



## AQUAFISH COLLABORATIVE RESEARCH SUPPORT PROGRAM NEWSLETTER

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## AQUAFISH CRSP 2011 ANNUAL MEETING IN SHANGHAI, CHINA

*By Stephanie Ichien*



*Sunrise on Shanghai. Photo by Stephanie Ichien*

With the fifth year and final phase of the Aquaculture & Fisheries Collaborative Research Support Program (AquaFish CRSP) drawing to a close, this year's annual meeting in Shanghai, China was a critical gathering of the AquaFish CRSP community to reflect on accomplishments and look ahead to the future of the program. The weeklong event got under way on Monday, 18 April with several workshops and concluded with the AquaFish CRSP Technical Session on Friday, 22 April. Among the 18 April workshops, Dr. Hillary Egna arranged and chaired a special Air Breathing Fishes Workshop from 8:30 am to 2:00 pm (for more see side bar on page 5), which was followed by two other meetings including an African Outreach coordination meeting. The technical session was organized to run in conjunction with the Asian Fisheries Society's 9th Annual Fisheries & Aquaculture Forum (9AFAF) and the 9th International Symposium on Tilapia Aquaculture (ISAT9). Over 70 program participants from nearly all the AquaFish CRSP project sites were involved with the various

*Annual Meeting continued on page 2...*

*Annual Meeting continued from page 1...*

meetings and sessions throughout the week. The AquaFish CRSP Annual Business Meeting was held on Tuesday, 19 April at the Shanghai Marriott Hongqiao and was attended by 63 investigators, collaborators, evaluators, and students. After the welcomes and introductions, AquaFish CRSP Director, Dr. Hillary Egna, gave a presentation with a snapshot of CRSP progress through an index of CRSP statistics and a discussion of things to come. Each of the eight Lead US Principal Investigators then provided short summaries for their projects, recognizing their collaborating researchers and highlighting the work that has been done.

A working session followed the morning segment of the meeting, in which the group was divided by region to discuss the largest constraints to "Advancing the Productivity Frontier" in aquaculture and to identify the researchable priorities in aquaculture and in fisheries. After the working session, the meeting reconvened and the regional groups reported back with

their findings, providing a collection of topics to potentially help direct future research. Will Leschen of the University of Stirling followed with a presentation on the role and progress of the Sustainable Aquaculture Research Network in Sub Saharan Africa (SARNISSA), which can be found at [www.sarnissa.org](http://www.sarnissa.org).

The meeting adjourned at 5:30 in the evening and was followed by the AquaFish CRSP Award Ceremony, attended by over 85 people. Dr. Egna introduced the Shanghai Ocean University (SOU)-CRSP Yang Yi Young Scientist Travel Fund Award, which was established in 2010 to honor the memory of the late Dr. Yang Yi of SOU. The award was presented to Pandit Narayan Prasad, Assistant Professor and PhD student at the Institute of Agriculture and Animal Science in Rampur, Chitwan, Nepal. (For more on Pandit see Goings on in the Pond... on page 14)

In the days following the AquaFish CRSP Business Meeting, 9AFAF and ISTA9 commenced at

*Annual Meeting continued on page 5...*



*Dr. Hillary Egna welcomes members of the AquaFish CRSP community at the Shanghai Marriott Hongqiao (top left). Members engage in a working session group (bottom left) and CRSP Host Country collaborator, May Myat Noe Lwin, helps setup the AquaFish CRSP booth at the tradeshow (right). Photos courtesy of Stephanie Ichien.*



# NEW MILKFISH CULTURE FEEDING ALTERNATIVES TO REDUCE PRODUCTION COSTS AND IMPROVE INCOME FOR FISH FARMERS IN THE PHILIPPINES

By Evelyn G. De Jesus-Ayson and Russell J. Borski

Milkfish, the national fish of the Philippines, is the most important foodfish produced from aquaculture there, constituting a large portion of the staple diet of most Filipinos. Locally known as bangus, milkfish are an ideal culture fish because they are fast-growing, omnivorous, hardy, disease resistant, and also euryhaline, denoted by their ability to live in both freshwater and full-strength seawater. Traditionally, they are cultured in brackish water and freshwater ponds or freshwater pens. Average annual production for brackish water ponds is around 820 kg/ha and from freshwater pens around 3600 kg/ha. Recently, milkfish culture in freshwater and



marine cages has increased because of higher demand and greater productivity. However, feed constitutes more than half of the total variable costs for producing milkfish. Therefore, strategies that limit the quantity of feed used for grow-out could reduce overall feed costs, improve production efficiency, and increase farmers' incomes.

CRSP Investigations at the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC AQD) in the Philippines collaborated with AquaFish researchers at North Carolina State University (NCSU) to demonstrate that feeding on alternate days results

in comparable production as feeding stocks every day and thus is effective in reducing overall costs in the culture of milkfish in the Philippines. These findings were the result of several feed trials conducted to compare the effects of two distinct feeding regimes on the growth performance and production cost of milkfish stocked in both brackish water ponds and marine cages.

For growth trials in brackish water ponds, four pond compartments with an area of 700m<sup>2</sup> were stocked with milkfish fingerlings at a stocking density of 0.5 fish/m<sup>2</sup>. Stocks in two ponds were fed daily with normal ration while fish in the other

Table 1. Production characteristics of milkfish in brackish water ponds

Parameter	Treatment A (Fed daily, control)	Treatment B (Fed on alternate days)
Initial ABW (g)	72.12 ± 6.04	66.30 ± 2.23
Final ABW (g)	324.31 ± 17.13	275.79 ± 19.52
Survival Rate (%)	83.93 ± 6.85	92.62 ± 3.82
Actual Biomass Harvested (kg)	99.01 ± 10.16	94.48 ± 4.14
Total Food Consumed (kg)	326.59 ± 8.01	140.87 ± 11.95
Total Feed Cost (PhP)	8818.0 ± 216.33	3803.54 ± 322.57
Savings on Feed Cost (PhP)		5014.51 ± 528.67
Savings on Feed Cost (%)		56.54 ± 4.60
FCR	3.41 ± 0.37	1.50 ± 0.14

Table 2. Production characteristics of milkfish in floating marine cages

Parameter	Treatment A (Fed daily, control)	Treatment B (Fed on alternate days)
Initial ABW (g)	29.55 ± 6.02	31.76 ± 6.15
Final ABW (g)	185.13 ± 17.43	140.5 ± 33.91
Culture Period (days)	135 ± 12.66	170.33 ± 5.55
Survival Rate (%)	83.12 ± 1.27	88.69 ± 3.65
Actual Biomass Harvested (kg)	629.67 ± 6.01	615 ± 42.36
Total Feed Consumed (kg)	2015.13 ± 36.76	1374.79 ± 10.14
Total Feed Cost (PhP)	54,408.42 ± 993.56	37,119.24 ± 274.26
Total Savings on Feed Cost (PhP)		17,289.18 ± 788.88
Savings on Feed Cost (%)		31.74 ± 0.50
FCR	3.2 ± 0.06	2.25 ± 0.15

FCR: Feed Conversion Ratio

ABW: Average Body Weight

Milkfish continued on page 4...



The milkfish research site at SEAFDEC AQD in the Philippines. Photo courtesy of Evelyn G. De Jesus-Ayson

two cages were fed the normal ration but on alternate days only. Two runs were conducted and the data are summarized in Table 1.

The marine cage trial used hatchery produced milkfish fry grown in brackish water nursery ponds. Milkfish fingerlings were randomly stocked in 6 unit 75m<sup>3</sup> cages at a density of 35 fish/m<sup>3</sup>. As in the pond trials, stocks in 3 control cages were fed daily with normal daily ration while fish in 3 replicate experiment cages were fed on alternate days. Feeding rations were adjusted every two weeks based on the average body weight of the fish during the last sampling. The fish were cultured for 4 months. The data are summarized in Table 2.

**The most remarkable results of the pond and marine cage culture trials are the significant reduction in feed inputs and improvement in feed conversion ratio (FCR),** which is the amount of feed it takes to grow fish to a certain biomass. The improved FCR of fish fed on alternate days yielded comparable harvested biomass of milkfish but with substantially less feed input compared with fish fed daily (Tables 1 & 2). For the pond trials, savings in feed cost of  $56.54 \pm 4.60$  percent were realized whereas in the marine cage trials, expenditures on feed inputs were on average  $31.74 \pm 0.50$  percent lower in alternate day fed stocks than the daily fed stocks.

As the aquaculture industry continues to expand, the cost of commercial fish feeds will continue to increase as the market demand increases and the availability of fishmeal declines. Our studies show that feeding on alternate days is an effective strategy for reducing the cost of production as well as negative environmental impact but does not affect the production of milkfish. Future work at SEAFDEC AQD and NCSU will continue to look at strategies that will improve production efficiency of milkfish, enhance income of farmers and advance integrative culture techniques that reduce the environmental impact of fish culture. Similar strategies can also be tested and applied in the culture of other economically valuable fish species. SEAFDEC AQD and NCSU are partnering with the Philippine Bureau of Fisheries & Aquatic Resources for a wider dissemination of the feeding strategy for milkfish among farmers especially in the Philippines. With the growing interest in milkfish culture in the Association of Southeast Asian Nations (ASEAN) member countries, SEAFDEC AQD can likewise collaborate with relevant institutions to disseminate the AquaFish CRSP-generated technologies throughout the region.



Milkfish feeding experiment at SEAFDEC AQD in the Philippines. Photo courtesy of Evelyn G. De Jesus-Ayson.



*Annual Meeting continued from page 2...*

Shanghai Ocean University and the Host Country Lead PI meeting-field trip was held. In addition to the CRSP technical session within ISTA9, the CRSP Management Office ran an AquaFish CRSP booth at the 9AFAF tradeshow and developed four posters, which provided conference attendees a glimpse into the research successes of the program. The technical session, chaired and organized by Dr. Egna "Accelerating Aquaculture Development in Poorer Countries," contained a total of 19 presentations, with 18 directly affiliated with the CRSP and one from the Asian Institute of Technology, a longtime former Aquaculture CRSP site. (ISTA9 abstract and conference information can be found at [ag.arizona.edu/azaqua/ista/ISTA9/ISTA9.htm](http://ag.arizona.edu/azaqua/ista/ISTA9/ISTA9.htm) )

In addition to the technical session, AquaFish CRSP was highly involved throughout 9AFAF and ISTA9. On 21 April, Dr. Egna presented a paper at the 3rd Gender in Aquaculture and Fisheries Symposium (GAF3). The paper, which was a collaboration between Dr. Egna, Nancy Gitonga, and Lisa Reifke was titled, "Challenges of including gender dimensions in biotechnological research projects" and can be found at [genderaquafish.org/](http://genderaquafish.org/). Dr. Egna was subsequently invited to the FAO Special Workshop on the Future Direction for Gender in Aquaculture and Fisheries Action, Research and Development.

On Saturday 23 April, the session titled, "Marketing and Globalization," took place as a part of 9AFAF. The session was organized and chaired by Dr. Egna and was emceed by assistant chair, Dr. Kwamena Quagrainie. The following day closed out the weeklong event in a final daylong meeting with the External Program Advisory Council representative, Dr. Christine Crawford.



## SHANGHAI SIDE BAR: NEW HORIZONS OF RESEARCH AND RECOVERY

### AIR BREATHING FISHES

On Monday, 18 April, over twenty AquaFish CRSP researchers and collaborators gathered at the Hongqiao Marriott in Shanghai, China to discuss the prospects for new research on air breathing fishes. The session organized and chaired by Dr. Hillary Egna included ten presentations outlining the research needs for six groups of air breathing fishes. AquaFish CRSP staff for the meeting, Liu Liping and Stephanie Ichien, provided on-site assistance and coordination for the workshop. Getting the workshop underway, Dr. Egna made an introductory presentation about the importance of air breathing fishes in the face of climate change and the general interest in these fishes. Subsequently, So Nam presented on snakehead in Cambodia, Felix Ayson and Remedios Bolivar presented independently on gouramis in the Philippines, Jim Diana presented for Solomon David on gar, Maria Portella presented for herself and Konrad Dabrowski on gar and arapaima, Charles Ngugi presented on behalf of Mlewa C. Mwatete on lungfish in Kenya, Maria Haws presented for Armando Garcia-Oretega on chame, Phu Hoa presented on marble goby in Thailand, and Joe Molnar presented for John Walakira on lungfish in Uganda and Kenya. The group discussed each of the concepts in great detail, developing appropriate topics to take forward. Seven concepts are slated for funding as a stepping-stone to further developed investigations. The ten presentations, the following discussions, and the seven concepts will pave the way for a new wave of AquaFish CRSP work. The workshop was very successful in generating interest in a fresh line of work.

### WELL-WISHES FOR SWAN

Sk. Ahmad- Al- Nahid (Swan) had been awarded a CRSP-ISTA award to travel to Shanghai, China to participate in and present at the 9th International Symposium on Tilapia Aquaculture and the AquaFish CRSP Annual Meeting. However just days before the start of the CRSP Meeting, on his way to the China Embassy in Bangladesh to get his China visa, he was involved in a road accident. Swan's autoricksha was struck by a bus, giving him a serious head injury and requiring nine stitches. Sadly, Swan was unable to travel to China to participate in the conference. Our thoughts and sympathies go out to Swan with hopes of a full and speedy recovery.





## INTO UNCHARTED WATERS: KENYA TAKES A DRAMATIC LEAP IN AQUACULTURE

By JEFF HINO

**A**quaculture is helping jump-start Kenya's struggling economy, thanks in part to an international program led by Oregon State University.

Kenya is in the midst of rebirth: The East African nation signed a new constitution in August, and has launched an economic stimulus program that includes a novel US\$16 million effort to increase fish farm production from 1,000 tons in 2008 to 15,000 tons in 2012.

The initiative comes as natural fish stocks in Lake Victoria are declining from overfishing and demand for fish is increasing. Government officials are counting on fishponds — which will be home to millions of tilapia, catfish and ornamental fish — to supply a more sustainable source of protein and income.

A key partner in the efforts is the AquaFish CRSP. It's funded by the U.S. Agency for International Development (USAID) and by participating institutions, and is headquartered at OSU. The program works with developing countries to improve the livelihoods of the rural poor while growing their aquatic product industry. Other

projects include researching beneficial bacteria for tilapia ponds in Mexico and evaluating the effects of invasive species in China and Vietnam.

"It's less about fish than about poverty reduction," said OSU's Hillary Egna, the director of AquaFish CRSP. "We work with people who work with the poor, and we help them build capacity for small-scale economic development."

AquaFish CRSP has been helping improve Kenyan aquaculture since 1997. One beneficiary is George Ambuli, the CRSP-trained chairman of a fish-farming cooperative in a small village near Lake Victoria. "I'm proud to say that fish farming has made me what I am today," he said. "I eat fish, I have a cell phone in my pocket, and I am paying the school fees for my 9-year-old daughter, all with my fish money."

The aquaculture component of the stimulus package was created in late 2009. The program aims to increase the country's fishponds from 7,500 to 48,000. "Fish production in Kenya was a very small industry prior to this cooperative research program," said Kwamena Quagraine, a lead U.S.-based researcher for CRSP's projects in Africa. "CRSP started with research to understand the whole fish production industry, including pond construction, management and the varieties of fish species that can be produced."

The initiative is expected to benefit some of the country's poorest farmers, as well as two traditionally underprivileged groups: women and youth. Though fishponds continue to be owned almost exclusively by men, women are increasingly involved in all phases of fish farming, including feeding, fertilization and predator control. Kenya's vastly underemployed youth, meanwhile, are finding jobs and gaining skills in pond construction.

But the huge growth in fish farming has presented some cultural and economic challenges. The demand for fingerlings to stock the fast-growing number of fishponds has skyrocketed from 1 million to 28 million in less than a year, forcing the government to lean heavily on private industry. Officials plan to upgrade more than 30 of the nation's hatcheries to help meet demand.

Another obstacle is a sudden need for programs to train new fish farmers how to manage their ponds and market their fish. On top of that, farmers who have built their own ponds without stimulus funding are looking to the government

*Uncharted Waters continued on Page 7...*



*Uncharted Waters continued from Page 6...*

for guidance and training. The government is working to meet these demands as it phases out its involvement over the next 18 months. (See Lessons in the Field for a success story on how Aqua Stores are reaching out to assist new farmers in the industry).

As Kenya's aquaculture program expands, fisheries officials plan to put additional marketing structures into place. Outreach efforts include encouraging farmers to improve their income by including value-added activities like gutting, scaling and drying fish for market. The government is building 80 small refrigeration centers around the country, which will help farmers sell fish beyond neighborhood markets. Although perception persists that farmed fish are not as good as captured fish, Fisheries Director Godfrey Monor is confident that in time, half of the fish consumed in Kenya will be farm-grown.

For more on how fish farming is working towards boosting Kenya's economy, visit this publication on our website at [aquafishcrsp.oregonstate.edu/news\\_events.php](http://aquafishcrsp.oregonstate.edu/news_events.php)

**"I'M PROUD TO SAY  
THAT FISH FARMING  
HAS MADE ME WHAT I  
AM TODAY. I EAT FISH, I  
HAVE A CELL PHONE IN MY  
POCKET, AND I AM PAYING  
THE SCHOOL FEES FOR MY  
DAUGHTER, ALL WITH  
MY FISH MONEY."**



*This story was also published in the July-August 2011 Issue of Global Aquaculture Advocate Vol.14: Issue 4. pg 19-21.*

## LESSONS IN THE FIELD: DUNCAN SIJEH BRINGS SUPPORT TO NEW AND EXPERIENCED FISH FARMERS IN WESTERN KENYA WITH AQUA SHOPS

*By Chelsea Stephen*

Duncan Sijeh is a tireless man. His title is Fisheries Officer of FARM-Africa, but in communities throughout his native Kenya, Sijeh is an educator, an innovator, a leader, and a friend. He has played a pivotal role in the setup of FARM-Africa's Aqua Shops Project, which provides products and services such as fish feed, natural fertilizer, technical advice, and marketing linkages for up to 1,000 smallholder farmers interested in starting their own fish farming business. Under the franchise

model, all Aqua Shops stock the same necessary inputs and also offer advice, information, and marketing services to new and experienced fish farmers.



One of six FARM-Africa Aqua Shops opening in western Kenya. Photo courtesy of FARM-Africa <<http://www.farm africa.org.uk/index.php>>

The Department for International Development (DFID) funds this project as part of the Aquaculture Research into Use Program. "We have recruited six franchises in both high and low aquaculture potential areas, each serving six outgrower groups of 15-25 members," says Sijeh of the success of the enterprise. "It's crucial that we assess the informational needs of

*Lessons from the Field continued on page 8...*

*...Lessons from the Field continued from page 7*

fish farmers in order to develop, source, translate, adapt and test information packages addressing the identified needs for dissemination to fish farmers."

From the start, Sijeh took overall responsibility for the launch and support of the franchise scheme. With Aqua Shops as his platform, he has been able to disseminate best management practices to current and prospective fish farmers. At each stage of development, he has coordinated meetings and workshops, documented progress, and remained attentive to recommendations for change. In the political arena, he has played a critical role in influencing policy changes to improve opportunities for aquaculture development, and helped build consensus and ownership of recommendations among policy makers and implementers. Furthermore, he continues to contribute to the development of FARM-Africa policies and strategies as they relate to fisheries development.

It seems inconceivable that Sijeh might have landed any other career in his professional development. Yet, there was a time when Sijeh could not possibly have predicted how far he would take aquaculture in his own country, or conversely, how far aquaculture would take him. There was a point when, as a young student facing financial challenges, Sijeh struggled to complete his master's degree in Aquaculture at Moi University. He was considering deferring his courses, when Dr. Charles Ngugi came through for him with the much-needed financial assistance provided by AquaFish CRSP. "I was very happy and lacked words to thank Dr. Ngugi and the CRSP," remarks Sijeh. He was one of several students who was able to receive funding from the CRSP to pursue a master's degree. In time, Sijeh managed to complete his MS thesis, focusing on socioeconomic factors affecting production and marketing of catfish fingerlings used as bait for Lake Victoria fisheries. Sijeh took on the responsibility of merging the aquaculture fisheries sector with the capture fisheries sector, providing farmed catfish bait – an alternative to the more environmentally taxing wild fingerling trade – to Nile perch fishers. This linkage ensured sustainable utilization of a natural resource and the creation of employment for fish farmers and middlemen bait-traders.

Today Sijeh is enthusiastic about paying forward his own good fortune, this time linking farmers with much needed and otherwise inaccessible resources and services. The inauguration of FARM-Africa's Aqua Shops coincides with the Kenyan Government's promotion of aquaculture and small-scale fish farming. With 4,000 newly constructed fish ponds expected in western Africa, there is concern that limited supplies and lack of basic training could result in pond abandonment. Some might say that the success of Kenya's aquaculture initiative hinges partly on the success of Aqua Shops franchises. Sijeh doesn't seem to want to rest until he secures this success.

To read press coverage on Aqua Shops or view a video on Duncan Sijeh's involvement in the baitfish project on Lake Victoria, please visit the links below:



[www.agfax.net/radio/detail.php?i=415](http://www.agfax.net/radio/detail.php?i=415) & [www.agfax.net/radio/detail.php?i=423](http://www.agfax.net/radio/detail.php?i=423)



[www.youtube.com/watch?v=xDi454ieqoY](http://www.youtube.com/watch?v=xDi454ieqoY)



*FARM-Africa and partners opened six new Aqua Shops in western Africa to encourage and support emerging and experienced fish farmers. Photos courtesy of FARM-Africa < <http://www.farm africa.org.uk/index.php>>*



# AN OVERVIEW OF THE FOURTH FISH FARMERS SYMPOSIUM AND TRADE FAIR IN UGANDA

By Nelly Isyagi, Rita Amolo, and Maurice Ssebisubi  
Aquaculture Management Consultants Ltd. Kampala, Uganda



Farmers sampling tilapia at Kabaganda Fish Farm (top); the manager of Kireka Fish Farm explains catfish hatchery processes (center); Suzanne Njeri, a farmer from Kenya, shares her experiences with participants at the 2011 symposium (bottom). Photos courtesy of Aquaculture Management Consultants Ltd.

Over the last 5 years, the Walimi Fish Farmers Cooperative Society (WAFICOS) has developed a tradition of holding annual symposia and trade fairs as a platform for experience sharing and exposure to new developments among farmers and stakeholders. The last two symposia were conducted in collaboration with AquaFish CRSP. Additional support for the 2011 symposium was obtained from the USAID Livelihoods and Enterprises for Agricultural Development (LEAD) and the National Agricultural Research Organization (NARO). The symposia are becoming more of a major forum through which farmers and key players in the farmed fish value chain – input suppliers, fish processors, researchers and trainers, and private service providers – can network and discuss issues that affected the sector the previous year.

In the previous year, 2010, the viability of fish farming enterprises was greatly challenged. The supply of commercial feed was seriously affected as the main fish feed producer, Ugachick Poultry Breeders Limited, was installing a steam extruder to produce steam extruded fish pellet. The only establishment that could produce good quality formulated fish feed was the Source of Nile Limited, whose capacity was grossly inadequate as the facilities were primarily to cater for its own needs and were not mechanized. Source of Nile Limited is the largest tilapia hatchery and cage farm in Uganda. Consequently, the only alternative for farmers was to produce their own feed on farm. Furthermore, the costs of feed ingredients – and consequently feed on the whole – shot-up by more than 50%. The low supply of feed also affected levels of seed production, which resulted in several ponds not being stocked on schedule.

Being able to produce feed consistent in quality was a major challenge for fish farmers particularly for those who had expanded their operations given the availability and performance of Ugachick's initial sinking feed pellet. Yields and quality of farmed product subsequently declined and became inconsistent. Several farmers had their fish turned away from fish processing plants as well as farmers engaged in the business of smoking fish because of the high variability in size and high degree of fattiness in the farmed product. So in addition to declining yields, farmed fish became less marketable. Several previously profitable operations suffered significant losses.

The major issues discussed at the 2011 symposium covered: Production Planning and Management; Fish Feeds and Feeding; Value Addition and Marketing of Farmed Fish; and Current Support Services to the Aquaculture Private-Sector. The sessions were lively, particularly the open session titled "When I sold my fish

*Symposium and Trade Fair continued on page 10...*

*Symposium and Trade Fair continued from Page 9...*

at a loss and at a profit" where farmers shared experiences.

The trade fair ran concurrently with the symposium. This year the technologies showcased included a range of farmed fish products and inputs for sale. Several farmed fish by-products were prepared and displayed for sale. All the fish brought to the symposium this year was sold and there was demand for more from participants as well as passers-by who had come to the trade fair.

Three optional one-day field tours were also conducted that focused on demonstrating Best Management Practices in the production and marketing of catfish and tilapia fingerlings and table fish. Post-harvest handling, filleting, smoking and packaging were among the key aspects demonstrated.

The 2011 symposium attracted a total of 150 persons. Fifty-one percent of participants this year were farmers, 19% researchers and trainers and 12% technical advisors. Two fish farmers attended from Kenya. This year a South African Company, Deep Blue Aquatic Systems, displayed live fish holding systems.

Participants viewed the symposium as a great success. Mr. Paul Ssebinyansi, the WAFICOS chairman, commented "The presentations have been relevant and have addressed farmers' issues, challenges and experiences."

## PONDERINGS...

A poem by John Gardner

*Slowly, slowly, he cruises  
And slowly, slowly, he chooses  
Which kind of fish he prefers to take  
this morning;  
Then without warning  
The Barracuda opens his jaws, teeth  
flashing,  
And with a horrible, horrible grinding and  
gnashing,  
Devours a hundred poor creatures and  
feels no remorse.  
It's no wonder, of course,  
That no little fish much likes the thing,  
And indeed, it occasionally strikes the  
thing,  
That he really ought, perhaps, to change  
his ways.  
"But," (as he says with an evil grin)  
"It's actually not my fault, you see:  
I've nothing to do with the tragedy; I  
open my mouth for a yawn and -ah me!-  
They all*

*Swim*

*In."*



## CONGRATULATIONS TO DR. MADHAV SHRESTHA!

Dr. Madhav Shrestha was honored on 17 May 2011 by the Prime Minister of Nepal for his continuous dedication and contribution to the Agriculture/Aquaculture Development in Nepal. He shares this honor with two others, Dr. Bhagawan Koirala and Dr. Dambar Nepali, who were also honored for their contributions to their respective fields. Dr. Shrestha is an Aquaculture and Aquatic Resources Management (AARM) Alumnus (MSc' 92, PhD'94) of the Asian Institute of Technology (AIT). As one of many valuable collaborative partners of AARM, Dr. Shrestha has played a pivotal role in launching a diverse range of projects in Nepal. He was the key organizer of the national symposium on Small-Scale Aquaculture in Nepal during 5-6 February 2009, and has been very successful in garnering support from national funding agencies for a number of projects designed to benefit the local communities throughout the country. In the past decade Dr. Shrestha has helped inaugurate such projects as Women in Aquaculture (2000-2006), Aqua-Internship projects (2008-present), Aquaculture without Frontiers- Nepal, and several CRSP projects, to name a few. For more information on these projects, visit:

[www.aquaculturewithoutfrontiers.org](http://www.aquaculturewithoutfrontiers.org) and [aquafishcrsp.oregonstate.edu](http://aquafishcrsp.oregonstate.edu)



## GRADUATE STUDENT PROFILE: BOAMAH YAW ANSAH

*By Chelsea Stephen*



*Boamah Yaw Ansah at work in the lab at Virginia Polytechnic Institute & State University, analyzing water samples collected for his PhD. Photo Courtesy of Boamah Yaw Ansah*

Having grown up in Apam, Ghana, Boamah Yaw Ansah is witness to the early stages of aquaculture in his home country, which is largely comprised of small-scale, semi-intensive operations in earthen ponds. Fisheries constitutes an important sector in Ghana's national economic development, but depletion of resources has made it difficult for commercial fishing to meet the demands of Ghana alone. Fish production from aquaculture is expected to help, but its contribution to the national economy has not been disaggregated and its relative importance is generally unrecognized.

Within the last decade or so, there has been a growing enthusiasm about fish farming on

Ghana's Volta Lake. "Aquaculture is still in the nascent stages in Ghana," says Ansah. "However, the huge potential of the industry in the country is obvious, considering the deficit in fish production demand." Ansah hears that potential knocking loudly on Ghana's door, and he wants to open it up and let it flourish. It seems fitting, considering aquaculture had the same effect on Ansah himself. Ansah's first love was water quality management. After getting involved in an internship with the Water Resources Commission (WRC), he chose to study Fisheries and Watershed Management at the Kwame Nkrumah University of Science and Technology (KNUST) in Ghana. Before long Ansah discovered that aquaculture studies effectively merged his interest of watershed management and low impact ecosystem services with his growing interest in food security. To Ansah, it seemed possible that aquaculture could address these critical issues affecting his home country. Ansah went on to get his Master's degree at Virginia Polytechnic Institute & State University with funding support from AquaFish CRSP and KNUST, which he completed in 2010. In February 2011, he received the Norman E. Borlaug Leadership Enhancement in Agriculture Program (LEAP) Fellowship.

Today, Ansah is as passionate as ever about the potential of aquaculture in Ghana. He is now working towards his PhD in Fisheries and Wildlife Conservation at Virginia Tech with his major professor Dr. Emmanuel Frimpong on a project titled "Enhancing profitability of small-scale aquaculture farm operations through resource management and environmental best management practices." This is a new "Feed the Future" (FtF) project with Purdue University under a collaboration between Dr. Kwamena Quagraine at Purdue and Dr. Hillary Egna at Oregon State University. In addition to Ghana, this project also involves work in Kenya and Tanzania. Two examples of Best Management Practices (BMPs) considered for tilapia production in Ghana are water re-use and utilization of floating feeds. Part of this FtF project aims to assess the impacts of these two aquaculture BMPs on water quality, farm profitability, and social welfare among Ghanaian fish farmers. Data will be obtained from bi-weekly measurement of fish growth rates and water quality at cooperating farms

*Graduate Student Profile continued on page 14...*



## RESEARCHERS AIM TO BOOST PRODUCTION OF TWO NATIVE FISH SPECIES IN MEXICO

By Tiffany Woods

Rafael Fernandez Guzman raises tilapia out in the lush, green Mexican countryside. It's a place where cows graze and the roads are lined with stands selling tortillas, papayas, potted plants, bananas and roasted chickens.

The straw hat-wearing, cell phone-carrying former cattle rancher farms the fish in rectangular, excavated earthen ponds roughly the size of basketball courts not far from the city of Villahermosa. His customers drive up and buy them fresh from the water, still breathing and flopping. He sold 120 metric tons of tilapia in 2009, the equivalent of 230,000 fish, he says.

Now he wants to branch into popular native species like Mayan cichlids and bay snooks (they're not actually related to snooks) because customers regularly ask for them, he says. The problem is, though, that he's not sure if these fish would be as lucrative as tilapia. He wouldn't

*Photo Above: Enrique Hernandez Gonzalez inspects a mesh cage of Mayan cichlids. A student at the Autonomous Juarez University of Tabasco in Villahermosa, Mexico, he is helping conduct research that aims to develop a genetically superior broodstock of Mayan cichlids and bay snooks for use in fish farming. Photo By Tiffany Woods*

stray from tilapia, he says, unless he could earn a profit margin of at least 25 percent.

Researchers at the Autonomous Juarez University of Tabasco in Villahermosa are trying to make sure that he can. Through systematic breeding, they're working to develop improved broodstocks of Mayan cichlids and bay snooks that would produce fast-growing, meaty fish that are consistent in size and quality and could compete economically with tilapia when raised in farmed conditions. The university aims to sell the juveniles, known as fingerlings, to fish farmers in southeastern Mexico.

Production of these species in captivity is also necessary because environmental degradation and overfishing have reduced their populations, says Kevin Fitzsimmons, a professor at the University of Arizona and a former president of the World Aquaculture Society.

He's one of the participants in the project, which is partially funded by the U.S. Agency for International Development through its AquaFish Collaborative Research Support Program headquartered at Oregon State University. Hillary Egna, the program's director, initiated the project.

For nearly a decade, the university in Villahermosa has been breeding and raising these native cichlids in captivity and selling them to the state of Tabasco and local governments for repopulation efforts, but this is its first attempt to improve the genetics of farmed stocks, says Wilfrido Contreras Sanchez, the lead Mexican researcher on the project.

The omnivorous Mayan cichlid, known locally as castarrica, is native to the fresh and brackish waters of Central America and southeastern Mexico. It has black vertical bands on its sides and is just the right size to fit on a dinner plate. The carnivorous bay snook, also known as tenguayaca or giant cichlid, has a line of large black spots on its sides, inhabits fresh waters in southeastern Mexico and Central America and grows slightly bigger than the Mayan cichlid.

Researchers chose these two species because they have been overexploited, they fetch higher prices than tilapia in local markets,

*Native fish in Mexico continued on page 13...*



*Native fish in Mexico continued from page 12...*

consumers like them, and fish farmers want to raise native species because of their popularity, Contreras says.

The challenge, however, is to produce fish that grow fast enough to compete with the quick-growing tilapia, a popular, easy-to-raise, non-native farmed cichlid that is ready for market after six months in grow-out ponds. The reason for wanting to speed up their growth is simple: The longer fish take to reach market sizes, the more money producers have to spend on feeding them.

Contreras doubts that these native species could ever grow as fast as tilapia. But, he says, if the time were shortened even just partially, the economics might work out in the end because of their more lucrative price. At local fish markets, one kilogram (2.2 pounds) of tilapia sells for around 40 pesos (about \$3.40) but bay snooks and Mayan cichlids command at least twice that.

Libido Rivera Lopez knows about the economics. The wiry, soft-spoken fish farmer and other members of a cooperative in the community of Cucuyulapa took a stab at raising Mayan cichlids but threw in the towel because the fish took too long to reach a marketable size. They went back to their trusty tilapia.

But if the researchers' work is successful, Rivera might have a second chance. At one of the university's campuses near Villahermosa, the project is in full swing. Dozens of mesh cages holding Mayan cichlids and bay snooks float

in two earthen ponds. The fish are the offspring of nearly 200 wild progenitors that underwent a rigorous physical exam, including blood cell counts, before being deemed healthy enough to be parent material. Once the blood work was done, the fish consummated their relationships in nuptial tanks and spawned hundreds of thousands of small fry.

Researchers have been gradually weeding out the slow-growing offspring. It's tedious, repetitive, slimy, sweaty, wet work. The kind you give to students – like Enrique Hernandez Gonzalez. The biology undergraduate is up to his waist in the pond water, dragging the cages to shore and scooping Mayan cichlids into a bucket. Standing in the sweltering humidity under a tree, graduate student Beatriz Adriana Hernandez Vera then weighs and measures their flopping, slippery bodies as Rosa Aurora Perez Perez, also a graduate student, records the data on a clipboard. Thousands of squirming fish have passed through their hands since the selection process started in 2009.

They'll keep an elite group of the largest and heaviest ones. They'll then breed those lucky few, cull their undersized offspring, breed the survivors, discard the lightweights and voilà, several crosses later, they'll have the final crème de la

crème parent stock: 880 hearty Mayan cichlids and 960 robust bay snooks, with both groups equally split by gender. They'll be maintained as broodstock to supply a steady stream of fingerlings to fish farmers.

One day, those offspring just might end up at Rafael Fernandez's fish farm.



*Fishmonger Candelario Jimenez Hernandez holds up a small Mayan cichlid at a market in Villahermosa, Mexico. He also sells tilapia (in foreground) and bay snooks (the yellowish, spotted fish in center). Photo By Tiffany Woods*

For more on how researchers in Mexico are trying to develop a genetically superior broodstock of Mayan cichlids and bay snooks for use in fish farming in a video produced by Tiffany Woods, please visit the AquaFish CRSP website: [aquafishcrsp.oregonstate.edu/news\\_events.php](http://aquafishcrsp.oregonstate.edu/news_events.php)



*Graduate Student Profile continued from page 11...*

throughout Ghana. Field work, Ansah says, is one of his favorite components of the work. "The most enjoyable experience is returning to Ghana every summer and travelling through local communities."

But what influences the adoption of BMPs among fish farmers? Innovation Diffusion is a type of decision making that occurs through a series of communication channels over a period of time among members of a similar social system. New innovations or practices can be rejected at any point throughout the five stages of adoption, defined as knowledge, persuasion, decision, implementation, and confirmation. Ansah has identified three different techniques that facilitate diffusion of new innovations or practices among fish farmers: demonstrations, workshops, and farmer-to-farmer training. His dissertation will investigate the relative effectiveness of these Innovation Diffusion Techniques, and assess the impact that BMP adoption has on the supply of ecosystem services.

To date, farmers have been selected to participate in the study and farm demonstrations have commenced. The first three regional workshops are scheduled to begin in July, at which time surveys will be administered before, during, and after to ascertain the status quo proportion of farmers using the BMPs. Ansah hopes that the results will be applicable to the entire sub-Saharan African region, where the cultivation of tilapia in earthen ponds is ubiquitous. But its immediate utility in Ghana is certainly tenable. "This study will provide important data for Ghana's forthcoming fisheries and aquaculture policy document," say Ansah. "Effective Innovation Diffusion Techniques will also be available, which will guide future extension efforts on BMP adoption and adaptation to local conditions." But as Ansah proclaims, it's not only about increasing production. "Aquaculture ought to prevent environmental impacts – commonly water quality issues – that have pervaded aquaculture adoption in the past," he states. Adoption of BMPs could be just the ticket that Ghana needs to realize aquaculture's full potential in the country.



## Goings-on in the Pond...



AquaFish CRSP was featured in Oregon's Agricultural Progress, a research magazine for the Oregon State University Agricultural Experiment Station. "Hatching Dreams for a Better Life," written by Peg Herring, reflects on director Hillary Egna's 20 years of devotion to the international program. "The AquaFish program reaches people where and how they live, and is therefore distinct among most other international programs," writes Herring. For the full story, visit: [oregonprogress.oregonstate.edu/winter-2011](http://oregonprogress.oregonstate.edu/winter-2011)

Congratulations to CRSP Principal Investigators, Russell Borski and Wilfrido Contreras-Sánchez, who were honored for the exceptional quality of their respective project reports at the Annual Meeting in Shanghai. Lead US PI, Russell Borski, received Best Paper for Comprehensiveness of Topic and Clarity of Presentation for presenting on "Fishmeal-free diets improve cost effectiveness of culturing Nile tilapia in ponds under an alternative day feeding strategy" (see *related story on page 3 of this issue*). Host Country PI, Wilfrido Contreras-Sánchez, was honored with the Best Paper Award for Innovative Research and Clarity of Presentation for presenting on the "Potential use of bacterial degradation to eliminate methyltestosterone from intensive tilapia masculinization systems" (see *related story on page 1 of Aquanews Fall 2010, volume 25, number 3*).

Honored during the AquaFish CRSP Award Ceremony on 19 April in Shanghai, Pandit Narayan Prasad received the SOU-CRSP Yang Yi Young Scientist Travel Fund, which was established at Shanghai Ocean University in memory of Dr. Yang Yi to recognize excellent young scientists from the AquaFish Asian Partner institutions. The award provides the opportunity for the recipient to attend the Aquafish CRSP annual meeting and to present their work at the associated conference. Pandit gave his presentation on "Heat-Induced Germ Cell Loss In Sub-Adult Nile Tilapia *Oreochromis niloticus*" during the AquaFish CRSP Technical Session during ISTA9 on 22 April.

*More awards and honors on page 15...*



## Upcoming Meetings and Events...

*The AquaFish CRSP is proud to support workshops and meetings designed to facilitate increased knowledge and communication in aquaculture. Upcoming meetings and workshops include...*

### **American Fisheries Society 2011 Annual Meeting**

4-9 September 2011  
Seattle, Washington USA  
[www.afs2011.org/](http://www.afs2011.org/)

### **AquaFish CRSP Biodiversity Symposium: The effects of semi-intensive aquaculture on biodiversity in nearshore and inland waters (All Invited)**

8-9 September 2011  
Seattle, Washington USA  
[www.afs2011.org/](http://www.afs2011.org/)

Third International Conference on Sustainable Animal Agriculture for Developing Countries (SAADC 2011)  
26 - 29 July 2011  
Nakhon Ratchasima, Thailand  
[www.saadc2011.com/home.php](http://www.saadc2011.com/home.php)

The Aquaculture Roundtable Series – TARS 2011  
Aquaculture Feeds and Nutrition  
17-18 August 2011  
Singapore  
[www.tarsaquaculture.com/](http://www.tarsaquaculture.com/)

European Aquaculture Society  
AquaNor Forum 2011: Up-scaling Aquaculture Systems  
17-18 August 2011  
Trondheim Spektrum, Norway  
[www.easonline.org/component/content/article/181d](http://www.easonline.org/component/content/article/181d)

Fifth International Symposium on GIS/Spatial Analyses in Fishery and Aquatic Sciences  
22– 26 August 2011  
Wellington, New Zealand  
[www.esl.co.jp/Sympo/5th/first\\_announcement.pdf](http://www.esl.co.jp/Sympo/5th/first_announcement.pdf)  
Aqua Africa 2011  
Aquaculture Association of Southern Africa  
13-16 September 2011  
Mangochi, Lake Malawi  
[www.aasa-aqua.co.za/site/conferences/](http://www.aasa-aqua.co.za/site/conferences/)

The 4th International Oyster Symposium  
15-18 September 2011  
Hobart, Tasmania, Australia  
[www.oysterstasmania.org/](http://www.oysterstasmania.org/)

Third International Symposium On Cage Aquaculture in Asia (CAA3)  
16-19 November 2011  
Kuala Lumpur, Malaysia  
[www.asianfisheriessociety.org/caa3/](http://www.asianfisheriessociety.org/caa3/)

## Congratulations!

To Wilfrido Contreras-Sánchez who was honored with the award "State Medal for environmental Conservation" based on his work on native species of fish (gars, chichlids and snooks). This award is given by the State Congress. (For more information on some of Wilfrido's work on native cichlids see page 12)

To Remedio Bolivar and her team, honored with the Best Paper Award for their investigation "Internet-Based Podcating: Extension Modules for Farming Tilapia in the Philippines" at the 23rd CLSU in-House Review of Completed and Ongoing R&D Projects.



For more meeting and employment opportunities visit our Education & Employment Opportunities network database online, EdOpNet, at [aquafishcrsp.oregonstate.edu/edop.php](http://aquafishcrsp.oregonstate.edu/edop.php)

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## AQUAFISH CRSP CONTACT INFORMATION

AquaFish CRSP and Aquaculture CRSP publications can be accessed online at [aquafishcrsp.oregonstate.edu/publications.php](http://aquafishcrsp.oregonstate.edu/publications.php)

Aquanews is available on-line at <http://aquafishcrsp.oregonstate.edu/aquanews.php>. Past issues may also be accessed online at [aquafishcrsp.oregonstate.edu/AquaNewsArchives.php](http://aquafishcrsp.oregonstate.edu/AquaNewsArchives.php)

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

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