



Final Aquaculture CRSP Meeting: Focus on Success

The final ACRSP meeting was held February 25-26 in San Antonio, Texas, preceding Aquaculture 2007, the international conference on sustainable aquaculture. The ACRSP began in 1982, facilitating collaborative aquaculture research among its participating Host Countries and U.S. institutions. Over the years, researchers met to discuss challenges faced and goals achieved in their respective projects as the program grew from 7 to 28 participating nations. This year's meeting wrapped up the 25-year program with a focus on success stories and lessons learned from Principal Investigators (PIs).



Host Country PIs and program participants from over a dozen countries joined ACRSP Director Hillary Egna, Program Management staff Karl Kosciuch and Jim Bowman, and Harry Rea of USAID for the two-day meeting in San Antonio. The history of the ACRSP, upcoming reports on site descriptions, and translated abstracts of research reports were discussed, among other topics. But the focal point of the meeting was on success stories shared by U.S. and Host Country PIs. The group reported updates for research projects concerning production technologies, watershed management, human health and nutrition, and jointly funded ventures in

... ACRSP Continued on page 7

ACRSP Awards Student Researchers

ACRSP representatives presented Awards for Best Student Poster at the Aquaculture 2007 meeting to three outstanding student researchers in the field of sustainable aquaculture. The first place



Kevin Fitzsimmons (U. of Arizona) presented Kevin Neves (Delaware State U.) with the first place award for Best Student Poster.

award of \$400 went to Kevin Neves' poster entitled "Reducing the Need for Live Prey Items by Feed Training Wild Caught Weakfish *Cynoscion ragalis*" (K Neves *et al.*). The

two runner-up awards of \$200 each were given

to Helene T. Hegaret ("Mitigation of Risk of Transplanting Harmful Algae along with Transport of Bivalve Shellfish," HT Hegaret *et al.*) and Aaron Preciado-Negrete ("Effect of Soybean Meal as the Principal Protein Source in Practical Diets for Shrimp *L. vannamei* Juveniles at Growth Limiting Dietary Protein Level," D Ricque-Marie *et al.*).



Workshop Prepares Fisheries Officers for Training Roles

Jim Bowman

Ten of the Kenya Fisheries Department's top Fisheries Officers convened at Sagana Aquaculture Center (Sagana, Kenya) for an ACRSP-sponsored Training of Trainers (TOT) workshop between 20 November and 1 December 2006. This workshop followed short courses conducted in Kenya under ACRSP sponsorship between 1999 and 2005. Whereas previous courses had focused on the basic technical and business aspects of fish culture (including pond construction, pond management, and fish farming economics), this latest course was intended to prepare selected Fisheries Officers for the role of training other fisheries personnel in the future. Each of the officers selected for the TOT course had participated in at least one of the previous technical courses, is currently posted in an area with relatively high aquaculture potential, has shown initiative in the promotion of fish farming, and has demonstrated an aptitude for teaching. The course was led by Charles Ngugi (see also Moi University story on page 7) and Jim Bowman, ACRSP Principal Investigators for the Kenya Project.

For this course the traditional classroom-and-lecture format was discarded in favor of a more hands-on, learn-by-doing approach. The "text" for this course was the latest draft of "A New Guide to Fish Farming in Kenya," developed by Kenya Project personnel and slated for publication by the Aquaculture CRSP. The group divided themselves into five two-person teams, each of which selected one or more chapters of the manual to present to the group. With the fish farming guide and a set of previously prepared PowerPoint® teaching modules as resources, each team prepared a new lesson for presentation to the rest of the group. Following a review and critique period, considerable time was spent discussing the new fish farming guide, making revisions and in general making the manual more usable for its intended audiences.

Participants in the workshop were also able to make several field visits to see different kinds of aquaculture in action. Field visits included stops at the farm of former ACRSP participant Mr. William Kiama (now operating his own gold-



Former CRSP student JB Mugo assisted in the training by demonstrating procedures for selecting catfish broodfish for spawning.

... TOT Continued on page 4

Goings on in the Pond...



Aquanews is going on-line! In order to conserve valuable resources, the Aquanews newsletter will be available in PDF format through email beginning Spring 2007. Hard copy versions will no longer be mailed. If you wish to add your name to the list of email recipients, please send a request to aquafish@oregonstate.edu, and include **Aquanews** in the subject line. As always, current and previous Aquanews editions are archived on-line at <http://pdacrsp.oregonstate.edu>.

Enter the contest for a new slogan for Aquaculture and Fisheries 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 15 May, and include **Slogan** in the subject line. The winner receives a **free CRSP tee shirt!**

ACRSP wishes farewell to its former staff and students DD Bixby, Karl Kosciuch, and Ryan Boone. We thank you for your service and wish you the best.

Many thanks to ACRSP External Program Advisory Council (EPAC) committee members Marcia Macomber, Nathanael Hishamunda, and Christine Crawford, who met recently at the ACRSP final annual meeting to review ACRSP activities. And kudos to EPAC member Jason Clay (Vice President of Global Solutions, World Wildlife Fund), the plenary speaker at Aquaculture 2007.

Kevin Fitzsimmons was awarded an "Outstanding Service Award" at this year's ACRSP meeting in San Antonio, commemorating his 10-year service as an ACRSP PI.

Note: The new name of Aquaculture & Fisheries CRSP is AquaFish CRSP (effective Jan 2007). The Aquaculture CRSP retains its name, Aquaculture CRSP.



Graduate student profile: Fred Chu Koo

Fred Chu Koo is working hard to improve aquaculture techniques and resource use in his home country of Peru. Fred earned an undergraduate Biological Sciences degree (1995) from Peru's Universidad Nacional de la Amazonía Peruana, and an M.S. (2000) in Aquatic Biology and Fisheries from Universidade Federal do Amazonas in Brazil. Fred then joined the Instituto de Investigaciones de la Amazonía Peruana (IIAP) in his hometown of Iquitos, Peru, and through that institute's collaborative research agreement with Southern Illinois University at Carbondale (SIUC) Fred joined SIUC as a graduate student. He has been working with his major advisor, Dr. Chris Kohler, and Dr. William Camargo at SIUC on ACRSP-funded projects for five years, and anticipates defending his Ph.D. dissertation, "Nutritional Studies and Ecological Role of Two Amazon Fish *Colossoma macropomum* and *Piaractus brachyomus* (Pisces: Characiformes)" this year.

Fred's ACRSP research has focused on evaluating the nutritional feasibility of mixing native Amazon plants and agricultural by-products with commercial feedstuffs to produce nutritional, balanced diets for cultured fish species while "aiming to reduce feeding costs for local fish farmers back in Peru." At SIUC, Fred investigated native Peruvian plant species as potential components of fish diets, and nutrient digestibility of these plants for Amazonian cultured fish. He performed grow-out trials comparing fish growth and feed conversion of the plant-based pelleted diets, incorporating hematological and compositional analyses of experimental fish in his analysis. Fred also described the seed-dispersing role of two Amazon fishes at IIAP in Peru.

Fred has enjoyed immensely the opportunity to study at SIUC under Drs. Kohler and Camargo, broadening his academic and cultural horizons through meeting and collaborating with students from different countries and traveling in the U.S. And he is excited about the future of freshwater fish aquaculture in his home country. He has seen his own research applied in Amazonian Peru through local fish farmers' use of low-cost balanced fish diets. As a graduate student in Peru, Fred realized the growth potential of aquaculture, and since then the "aquaculture of native Amazon fishes has really been extended along the entire Peruvian Amazon thanks mainly to the efforts done by IIAP and its partners (NGOs, CRSP, EU, etc.)."

... FRED Continued on page 7



Fred represented Peru at a United Nations Conference on Trade and Development in Rio de Janeiro, presenting information on Amazonian fish for BioTrade activities.

ACRSP Student Wins Award

Herbert Ssegane, a University of Georgia at Athens (UGA) graduate student from Kampala, Uganda was recently awarded the prestigious E. Broadus Browne Research Award. The College of Agriculture and Environmental Sciences at UGA selects one outstanding master's degree student each year to receive this award.

Herbert's research focuses on the utilization of tools such as Google Earth Pro to extract watershed variables and integrate derived variables into erosion prediction and sediment yield models for riparian buffer zones protecting streams. He has been a graduate student at UGA's Department of Biological and Agricultural Engineering with Dr. Bill Tollner since 2005, and has applied his work to an ACRSP-funded project under Dr. Tollner in the Nzoia watershed in Kenya.

Included in this award, Herbert receives a certificate of achievement for outstanding research performance and a fully paid trip to a national meeting in his discipline. Herbert and Dr. Tollner look forward to presenting their work at the American Society of Agricultural and Biological Engineering in Minneapolis, Minnesota this summer.



TOT continued from page 2...

fish and tilapia facility), at Kiganjo Fish Hatchery (operated by the Kenya Fisheries Department), and at "Trout Tree," a commercial trout production facility and restaurant operated by the TamTrout company near Nanyuki.

The TOT workshop accomplished a number of key objectives. The primary goal of preparing a new group of officers for the task of teaching aquaculture basics was definitely achieved. Each of the teams of participants did an outstanding job of preparing course material for presentation. Moreover, the Fisheries Officers directly assisted in developing a handbook that they will be able to use in future training courses, and are now well prepared



Members of the group sample fish on a field visit to Kiganjo Trout Hatchery in Kenya's Central Province.

to begin their new roles as trainers of farmers and new Fisheries Department recruits. Their first assignments of training Fisheries Extension Officers were scheduled for January and April of 2007. The Aquaculture CRSP is looking forward to its publication of "A New Guide to Fish Farming in Kenya" this summer.

Poetry Corner

In a fishpond reflection
 What do I see?
 A magic world
 Where clouds do float
 White against the sky they fly
 Where goldfish nibble on blue
 And ripples are diamonds
 That dance with the sun
 Warm feels the water sun
 Nothing is more fun.

-Niki Collins-Queen

I will turn up the ends of
 my trousers around my
 boots, and my cuffs back
 from my wrists and go
 with drivers and boatmen
 and men that catch fish
 or work in fields. I know
 they are sublime.

-Walt Whitman

Eagle-Condor Project links Indigenous Peoples

The Eagle-Condor Exchange Project was established in 2005 as a collaborative effort between Aquaculture CRSP participants and Heifer International (www.heifer.org). The goal of the project is to facilitate the exchange of views and ideas between "Eagles," Northern Native Americans involved in aquaculture, and their "Condor" counterparts in Latin America. The two groups recently met in Tabasco, Mexico over 7-14 March to discuss potential collaborations and their mutual cultural objectives: biodiversity, sustainability, and community wellness.

The weeklong event was hosted by Dr. Wilfrido Contreras-Sánchez, ACRSP Host Country PI at Universidad Juárez Autónoma de Tabasco (UJAT), and highlighted aquaculture facilities and water conservation efforts in surrounding areas. The Heifer International representative was Alejandro Lopez Musalem, Director of Heifer Mexico. Wilfrido was assisted by UJAT professor Ulises Hernández-Vidal and technician Alejandro Mcdonal-Vera, who traveled with participants to sites in Tabasco and nearby Chiapas, including a side visit to the archeological site of Palenque. This was the first opportunity to see the ancient Mayan city for several of the indigenous Mexican Condors.

Student translators from UJAT assisted in communication between the two groups, and strong connections were felt among the participants as they discussed their perspectives on traditional practices and uses of technology in the framework of aquaculture and indigenous cultures. More information on the Eagle-Condor Exchange Project may be found at http://pdacrsp.oregonstate.edu/pubs/featured_titles/eagle-condor.html, including meeting notes from last year's meeting in Peru.

Notice of Publication

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INSULIN-LIKE GROWTH FACTOR-I cDNA CLONING, GENE EXPRESSION AND POTENTIAL USE AS A GROWTH INDICATOR IN NILE TILAPIA, *Oreochromis niloticus*

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06-216

IGF-I is a mitogenic polypeptide that is an important regulator of growth in fish. The potential of IGF-I mRNA abundance as a rapid growth indicator in the Nile tilapia, *Oreochromis niloticus*, was evaluated. Hepatic IGF-I cDNA was isolated and partially cloned. The partial sequence having 539 bases encodes for the signal peptide, mature protein and a portion of the E domain. The deduced 68 amino acid sequence for mature IGF-I showed 84–90% and 77–79% sequence identity with fish and mammalian counterparts, respectively. The deduced amino acid sequence for domains B and A was most conserved (93–97%) relative to other fishes. A sensitive TaqMan real time qRT-PCR assay for *O. niloticus* was developed based on the mature IGF-I peptide for measures of hepatic IGF-I mRNA levels. Hepatic IGF-I mRNA levels were found to be significantly correlated with growth rate of fish reared under different feeding regimes and temperature conditions. Higher feed consumption and water temperature produced faster-growing fish and increased hepatic IGF-I mRNA expression. These findings suggest that hepatic-derived IGF-I plays a key role in controlling growth in *O. niloticus* and indicates that IGF-I mRNA quantification could prove useful for the rapid assessment of growth rate in this species.

This abstract was excerpted from the original paper, which was published in Aquaculture, Vol. 251: 585-595 in February 2006.

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A MIXED-INTEGGER TRANSSHIPMENT MODEL FOR TILAPIA (*Oreochromis* sp.) MARKETING IN HONDURAS

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06-217

Tilapia production in Honduras has increased in recent years. However, lack of thorough understanding of domestic markets and coordinated production efforts have hampered the development of a domestic market. This study quantified marketing costs for tilapia marketed in Honduras and developed a mixed-integer transshipment mathematical programming model to identify the most profitable marketing alternatives for small- and medium-scale farmers. Of the total marketing costs (\$0.07-\$0.41/kg), 40-73% were for transportation and 13-30% for packaging costs. This depended upon farm size, location, and the specific market targeted. Model results suggested restaurants as primary targets with supplemental production delivered to supermarkets in relative proximity to the selected restaurants. The model selected cities with sufficient restaurant demand to absorb the farm's total production. Farms with high production levels can take advantage of the reduced transport cost of larger trucks and sell excess product to alternative outlets whereas small-scale farm volumes were too low to supply markets on a weekly basis. Farms located in the East and South regions had a marketing advantage over farms in other regions due to proximity to the most profitable Distrito Central outlets. To successfully compete for Honduran markets other than the low-priced local open-air markets will require farm sizes greater than 6 ha to supply a minimum weekly production of 900 kg.

This abstract was excerpted from the original paper, which was published in Aquaculture Economics and Management, Vol. 10 No. 3: 245-264 in December 2006.

...NOP Continued on Page 6

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TRENDS IN THE EVOLUTION OF THE PRODYNORPHIN GENE IN TELEOSTS: CLONING OF EEL AND TILAPIA PRODYNORPHIN cDNAs

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06-218

The detection of the prodynorphin gene in anuran amphibians and lungfishes may indicate that this gene arose as a result of the duplication of the proenkephalin gene early during the divergence of the Sarcopterygii, or that this gene may predate the divergence of the ray-finned fish and the lobe-finned fish. The cloning of prodynorphin-related genes from the pufferfish and zebrafish supports the latter hypothesis. This study analyzes trends in the radiation of the prodynorphin gene in teleosts. Prodynorphin cDNAs were cloned from the brain of the eel *Anguilla rostrata* and the Nile tilapia, *Oreochromis niloticus*. These teleost prodynorphin sequences have distinct alpha-neoendorphin, dynorphin A, and dynorphin B sequences, and a novel opioid sequence, YGGFI. The relationship of these teleost prodynorphin sequences to other actinopterygian and sarcopterygian prodynorphin sequences will be discussed.

This abstract was excerpted from the original paper, which was published in Peptides, Vol. 27 No. 4: 797-804 in April 2006.

Upcoming Meetings and Events...

A CRSP is proud to support workshops and meetings designed to facilitate increased knowledge and communication in aquaculture. Recently, representatives from North and South Native American groups met in Tabasco, Mexico to exchange cultural and technological ideas (see also Eagle-Condor story on page 4). Meetings and workshops coming up in 2007 include...

- **International Course: Construction of Ponds for Aquaculture and Dams for Water Storage**, 4 May in Ciudad de David, Panamá; and 7 May in Ciudad de Cañas, Costa Rica
contact smeyer@zamorano.com
- **Pond School 2007: Creating and Maintaining Healthy Ponds**, 5 May in Corvallis, Oregon USA
www.oregonaquaculture.org
- **6th International Training Course of Prominent Amazon Species**, 4-8 June in Balbina, Brazil
<http://fisheries.siu.edu/amazonia/event/events.html>
- **8th Symposium of Central American Aquaculture**, 22-25 August in Tegucigalpa, Honduras
contact andahn@hondutel.hn
- **8th Asian Fisheries Forum**, 20-23 November in Kochi, India
www.8aff2007.org



Mosibudi Mangena (left), South African Minister of Science and Technology visits with Khalid Salie (right), ACRSP HCPI at one of his small-scale projects, Folbakkies Rainbow Trout Farm in Franschhoek, Republic of South Africa.



Moi University Awarded Kenya BDS Project

From the USAID Nov-Dec 2006 Newsletter

Kenya Business Development Services (BDS) recently awarded Dr. Charles Ngugi at Moi University's Department of Fisheries and Aquatic Sciences a contract to support small-scale producers of Nile tilapia and catfish fingerlings in Kenya's Western Province. The fingerlings are of critical importance to aquaculture and the Nile perch fishing industry in their role as long-line bait, as current production cannot meet the demand in this area.

Dr. Ngugi (see also Workshop story on page 2) has been involved with the ACRSP for five years, and currently serves as a Host Country PI. The efforts of ACRSP ambassador Nancy Gitonga (former Kenya Fisheries Department Director) and Dr. Ngugi led in part to the Kenya BDS project award. Dr. Ngugi will oversee the launch, implementation, and evaluation phases of the project through FishAfrica over the next six months, in this BDS-Moi University collaborative effort to transform small-scale farms into high-yield production units operating as profitable business ventures.

Participants from the Department of Fisheries and Aquatic Sciences and the Kenya Fisheries Department extension services will provide technical assistance to fish farmers in pond design, fish propagation, and husbandry, with an emphasis on sustainable management. Farmers will also be assisted with enterprise budgeting and cash-flow analysis in order to make profitable and responsible business decisions under their respective local operating conditions.

A primary goal of this program is to facilitate the formation of group farming efforts from single producers in order to realize the economic benefits of shared input costs. Over 40 farmers are expected to organize into four production units during the duration of the program, producing a projected 19.2 million baitfish for the perch fishing industry, an annual value of over Kshs 38 million (over U.S. \$500,000).



...FRED Continued from Page 3

He is proud to have contributed to research on nutrition, pond management, fish larvae culture and transportation, and breeding and spawning studies, among other topics, which have improved Peruvian aquaculture in recent years. Fred is also ready to

help Peru face challenges to the development of its aquaculture industry: opening international markets for Amazon aquaculture products, and balancing profitability with sustainability through the control of diseases and environmental impacts incurred by fish farming technologies and increased fish production.

Fred is currently heading an Aquaculture Research and Extension Project at IIAP, and after his defense at SIUC this fall he plans to begin a post-doctoral fellowship in Brazil, the U.S., or France. Fred is also looking forward to the promising future of aquaculture in Peru, and hopes to see more beneficial impacts of research-based advances in his field.



...ACRSP Continued from Page 1

a number of countries. An example of one of the many success stories involved the development of a recirculating aquaculture system module for family or multi-family use in Mexico. The collaborative



Hillary Egna, ACRSP Director

project with Cornell University, NOAA Sea Grants, and Universidad Juarez Autonoma de Tabasco (and other participants) incorporated graduate student, PI, and local community efforts to develop an affordable and simple tool to assist rural families in raising tilapia. The achievements of this project led to the Puebla State Government of Mexico purchasing the technological package for its rural development program. The collaborative efforts of U.S. and Host Country PIs and participants have resulted in many such improvements in host country aquaculture techniques, benefiting local economies and community members.

ACRSP members also gave presentations at the succeeding Aquaculture 2007 meeting in a number of sessions on freshwater prawn culture, ancient fishes, tilapia, and an Aquaculture CRSP session. The ACRSP annual meeting agenda and presentations are available for download at <http://pdacrsp.oregonstate.edu>. Information on the Aquaculture 2007 meeting is available at the World Aquaculture Society website, www.was.org.



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