AQUANEWS

Sustainable Aquaculture and Fisheries for a Secure Future

Feed the Future Innovation Lab for Collaborative Research on Aquaculture & Fisheries

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In this issue...

AFU Researchers Repeat Success with Breeding Native Sahar at New Location in Nepal

By Caleb Price, AquaFish Innovation Lab

AquaFish Graduate student Subhash Jha mixes Sahar eggs and milt with a feather to induce fertilization (photo courtesy of Subhash Jha).

The Golden Sahar (*Tor putitora*) is an Indian carp species endemic to Asia. Also called "mahseer", this cyprinid is a popular game fish and an economically important food fish in several countries across the Himalayan plateau. In Nepal, however, overfishing and habitat alterations have caused widespread declines in Sahar populations. Management efforts to reverse population declines, such as restoring habitat and curbing fishing pressure with government regulations, help alleviate the problem. Another approach is to supplement the threatened population by increasing supply from aquaculture production, which could allow for a continued market presence. AquaFish researchers have been working on improving breeding techniques

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AquaFish Partner Wilfred Jamandre Transfers Value Chain Analysis Expertise Across the Globe

By Morgan Chow, AquaFish Innovation Lab

Value chain analyses (VCA) in aquaculture reveal gaps in the value chain, and offer insight on strategies to improve its overall efficiency and equity. Gender integration in aquaculture value chains is crucial to the sustainability of this industry.

AquaFish researchers have been conducting aquaculture VCA research for many years, and have identified major barriers to women's participation as well as some key strategies for overcoming them. Dr. Wilfred Jamandre, a long-time AquaFish partner, has been working on VCA research at Central Luzon State University (CLSU) in the Philippines for almost ten years. During his time with AquaFish, Wilfred worked on numerous investigations related to fish VCAs. Wilfred has also advised AquaFish-supported students on VCA research, and continues to do relevant research that contributes to increased transparency and economic improvements in aquaculture. He has contributed to an AquaFish-supported VCA

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Wilfred visits a hatchery on the island of Luzon, Philippines (photo courtesy of Wilfred Jamandre).

Goings-On In the Pond...

Two large earthquakes (7.8 and 7.3 magnitude, respectively) struck Nepal within a two-week period this spring 2015. These earthquakes and aftershocks have killed and injured thousands of people and destroyed buildings throughout the country. AquaFish Host Country Lead Project PI, Dr. Madhav Shrestha, and Host Country Co-PI, Dr. Sunila Rai, have reported that the Nepal AquaFish team and their families are all safe and healthy, although their homes and research infrastructure sustained damage. The AquaFish Innovation Lab expresses its most heartfelt sympathies to its Nepali colleagues and their families and friends.

Oregon and the rest of the west coast of the U.S. also face the danger of a massive earthquake, which experts say could happen at any time. With renovations and earthquake retrofitting happening across the Oregon State University (OSU) campus, AquaFish moved offices again and is temporarily being housed in Bexell Hall until a more permanent space is available in Fall 2015.

AquaFish Investigator, Dr. Claude Boyd, and former AquaFish External Program Advisory Council (EPAC) member, Dr. Aaron McNevin, published an article in the May/June 2015 issue of the Global Aquaculture Advocate, entitled *Embodied Resource Use In Feed-Based Aquaculture*. In the article, authors stress the importance of improving feed conversion ratios in aquaculture to not only reduce resource use and production costs, but also to limit the amount of nitrogen and phosphorus discharged to the surrounding environment.

Aquaculture America (AA2015) in New Orleans, Louisiana

By Kat Goetting, AquaFish Innovation Lab

AA2015 provided a great opportunity to showcase the research AquaFish is doing around the world. More than 600 people attended the conference this year, which was held in the lively city of New Orleans, Louisiana, from 19-22 February 2015. AquaFish researchers and colleagues presented and led sessions on AquaFish-supported research with regional and global impacts.

Dr. John Walakira, a Host Country Co-PI in Uganda who earned his PhD at Auburn University with AquaFish support, presented on innovations in lungfish breeding in a presentation entitled *Guiding captive breeding of African lungfish* (Protopterus aethiopicus) *in Uganda: Genetic diversity and sex determination*.

Extending market and production information to a broad audience can help build sustainability and promote best management practices. This is what Moureen Matuha, an AquaFish-supported Master's student at Auburn University, hopes to accomplish through her research on *Mobile phone use in Ugandan aquaculture: Farmer experiences and aspirations.*

Long-time AquaFish colleague Dr. Wilfrido Contreras-Sanchez co-led a session on *Recent Advances in Snook Aquaculture*. Wilfrido was supported by the PDA/CRSP while earning his MS and PhD degrees, has served as an AquaFish Project PI, and currently serves as a Regional Center of Excellence (RCE) Coordinator for Latin America and the Caribbean. In addition to his collaboration with AquaFish, he is busy in his role as Vice President of Research at

Wilfrido Contreras-Sanchez presents on AquaFish-supported gar and snook research (photo courtesy of Wilfrido Contreras-Sanchez).

Universidad Juárez Autónoma de Tabasco (UJAT), Mexico.

He presented on AquaFish-supported gar and snook research, including:

- Induced reproduction and larval culture of the Mexican snook (*Centropomus poeyi*)
- Growth performance of wild common snook (*Centropomus undecimalis*) juveniles in captivity
- Evaluation of practical diets for fish meal replacement in the tropical gar (*Atractosteus tropicus*)
- Effects of salinity and water quality on juvenile tropical gar (*Atractosteus tropicus*) grow-out and survival

AquaFish also presented three program-wide posters — two highlighting work on capacity building and nutrition, and a third summarizing findings on best management practices for improving profitability of small-scale fish farms in Africa.

- *Human and institutional capacity development in aquaculture at centers for higher learning*
- *Addressing hunger and undernutrition through sustainable aquaculture*
- *Adapting best management practices for enhancing the profitability of small-scale aquaculture in Ghana, Tanzania, and Kenya*

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for Sahar, to support conservation and improved food security, for many years. In line with past AquaFish findings, researchers at Nepal's Agriculture and Forestry University (AFU) have developed artificial breeding techniques for Sahar, with a goal to establish mass-scale seed production technologies. Many current hatchery operations use reproductive hormones, such as carp pituitary extract, to artificially induce the development of ova in female fish. Though often effective, these techniques can have negative environmental effects that reduce the sustainability of the aquaculture operation.

Dr. Jay Dev Bista, AquaFish Host Country Co-PI, has worked for years with his colleagues at AFU and the Fisheries Research Center in Pokhara to establish a method that allows the fish to "ripen" (become sexually mature) without the use of hormones. By controlling for proper temperatures and stocking densities in culture ponds, Jay Dev and his team were able to create conditions that allowed nearly 100% of the females to become sexually mature in February and March 2015, and achieved hatch rates between 75 and 95% after spawning and incubation.

Feeding the broodstock fish a proper diet is critically important to helping the fish achieve sexual maturity. The fish are fed twice per day at a rate of 3% of their total body weight to help them maintain optimal health and growth rates. Protein-rich, high-quality diets meet the nutritional requirements of the animals and ensure that the females have sufficient energy to develop their ova during warm months.

The AquaFish team hopes to repeat the success of their initial attempts in Chitwan, where AFU is located. Sahar, like most other cyprinids (like carps, minnows, and barbs)

Jay Dev Bista and MS student Subhash Jha check the maturity of a Sahar brood fish to determine its readiness to spawn (photo courtesy of Subhash Jha).

are capable of spawning multiple times per year. Replicating the same spawning frequencies at different hatcheries throughout Nepal will increase Sahar seed production for grow-out farms, reducing the need for fishing bans and tighter regulations.

The first attempt to spawn the fish in Chitwan was unproductive, even though most of the male fish had achieved sexual maturity. However, most of the females were not ready to breed because of the cooler temperatures in September and October. Though perhaps disappointing, this result was not surprising, as these cooler months are considered to be the "minor season" for spawning.

Once the spring months arrived, and water temperatures began to rise, the researchers were able to achieve breeding success in Chitwan. These results are an encouraging step towards accomplishing the project objective of mass-producing Sahar seed for grow-out operations at fish farms throughout the country.

In Nepal, where there are very few experts working in the field of aquaculture,

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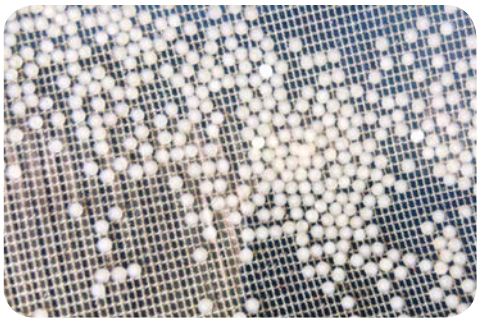

Fertilized Sahar eggs being incubated prior to hatching (photo courtesy of Subhash Jha).

knowledge transfer and extension activities are critically important for building capacity in the aquaculture industry, which relies heavily on government subsidies to keep fish farms running. Now that the project has successfully bred Sahar in Chitwan, they will begin to extend that knowledge to local fish farmers. By training fish farmers how to breed Sahar and achieve profitability on their farms, Jay Dev and his team hope their efforts will spur sustainable growth of the aquaculture industry in Nepal in order to meet the national demand for seafood, and reduce reliance on imports.

Subhash Jha, an AquaFish-supported graduate student at AFU, is optimistic that this research will benefit fish farmers in his native country. "My future plan is to develop a hatchery and training center so that I can train farmers and make them self-dependent in aquaculture," says Subhash. By developing the fundamental methods necessary for successfully breeding sahar in captivity, Jay Dev, Subhash, and the AquaFish team are paving the way for producing Sahar seed on a large scale in Nepal. The results of this research could ultimately kick-start an industry that can help achieve food security and promote conservation of this important yet threatened fishery through the development of sustainable methods for cultivation.

8th Fish Farmers' Symposium and Trade Fair, Uganda

By Joe Molnar, Auburn University, Alabama, USA and Theodora Hyuha, Makerere University, Kampala, Uganda

Karen Veverica conducts a demonstration on feed composition at Kajjansi Station during a field tour (photo courtesy of Joe Molnar).

The 14th of February was an exciting day for fish farmers in Uganda. After months of preparation, members of the Walimi Fish Farmers' Cooperative Society (WAFICOS) kicked off the 8th Fish Farmers' Symposium and Trade Fair at the Fairway Hotel in Kampala. Over 100 participants, many of whom are local fish farmers, attended the AquaFish-supported conference. The tradeshow brought representatives from private industry and eight different organizations, from Uganda, Tanzania, and Kenya.

With only a handful of organized fish farmer cooperatives in Uganda, WAFICOS is the oldest, largest, and most active aquaculture organization among them, with over 500 members. The cooperative is intended to provide support for fish farmers in Uganda by connecting them with relevant information and resources.

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AquaFish Student Corner

Graduate Student Profile: Jimi Reza

By Morgan Chow, AquaFish Innovation Lab

Jimi carefully places a tilapia gut sample into a test tube for preservation (photo courtesy of Jimi Reza).

Recently graduated AquaFish-supported Master's student, Jimi Reza, tested different feeding strategies at Bangladesh Agricultural University (BAU) to identify the most suitable feeding regimes for enhancing production in small-scale tilapia ponds in Bangladesh. Feed typically accounts for over 70% of total production costs for fish farmers globally, and can pose a significant barrier to fish farming. To address this obstacle to aquaculture development throughout the world, AquaFish researchers have been conducting experiments on how different feeding strategies influence fish growth rates, with the hope of increasing productivity for commercially-valuable fish species for culture operations.

The objective of Jimi's research at BAU, completed in February 2015, was to improve household income and the overall socioeconomic status of farmers in Bangladesh by continuing AquaFish's efforts to develop breeding methods that reduce feed costs. Jimi's work furthered previous AquaFish research in the Philippines on alternate-day feeding strategies for Nile tilapia and milkfish, which found that both species can be grown to market size with less feed and no loss in productivity.

Jimi and his fellow researchers applied five treatments randomly to 20 ponds that were stocked with tilapia fingerlings at a density of 5 fish/m^2. The five different treatments were:

1. Daily feeding with fertilization
2. Feeding every other day with fertilization
3. Feeding every third day with fertilization
4. No feeding with fertilization
5. Daily feeding without fertilization

Prior to stocking, ponds were dried and re-excavated to remove bottom mud, and

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Tilapia harvest from one of the experiment sites (photo courtesy of Jimi Reza).

AquaFish Student Corner

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Jimi's research partners in front of their pond experiment sites (photo courtesy of Jimi Reza).

urea and triple super phosphate were used for fertilization.

The results showed that overall production and gross returns were the highest in treatment five, but the highest net return and benefit-cost ratio were the highest with treatment two. These findings support previous AquaFish research, which found that alternate-day feeding with the correct fertilization could yield comparable growth rates at half the feed cost of the daily feeding strategy.

Jimi has always had a passion for research. Since he received his Bachelor's in Fisheries Science from Sylhet Agricultural University in Bangladesh in 2013, he has hoped to continue his education in aquaculture. Now as a recent Master's graduate, his desire to continue contributing to aquaculture development in Bangladesh is even stronger.

Jimi is grateful to have had the opportunity to meet AquaFish Director Dr. Hillary Egna, and appreciates all of the support he received from his advisor Dr. Md. Abdul Wahab (AquaFish Host Country Lead Project PI) and Dr. Russell Borski (AquaFish US Lead Project PI).

Jimi was recently hired as a Research Assistant for WorldFish, where he is working on developing small-scale aquaculture as an alternative livelihood option for fishers engaged in the Hilsa fishery in Bangladesh that experiences periodic fishing bans. Jimi attributes his graduate education with AquaFish toward helping him prepare for his work with WorldFish.

In spite of many issues that limit aquaculture growth in Bangladesh — such as a lack of start-up funds for poor farmers, water scarcity during dry seasons, and a shortage of available quality fish feeds — Jimi believes that sustainable aquaculture practices can contribute to Bangladesh's national economy and improve livelihoods for rural communities. For this reason, he plans to continue to explore ways that aquaculture can provide higher profits for small-scale farmers, and to disseminate his results in partnership with the Bangladesh Department of Fisheries and other groups in the public sector.

AquaFish Alumni Corner

Where Are They Now?: Ravelina Velasco

By Morgan Chow, AquaFish Innovation Lab

Central Luzon State University (CLSU) in the Philippines has always been Dr. Ravelina Velasco's academic home. Her interest in studying fisheries at CLSU began at a young age, when her father was the Dean of CLSU's College of Fisheries, and instilled a passion for research in Ravelina. After her father's passing, Ravelina continued to pursue her studies in fisheries. She developed a keen interest in genetic improvement of farmed tilapia and the great potential of these fish to positively impact the lives of Filipino farmers.

After completing her Bachelor's in Aquaculture at CLSU, Ravelina pursued a PhD at CLSU under Professor Remedios Bolivar, a long-time AquaFish partner and current Regional Center for Excellence (RCE) Coordinator for Asia. In 2008, Ravelina became a distinguished Borlaug LEAP Fellow through the support of Dr. Bolivar, as well as AquaFish Director Dr. Hillary Egna and AquaFish researcher Dr. Russell Borski. As a Borlaug LEAP fellow, Ravelina had the opportunity to collaborate with researchers at North Carolina State University (NCSU) and WorldFish in Malaysia.

According to Ravelina, being a Borlaug LEAP fellow boosted her pride and confidence in the importance of her work, and has "opened more doors of opportunities and friendship." Ravelina has received recognition for her work in many arenas, and attributes her academic success to the support she has received as a LEAP fellow and her involvement with AquaFish as a student.

"Aquaculture is my wind of destiny -- we create jobs, we train people as potential leaders…" -- Ravelina Velasco.

(Photo courtesy of Ravelina Velasco.)

Ravelina completed her PhD research in 2011 on the biological stress markers associated with the growth of Nile tilapia reared at different stocking densities. Shortly after graduating, Ravelina received a position as a Research Associate and Program Coordinator for the National Tilapia Research and Development Program at the Freshwater Aquaculture Center at CLSU. In June 2015, Ravelina will transition into a permanent position as an Instructor at CLSU.

Through hard work and dedication, Ravelina has made her way into a prestigious faculty position at one of the largest aquaculture academic institutions in the Philippines. Throughout her schooling, her classmates viewed Ravelina as a pillar of strength, persevering in her studies even when she lost her husband at a young age. Ravelina is proud of her work, and it brings her joy that she can both provide for her family and help others with their research and education.

Ravelina understands the great impact that aquaculture research can have on improving the nutritional status and income level of farmers, and is committed to promoting sustainable aquaculture practices throughout her career.

USAID Feed the Future Innovation Labs Annual Partners Meeting, Malawi

By Morgan Chow, AquaFish Innovation Lab

Representatives from 16 Feed the Future Innovation Labs (ILs), 8 African USAID Missions, USAID Washington, D.C. Offices, and implementing institutions, attended the USAID Feed the Future Innovation Labs Partners Meeting in Lilongwe, Malawi, from 20-23 April 2015 to discuss current research, progress, and ways to improve collaborations across Sub-Saharan Africa.

The meeting addressed ways to improve the understanding of processes for scaling up agricultural technologies; to identify pathways for improving nutritional outcomes through these research projects; and to enhance projects' focuses on human and institutional capacity building.

To kick off the meeting, USAID Missions presented areas of potential collaboration with the ILs, including agriculture policy, post-harvest, value chains, and nutrition. The Missions reiterated the importance of communication when disseminating new technologies to farmers.

Presentations by the ILs focused on sustainable intensification, or increasing food production while minimizing negative impacts on the environment, and the production of safe, nutritious food. AquaFish Director, Dr. Hillary Egna, presented *Pond to Platter: Linking human nutrition and sustainable aquaculture in Africa*, highlighting the better feed conversion ratio of fish compared to terrestrial protein sources, and dietary nutritional quality from a range of seafood products. The meeting provided an opportunity for participants to learn from one another and share ideas for collaboration across Sub-Saharan Africa.

Meeting participants in Lilongwe, Malawi (photo courtesy of Ford Evans).

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Exhibitor tables at the Fish Farmer Symposium (photo courtesy of Joe Molnar).

WAFICOS members include individuals, institutions, non-governmental organizations, companies, associations, and other stakeholders involved in the aquaculture industry in Uganda.

The cooperative was initiated in 2006 as a collaborative effort between the USAID-supported FISH (Fisheries Improved for Sustainable Harvest) Project, led by Auburn University, and the National Fisheries Resources Research Institute (NaFIRRI) in Uganda to create an avenue for fish farmers to provide feedback about improvements made at their farms by the FISH Project.

Since then, the AquaFish Innovation Lab has provided the technical and financial support to continue the Symposium. Other development partners, such as New Partnership for Africa's Development (NEPAD), Food and Agriculture Organization of the United Nations (FAO), and the Belgium Embassy, have supported the society by providing training, equipment, fishing gear, and assisting in the development of a strategic plan.

The 8th Symposium featured speakers from Uganda and abroad with an interest in aquaculture development, including many project personnel involved with the AquaFish project in Uganda. Speakers addressed various aspects of aquaculture production, most regarding the culture of tilapia and the African catfish. However, presentations also considered other species of interest. The final day of the Symposium consisted of a bus tour of fish farms, processing facilities, and research facilities.

This year's Symposium was officially opened by Hon. Nyyra Zerubel Mijumbi, Uganda Minister of State Fisheries, who introduced the meeting's theme: *Aquaculture as Competitive Business in Uganda*.

AquaFish HC Lead Project PI Dr. Theodora Hyuha, and AquaFish-supported PhD student Halasi Gidongo, both from Makerere University, presented an analysis of the profitability of raising catfish and tilapia in ponds in Uganda. They noted that the two species compete favorably in Ugandan markets; however, they face some constraints to market expansion. They found that increased extension visits at ponds would promote higher levels of profitability for both species by fostering best management practices. Researchers also encouraged farmers to form groups for better representation in the market and a bigger voice in the local government.

An informative presentation was made by Rabobank's Senior Analyst Gorjan Nikolik who considered *Bank Lending for Aquaculture: Challenges and Processes*. The 18% interest rates currently prevailing in Uganda make credit a serious concern for prospective and operating fish farmers and remain a barrier for expanding fish farming enterprises in the country.

The general session discussion was led by Dr. Nelly Isyagi, from Aquaculture Management Consultants Limited in Uganda, who summarized the most salient

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points from the two-day workshop. Farmers observed that their main problem was relatively low prices for their fish and high prices of inputs. Most fish farms are still small and therefore high profit margins are necessary. Securing access to markets for small-scale fish farmers is a pressing issue. An important path into the food system in Uganda is through the supermarkets that serve the urban populations in larger cities. Creating channels for moving product from farms to large urban markets is important for developing the aquaculture industry in Uganda.

Product quality and quantity, and ensuring a reliable supply to markets, are challenges that need to be considered by the industry. The ability to solve problems, discuss opportunities, and clarify technical matters through the emergence of new forms of communication, text messaging, and the growing presence of smart phones was also discussed. New innovations may allow fish to be sold on the farm or on the phone.

The present high demand for fingerlings was also a topic of conversation at the Symposium. Although this is a clear business opportunity for fish farmers with the right skills and facilities, it must be done responsibly. Quality breeding is important, as negative selection and inbreeding lead to weak production on grow-out farms.

The workshop provided valuable feedback to participants who were able to share common challenges and collaborate on possible solutions with other industry players. The farmers continue to struggle with locating markets, mainly due to intermittent supply, but they have begun to better understand their challenges. Workshops such as this help create opportunities for end-users to expand their networks and work together to overcome some of these obstacles.

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A fish farmer with his net at one of the tilapia hatcheries that Wilfred works with (photo courtesy of Wilfred Jamandre).

for seaweed aquaculture in Banda Aceh, Indonesia, and continutes to apply his expertise to projects around the world.

In 2013, Wilfred was recruited to participate in a VCA workshop at the Universidad Juárez Autónoma de Tabasco, Mexico, which brought together 23 participants, including fingerling and feed suppliers, fish traders, students, professors, and technicians to stimulate collaboration amongst stakeholders in the value chain. In addition to providing an analysis of the components of the value chain, including key customers, product forms, major routes, and payment flows, the study also provided recommendations for training participants to address emerging concerns. The study also revealed a need for improved hatchery and nursery facilities that can produce bigger fingerlings to shorten grow-out periods. They also found that niche opportunities for growers and consumers could be better promoted through various types of incentive schemes. The training illustrated the great accomplishments that can be made when

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AquaFish investigators from different host countries and project areas collaborate and share their expertise.

In Bangladesh, Wilfred is currently working on a project that aims to improve the nutritional status and livelihoods for marginalized women-led households in the southwest region. Project partners — North Carolina State University, University of Dhaka, Khulna University, the Southeast Asian Fisheries Development Center, and Bangladesh Agricultural University — hope a VCA of farm-raised tilapia and mud crab will allow for a better understanding of women's roles in the value chain. The results may help foster greater participation of women in aquaculture in impoverished areas of Bangladesh.

The study in Bangladesh will first determine the present status of household nutrition through surveys designed to understand the contribution of cultured fish species to the daily nutrition of women-led households. Researchers then plan to disseminate better management practices for integrating mud crab with tilapia ponds to facilitate increased availability of fish for household consumption, while also promoting sustainable farming practices. Once the VCA is complete, researchers will communicate policy recommendations for regional level policy in Bangladesh. Through other funding sources, Wilfred is also building on his AquaFish research to conduct a VCA in Tanzania with the University of Dar es Salaam's Institute of Marine Sciences. He has been able to further advance AquaFish foundational VCA research by collaborating with researchers in the evaluation of valuable fish species throughout Tanzania. The objective of the collaboration is to enhance capabilities and promote international cooperation through VCA of commonly farmed fish species and to promote educational and scientific cooperation among academic staff, visiting professors, and students.

Wilfred and his colleagues at a seaweed processing plant in Luzon, Philippines (photo courtesy of Wilfred Jamandre).

> *"Our work became a model for others as an alternative mode of identifying areas for improvement of food and related sectors by giving emphasis to strengthening links and governance structures within a value chain,"*
>
> — Wilfred Jamandre

Wilfred's work on VCA in the Philippines, Mexico, Bangladesh, and Tanzania are prime examples of the knowledge transfer that occurs from successful AquaFish research. Wilfred says that as links in aquaculture value chains get stronger, aquaculture can better serve emerging niche markets domestically and internationally, enhancing opportunities for growth. AquaFish strongly promotes domestic, regional, and international collaboration, which begins at meetings, conferences, and trainings. The strong linkages that Wilfred has cultivated with partners in other countries are important mechanisms for scaling up AquaFish research and enhancing capacity building.

Notices of Publication

Notices of Publication announce recently published peer-reviewed work carried out with AquaFish support. To receive a full copy of a publication, please contact the author(s) directly. All past and present Notices of Publication can be found on the AquaFish website at: aquafish.oregonstate.edu/nop.php

Prolactin is a major inhibitor of hepatic Leptin A synthesis and secretion: Studies using a homologous Leptin A ELISA in the tilapia (14-337).

Jonathan D. Douros, David A. Baltzegar, Jason P. Breves, Darren T. Lerner, Andre P. Seale, and E. Gordon Grau, and Russell J. Borski.

The present study identifies regulatory interactions between leptin A (LepA) and the pituitary hormone prolactin (PRL). In order to measure tilapia (*Oreochromis mossambicus*) LepA, an enzyme-linked immuno- sorbent assay (ELISA) utilizing a rabbit polyclonal antibody specific to tilapia LepA was first developed. The antibody shows strong cross reactivity to recombinant tilapia LepA (rtLepA), and a corresponding 16 kDa protein in both tilapia and striped bass plasma, but not to recombinant human leptin (rhLep). The assay has a linear detection range of 0.25–1000 nM, with intra- and interassay variability of 9% and 16%, respectively. Plasma LepA levels measured in tilapia ranged from 0.8 to 3.9 nM, similar to that found for other vertebrates. Hypophysectomy (Hx) increased circulating LepA and lepa mRNA levels in the liver, the dominant source of hormone production. Adminstration of ovine PRL (oPRL, 5 lg/g BW) to Hx fish restored circulating LepA and hepatic lepa mRNA levels to those of control fish. Additionally, oPRL reduced lepa mRNA levels in a dose-dependent fashion in cultured hepatocytes following an 18 h incubation. Previous work in our lab indicates that rhLep stimulates PRL release in vitro from tilapia pituitaries. Here, both rtLepA and rhLep (0.5 lg/g BW) increased mRNA expression of tilapia prolactin mRNAs (prl1, prl2) in the pituitary in vivo. These results demonstrate that LepA enhances pituitary prolactin synthesis and release, while PRL in turn inhibits hepatic leptin secretion and synthesis in teleosts. We postulate this regulatory interaction may be necessary for mobilizing energy reserves during acute hyperosmotic adaptation.

This abstract was excerpted from the original paper, which was published in the *General and Comparative Endocrinology* (2014), 207: 86-93.

The value of pig manure as a source of nutrients for semi-intensive culture of Nile tilapia in ponds (a review) (14-338).

Christopher L. Brown, Tingbao Yang, Kevin Fitzsimmons, and Remedios B. Bolivar.

Growing global needs for food call for substantial increases in protein production in coming years, and for diligent conservation efforts. Manures from farm animals have been viewed both as a resource and as a waste product, but they are critically important sources of nutrients for organic and integrated farming and for traditional Asian aquaculture. Given constraints on livestock production and capture fisheries, careful development of the aquaculture industry is a necessity. The production volume and market share of tilapia are advancing extremely rapidly, and so too is the proliferation of misinformation and controversy. Culture and feeding practices differ widely, but feeding is usually recognized as the single largest cost to producers. Traditional Asian integrated farming practices involve the use of manures and other farm wastes to promote algae and zooplankton production, serving as a sole or supplemental nutrient source to the food chain that supports tilapia growout. Tilapia also ingest manures. The efficient use of nutrients from manures can have multiple benefits to integrated terrestrial agriculture and aquaculture, as long as product safety and quality are not compromised. With efficient use, handling of manures is simplified, fish production costs are reduced, fish nutrition can be improved, and potentially polluting materials are cycled constructively on integrated farms. Consumer and press reactions to the use of farm manures in food production can be highly polarized. Published responses cover a range of extremes, from enthusiastic endorsement to volatile reactions and outright rejection; in some areas this practice is considered to be more of a "PR (Public Relations) problem" than a health hazard. The perception in online public media that tilapia coming from ponds fertilized with manure are heavily contaminated with pathogens has not been supported by evidence. The perspectives of farmers in two major tilapia production areas (China and the Philippines) are included.

This abstract was excerpted from the original paper, which was published in *Agricultural Sciences* (2014), 5: 1182-1193.

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Effects of dietary administration of stinging nettle (*Urtica dioica*) on the growth performance, biochemical, hematological and immunological parameters in juvenile and adult Victoria Labeo (*Labeo victorianus*) challenged with *Aeromonas hydrophila (15-339).*

Charles C. Ngugi, Elijah Oyoo-Okoth, James Mugo-Bundi, Paul Sagwe Orina, Emily Jepyegon Chemoiwa, and Peninah A. Aloo.

We investigated effects of dietary administration of stinging nettle (*Urtica dioica*) on growth performance, biochemical, hematological and immunological parameters in juvenile and adult Victoria Labeo (*Labeo victorianus*) against *Aeromonas hydrophila*. Fish were divided into 4 groups and fed for 4 and 16 weeks with 0%, 1%, 2% and 5% of *U. dioica* incorporated into the diet. Use of *U. dioica* in the diet resulted in improved biochemical, hematological and immunological parameters. Among the biochemical parameters; plasma cortisol, glucose, triglyceride and cholesterol decreased while total protein and albumin in fish increased with increasing dietary inclusion of *U. dioica*. Among the haematology parameters: red blood cell (RBC), white blood cell (WBC) counts, haematocrit (Htc), mean cell haemoglobin (MCH), mean cell haemoglobin concentration (MCHC) and netrophiles increased with increasing dietary inclusion levels of *U. dioica*, some depending on the fish age. Serum immunoglobulins, lysozyme activity and respiratory burst were the main immunological parameters in the adult and juvenile *L. victorianus* measured and they all increased with increasing herbal inclusion of *U. dioica* in the diet. Dietary incorporation of *U. dioica* at 5% showed significantly higher relative percentage survival (up to 95%) against *A. hydrophila*. The current results demonstrate that using *U. dioica* can stimulate fish immunity and make *L. victorianus* more resistant to bacterial infection (*A. hydrophila*).

This abstract was excerpted from the original paper, which was published in *Fish & Shellfish Immunology* (2015), 44(2): 533-541.

Evidence of rapid transfer and bioaccumulation of Microcystin-LR poses potential risk to freshwater prawn *Macrobrachium rosenbergii* (de Man) (15-340).

Li-Ping Liu, Xiao-Ming Su, Tao-Ying Chen, Kang Li, Jia Zhan, Hillary Egna, and James Diana.

Microcystins accumulate in aquatic organisms and can be transferred to higher trophic levels, eventually affecting vector animals and consumers. We examined three levels of an aquatic food chain (*Microcystis aeruginosa, Daphnia magna* and *Macrobrachium rosenbergii*) to identify the transfer efficiency and risk of microcystin on prawns. Samples were analysed using ultra performance liquid chromatography-mass spectrometry (MS)/MS and microcystin-LR (MC-LR) distributions in prawn tissues were studied. The results showed that prawns accumulate MC-LR both directly from *M. aeruginosa* and indirectly through *D. magna* which was pre-exposed to *M. aeruginosa*. MC-LR was detected in the gills, digestive tracts and hepatopancreas of the prawns 2 h. after exposure. MC-LR accumulated in prawns to 0.49 +/- 0.04 µg g-1 dry weight in hepatopancreas within 24 h, while it was not detected in muscle samples, and rarely appeared in blood samples in such a short period. Although MC-LR was not detected in muscle, the head including hepatopancreas of the prawns accumulated troublesome amounts of MC-LR. These results demonstrate that microcystis blooms in prawn farming potentially pose a risk to human consumers, although prawns may be exposed to the bloom for a very short time, hence regular monitoring of blue green algae population is recommended.

This abstract was excerpted from the original paper, which was published in *Aquaculture Research* (2015), 1-10.

Economic analysis of alternative Snakehead *Channa striata* feed (15-341).

Justin Grimm-Greenblatt, Robert Pomeroy, Boris Bravo-Ureta, Le Xuan Sinh, Huynh Van Hien, and Tessa Getchis.

The use of low-value small-sized fish (LVSSF) both as aquaculture feedstuff for snakehead and for human consumption in Vietnam and Cambodia could result in demand outstripping supply as human population and aquaculture production grow. Replacing LVSSF for snakehead aquaculture with pelleted feed would reduce the pressure on stocks of LVSSF. This study addresses the economics of this replacement strategy for snakehead culture in Vietnam. Economic engineering methods were used to assess the effects of pelleted feed for low, medium and high-productivity scenarios. The study compared net present values (NPV), internal rates of return (IRR) and differences in NPV between farms using pelleted feed and those using LVSSF. It also included sensitivity analyses that related NPV and IRR to increased snakehead prices. Results demonstrated strong economic incentives for high-productivity farms to use pelleted feed. However,

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pelleted feed was too expensive for medium- and low-productivity farms. NPVs were more sensitive to reductions in the cost of pelleted feed than to increases in the cost of LVSSF or the cost of capital.

This abstract was excerpted from the original paper, which was published in *Aquaculture Economics & Management* 19(2): 192-209.

PONDERINGS...

Though patterns placed
precisely on the seam
Do drift above the trout,
a piscine dream,

Yet fail they still to spark
the primal twitch
And unmolested float,
despite my wish.

Amend I must
my strategy herewith
To sink through currents swift
a beadhead nymph

Suspended by a line
so slight and bare
That no fish would suspect
malfeasance there.

Tis here, at last! I find
my happy course.
A tug, a twitter,
an electric pulse

Attend the play and fight,
and yield for free
The tired trout and
sweet solace to me.

By Caleb Price

First Ever Nepal Fisheries Society (NEFIS) Convention

NEFIS organizers welcome participants during the opening session of the two-day convention (photo courtesy of Dr. Madhav Shrestha).

Together with the Nepal Fish Farmers' Association, the Agriculture and Forestry University (AFU), and the Fisheries Research Division NARC, AquaFish co-sponsored the first NEFIS Convention on 30-31 January 2015 in Kathmandu, Nepal. The convention's theme was "Emerging Opportunities and Trends in Aquaculture/Fisheries," with a focus on the future of fish production in Nepal. The convention provided a unique opportunity for professionals and researchers in aquaculture and fisheries to come together and share scientific work and general knowledge with one another. Dr. Madhav Shrestha, AquaFish Host Country Lead Project PI, and Dr. Rama Nanda Mishra, Host Country Co-PI, helped organize the event.

Dr. Mishra set the tone with an overview of Nepal fisheries trends, and ways to improve the national seed production system, such as improving mechanisms for seed distribution. AquaFish-supported students and personnel, and researchers from partnering organizations presented an array of research results over the two days. AquaFish Host Country Co-PI, Dr. Jay Dev Bista, presented findings for attaining increased spawning rates for Sahar. AquaFish Host Country Investigators, Dr. Sunila Rai and Dr. Dilip Jha also presented findings from research related to aquaculture development in Nepal. Other presenters shared results on value chain analyses for major fish species, techniques for avoiding red-blooms in pond culture, and other relevant topics to Nepal aquaculture. Overall, the convention was a big success, and the organizers hope to make it an annual event.

AquaFish Outreach in Oregon, USA

By Morgan Chow, AquaFish Innovation Lab

AquaFish engaged Oregon's youth at two successful community outreach events this spring. At **Oregon Neighbors For Kids 1st Annual SM²ART** (Science Meets Music, Art, Reading and Technology) event on 21 February 2015 in Depoe Bay, Morgan Chow and Stephanie Ichien shared fun facts about aquaculture and AquaFish work with local visitors from towns in Oregon. As part of the annual **Oregon State University (OSU) Earth Day Community Fair** on 21 April 2015, AquaFish reached out to the OSU community about sustainable aquaculture practices and the work that AquaFish does to promote low-impact aquaculture.

AquaFish-supported PhD student, Stephanie Ichien, teaches a family from Depoe Bay about some important considerations for aquaculture (photo by Morgan Chow).

Paris Edwards shows a booth visitor how to spin AquaFish's trivia wheel at the Community Fair at OSU (photo by Morgan Chow).

Upcoming Meetings and Events...

People and the Sea VIII
24-26 June 2015
Amsterdam, The Netherlands
www.openchannels.org/conferences/mare-academic-conference-2015-people-and-sea-viii

Latin American & Caribbean Aquaculture 15
16-19 November 2015
Fortaleza, Brazil
www.was.org/meetings/default.aspx?code=LACQUA15

5th International Symposium on Cage Aquaculture in Asia
11-14 November 2015
Kerala, India
www.caa5.net/

11th Asian Fisheries & Aquacultur Forum and Exhibition (11AFAF)
3-7 August 2016
Bangkok, Thailand
www.asianfisheriessociety.org/events.php

Asian-Pacific Aquaculture 2016 and ISTA 2016
26-29 April 2016
Surabaya, Indonesia
www.marevent.com/APA2016_INDONESIA/APA16%20Reg%20Bro%203-11.pdf

Employment Opportunity

AquaFish is hiring an **Outreach & Capacity Building Coordinator** to join the management team at Oregon State University in Corvallis, Oregon. For a full position announcement, with required and preferred qualifications and application information, go to http://jobs.oregonstate.edu/ and search for posting # 0015111. OSU is an AA/EOE/Vets/Disabled Employer. Deadline for applications is 15 July 2015.

For more meeting and employment opportunities, visit our Education & Employment Opportunities Network (EdOpNet) online: aquafish.oregonstate.edu/edop.php

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AquaFish Innovation Lab and Aquaculture publications can be accessed online at aquafish.oregonstate.edu/publications.php

AquaNews is available on-line at http://aquafish.oregonstate.edu/aquanews.php. Past issues may also be accessed online at aquafish.oregonstate.edu/AquaNewsArchives.php

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

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