit-cost ratio proved that the low-dose BAU fertilization regime provided the best performance. Thus, the BAU fertilization regime was selected to be tested on-farm. In 2002, on-farm trials were conducted by the three collaborating NGOs (PROSHIKA, BRAC, and CARITAS) in different parts of the country, where each of the major NGOs have their own extension/dissemination network. After a full grow-out period from April to December 2002, water quality, fish production, and economic return (benefit-cost ratio) were compared between two regimes in each on-farm trial site and among all regimes at all sites. Considering production, fertilizer input level, and economic return, the on-farm trials indicated that the BAU fertilization regime was the most appropriate for carp polyculture in Bangladesh.



A couple carrying fish home in Mymensingh, Bangladesh (photo by Md. Asaduzzaman)

After this two-year, intensive research, a workshop on Fertilization Strategies in Pond Culture in Bangladesh was organized in June 2003 by ACRSP in collaboration with BAU, AIT, and several NGOs. Since that time, the ACRSP-recommended BAU fertilization regime has been used for pond fertilization by all stakeholders and farmers across Bangladesh with only minor modifications.

...**WORKSHOP** Continued from Page 4



Workshop participants at the CURDTS campus in Costa Rica

María Cristina Imolesi and Kathia Rincón from USMA; and in Costa Rica: Raul de la Espriella, Zamorano Alumni representative, Alvaro Otarola from the Costa Rican Institute for Fisheries and Aquaculture (INCO-PESCA) and Carlos Obando, Dean of College for Irrigation and Development of the Dry Tropics (CURDTS) in Guanacaste Province.

...**FINALISTS** Continued from Page 1

and partners. AquaFish Memoranda of Understanding are expected to be negotiated this Summer and Fall with institutions in Guyana, Mexico, Nicaragua, Cambodia, Vietnam, China, Tanzania, Ghana, Philippines, Indonesia, Nepal and Kenya. The AquaFish CRSP international partnership is eager to begin its work supporting fisheries and aquaculture projects around the globe, and hopes to continue the benefits achieved under OSU's USAID-funded Aquaculture CRSP (see stories this issue).

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



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AQUAFISH CRSP CONTACT INFORMATION

AquaFish CRSP and Aquaculture CRSP publications can be accessed online at <http://pdacrsp.oregonstate.edu/pubs/publications.html>.

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Your comments, stories, student profiles, and photos are always welcome! Send information to aquafish@oregonstate.edu (please include "Aquanews" in the subject line).

Program Director: Dr. Hillary S. Egna
Aquanews Editor: Dr. Kara Warner
Student Support: Aaron Zurcher

Aquanews is published quarterly by the Publications division of the Aquaculture CRSP and AquaFish CRSP, Oregon State University, 418 Snell Hall, Corvallis OR 97331-1643, USA. aquafish@oregonstate.edu

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The AquaFish Collaborative Research Support Program is funded in part by the United States Agency for International Development under CRSP Agreement No. EPP-A-00-06-00012-00 and by participating US and host country institutions.

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