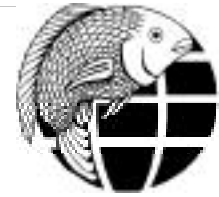


# AQUANEWS



*Sustainable Aquaculture  
for a Secure Future*

POND DYNAMICS/AQUACULTURE COLLABORATIVE RESEARCH SUPPORT PROGRAM NEWSLETTER

Volume 13, Number 4/Fall 1998

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## Letter from Honduras

**R**eaders are surely aware of the major devastation wreaked in Central America by Hurricane Mitch in late October and early November. The following eyewitness account is from a November 2 email message from Principal Investigator Bart Green, who leads the CRSP Honduras Project and lives with his family in Tegucigalpa.

On Friday (October 30) I traveled to Comayagua to pay the people in our project. In the Zamorano area forest reserve, a number of trees had fallen most likely because the thin layer of top soil was so water-saturated that it no longer could sustain the tree. Once in the Comayagua Valley, at the first bridge along the highway, just after Flores, the water already was lapping at the underside of the span as I crossed on my way to Comayagua. What was saving the bridge was that the highway approach to the bridge was lower, and the river had taken this route and was washing over the highway. The next bridge, in the vicinity of Los Palillos, was already closed, but there was a detour through La Via to the La Paz road back to the highway. Given this situation I decided to make my visit to Comayagua as short as possible. In talking with our people, the ponds at the El Carao station already were over-flowing on Thursday, and that flooding already was making access to the station difficult. By Friday we assumed that the ponds already had their banks topped over and that flooding prevented access to the station. I left Comayagua quickly. By the time I returned to the first bridge, more water was crossing the highway, and the water in the river was at the span. I later learned that about an hour later there no longer was passage over this bridge, which left Comayagua isolated from Tegucigalpa.

While we realize that any “news” we might have on the status of the situation or of relief efforts in Honduras will be out of date by the time this issue of *Aquanews* reaches you, we have also heard credible evaluations that recovery from this disaster is a process that will realistically take years—even decades—certainly not days or even months.

David Teichert-Coddington, Bart’s colleague at Auburn University says that he’s been asked by several persons about avenues for sending monetary aid to the country. He

writes, “I have the following organization to recommend for receiving donations and distributing goods and services directly to the Hondurans (not through the government or other large bureaucracies). The organization is Aldea Global (Global Village). It has worked in Honduras since the 1970s and concentrates on community development in both rural and, recently, urban areas. Their development emphasis is on income

... continued on p. 3

## CRSP Cross-Pollination: Strengthening Host Country and US Researcher Connections by Deb Burke

**T**ravel to conduct field research, solidify relationships, network and create new linkages, and attend conferences brought CRSP researchers to destinations such as the Philippines, Peru, Kenya, and South Africa.

### THE PHILIPPINES

CRSP researchers from the University of Hawaii (UH), Robert Howerton and Chris Brown, traveled in October to the Central Luzon State University (CLSU) in the Philippines to formally establish the collaborative relationship between CLSU and the PD/A CRSP. Upon arrival they met with their primary contacts at CLSU, Dr. Remedios Bolivar and Dr. Ruben Sevilleja, and spent a week discussing practical, scientific, and logistical issues of the research partnership. During this period practical and logistical concerns were resolved regarding future PD/A CRSP on-farm trials. A vehicle, which is necessary for use in the CRSP on-farm trials, was made available. Additionally, project participants decided to use a rapidly growing stock of tilapia from the GIFT (Genetically Improved Farm Tilapia) Foundation, which will provide fingerlings free of charge in exchange for the promotional value of the distribution of their fish for use in PD/A CRSP on-farm trials. Both Howerton and Brown presented seminars, which

... continued on p. 4

## New Fertilization Guide Available from PD/A CRSP in December

### POND FERTILIZATION: ECOLOGICAL APPROACH AND PRACTICAL APPLICATION

by Christopher F. Knud-Hansen

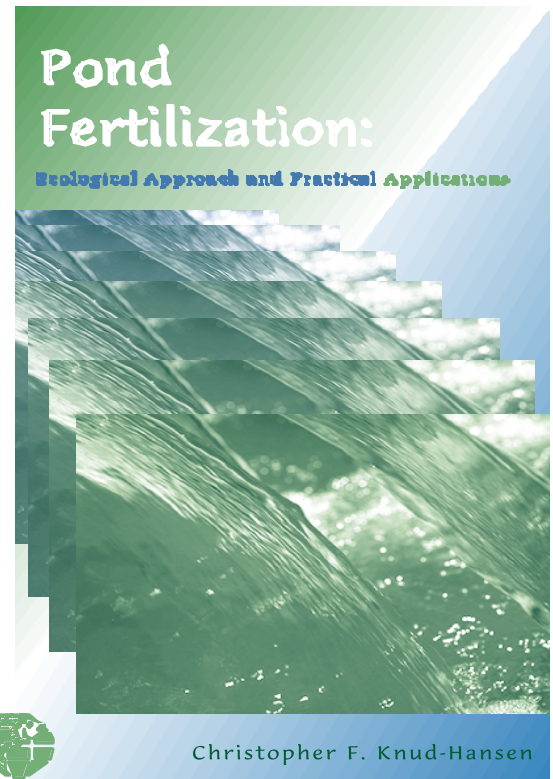
This 137-page report provides an approach to pond fertilization that takes into account the efficiencies, ecological impacts, and economics of various fertilizers as well as the dynamic chemical and biological processes that take place in pond ecosystems. The book incorporates years of PD/A CRSP pond dynamics and fertilization research in a form designed to be understood by regional extension workers, educated farmers, aquaculture students, and scientists.

Copies can be requested from:

Publications  
 Pond Dynamics/Aquaculture CRSP  
 Oregon State University  
 400 Snell Hall  
 Corvallis, OR 97331-1641

Email: [crsp.mail@orst.edu](mailto:crsp.mail@orst.edu)

The Pond Dynamics/Aquaculture Collaborative Research Support Program



Christopher F. Knud-Hansen

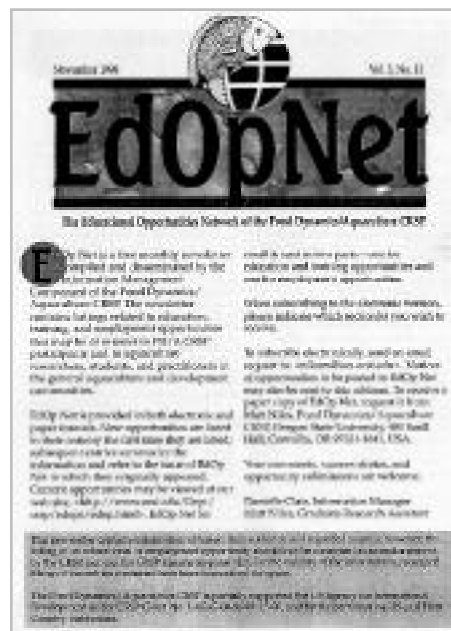
## Contents

Introduction  
 Ecological concepts related to pond production  
 Managing algal productivity  
 Comparative analysis of fertilizers  
 Pond characteristics that affect fertilization decisions

Methods for determining fertilization requirements  
 Fertile areas for practical fertilization research  
 Algal Bioassay Methodology to determine pond fertilization requirements  
 General guide for pond fertilization based on pond ecology and farm economics

## Happy Birthday, EdOp Net!

EdOp Net recently celebrated its second birthday with the publication of the October issue. A free monthly newsletter compiled and disseminated by the Information Management Component of the Pond Dynamics/Aquaculture CRSP, EdOp Net is filled to the gills with listings of education, training, and employment opportunities that may be of interest to PD/A CRSP participants and to aquaculture researchers, students, and practitioners in the general aquaculture and development communities.



EdOp Net is provided in both electronic and paper formats, and current opportunities may also be viewed at our web site, <http://www.orst.edu/Dept/crsp/edops/edop.html>. To subscribe to the email version of EdOp Net, send an email request to: [nilesm@ucs.orst.edu](mailto:nilesm@ucs.orst.edu). We also invite submissions for EdOp Net, and notices of opportunities may also be sent to this address. To receive a paper copy of EdOp Net, request it from: Matt Niles, Pond Dynamics/Aquaculture CRSP, Oregon State University, 400 Snell Hall, Corvallis, OR 97331-1641, USA.

## CRSP Photo Exhibit Celebrates International Collaboration

Collaborative research performed by the Pond Dynamics/Aquaculture CRSP is represented in an exhibit of 24 photographs entitled "Mutual Benefits for Developing Countries and the United States," on display in the USAID Information Center at the Ronald Reagan Building in Washington, D.C., from 21 September through 31 December 1998. The three photographs representing the PD/A CRSP were taken by Director Hillary Egna. The exhibit is designed to display the activities and accomplishments of the nine CRSPs in the developing world and the US. For those who are unable to make it to the capital before year's end, a virtual tour of the



CRSP Directors meet with USAID Administrator at the opening of the CRSP photo exhibit in Washington, D.C. From left to right: Edward Kanemasu, SANREM CRSP Director; J. Brian Atwood, USAID Administrator; Mike Roth, Basis CRSP Director; Pat Barnes-McConnell, Bean-Cowpea CRSP Director; Goro Uehara, Soils CRSP Director and BIFAD member; Hillary Egna, PD/A CRSP Director; and Edward Schuh, BIFAD Chair.

### BIFAD Commemorates 20 Years

The opening of the CRSP photo exhibit coincided with the September meeting of BIFAD, the Board for International Food and Agricultural Development. Proposed revisions to the Guidelines for Collaborative Research Support Programs were unveiled at the BIFAD meeting on 22 September. The revised guidelines are currently awaiting approval. A summary of the revised guidelines will appear in a future issue of Aquanews.

In addition to the opening of the CRSP exhibit and the BIFAD meeting, Dr. Egna attended a dinner at the State Department celebrating 20 years of BIFAD. Speaking at the dinner were:

- US Senator Tom Harkin;
- J. Brian Atwood, USAID Administrator;
- Peter Magrath, President of the National Association of State Universities and Land Grant Colleges;
- Peter McPherson, President of Michigan State University and former USAID Administrator; and
- Edward Schuh, BIFAD Chairman.

The dinner celebrated advances in agricultural prosperity achieved by the partnership between universities and US and international agricultural communities. At the dinner, present and past members of BIFAD were honored for their service.

exhibit is available on the Internet at <http://www.ianr.unl.edu/crsps/virttour.htm>.

PD/A CRSP Director Egna attended the opening of the exhibit on 22 September. An estimated 50 to 60 people were present for the opening reception. J. Brian Atwood, USAID Administrator; G. Edward Schuh, Chairman of BIFAD; and Dr. Pat Barnes-McConnell, Vice-Chair of the CRSP Council, spoke on the diversity of images in the exhibit and the benefits accrued both overseas and to the US by the involvement of universities in international development work. The artistic curator for the exhibit was Nate Wambaugh and captions were written by Dan Moser, both of the University of Nebraska. 🐟

### Letter from Honduras

... from p. 1

generation by agricultural production and small businesses. I am personally familiar with several of the projects administered by Aldea Global and am a friend of the director, Chet Thomas. I am confident that all funds received are administered honorably and exactly as designated."

Checks may be sent to Aldea Global at the following address: Amigos de Honduras, P.O. Box 98293, Seattle, WA 98198-0293. For more information about this relief effort, please contact David Teichert-Coddington, 203 Swingle Hall, Dept of Fisheries and Allied Aquacultures, Auburn University, AL 36849-5419, tel: 334-844-9209 fax: 334-844-9208, email: [dcoddington@ag.auburn.edu](mailto:dcoddington@ag.auburn.edu). 🐟

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## CRSP Graduate Student Profile: Daniel Jamu

by Matt Niles

When Daniel Jamu began working with the CRSP five years ago, he recognized the importance of managing aquaculture practices to achieve high levels of productivity while minimizing negative impacts on the environment. One of his specific goals was to produce a tool that could be applied to analyze the ecological effects of integrating aquaculture and agriculture activities.

He envisaged a model that could be used to assess environmental impacts of aquaculture effluents and help with the siting and management of aquaculture facilities. Working with Raul Piedrahita at the University of California, Davis, Daniel developed a model for analyzing nitrogen and organic matter dynamics in integrated aquaculture/agriculture systems.

Among the potential beneficiaries of this model is Daniel's native country of Malawi. Daniel believes his work with the CRSP to be particularly

important there because of its consideration of the contribution of agricultural activities to aquaculture production.

"Although this area of aquaculture production has a long history, it is becoming more important because of the large number of ponds that are built on agricultural land and the need to reduce the impacts of aquaculture effluents through waste reuse. The success of these activities rests on the availability of adequate scientific knowledge on how the integration works, which processes are important, and how. My work attempts to identify the possible processes that are important and to provide a framework for more field experimentation to confirm the results obtained with the model," he explains.

Daniel plans to return to Malawi this fall and establish a research program that tests and confirms some of the model results he obtained during his work at UC Davis with the CRSP.

He also plans to continue other research he started before coming to the US. Daniel has worked in Malawi with ICLARM, conducting research on pond dynamics, farm waste utilization, and nutrient dynamics in integrated aquaculture/agriculture systems. He was also involved in aquaculture extension and training, as well as aquaculture related research supported by the International Foundation for Science.

As a result of his work with the CRSP, Daniel will bring some very valuable experience back to Malawi.

"My involvement with CRSP has improved the quality of my research work and this I believe will translate to the development of more reliable information available to farmers, extensionists, and others."

As a result of his own and other CRSP research, Daniel's vision of improved, environmentally friendly aquaculture production in Malawi may soon be realized. 🐟

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## CRSP Cross-Pollination

... from p. 1

facilitated considerable discussion. Additionally, a ceremony, which was well-attended and covered by the press, was held to present the fully executed Memorandum of Understanding between UH and CLSU to CLSU President, Fortunado A. Battad.

Other trip highlights included visits to five farm sites, the Bureau of Fisheries and Aquatic Resources (BFAR), the GIFT Foundation, and many of the Freshwater Aquaculture Center (FAC) laboratories, including the labs that are working on the YY male tilapia project. A tissue culture laboratory at Baguio State University was also visited. While visiting Baguio State University, Howerton and Brown had the opportunity to meet with the University's president and several of the country's prominent biologists.

Howerton and Brown's visit yielded a well-defined picture of how each

participant will be involved with the Philippines project, and, as per Brown's account, the trip was enveloped in "a sense of cooperative spirit."

### PERU

During a nine-day visit to Peru in September, researcher Joe Molnar, in partnership with two scientists from the CRSP Host Country collaborating institution, Instituto de Investigaciones de la Amazonia Peruana (IIAP)—Project Leader Gonzolo Llosa and Professor and Senior Scientific Advisor Fernando Alcántara—conducted fieldwork in the rural communities on the Tamshiyacu, Tahuayo, and Napo river systems of the Amazon in the Iquitos region. The research team interviewed fish farmers, community residents, and public and private agency officials regarding approaches to small-scale, community-based aquaculture in the Peruvian Amazon and the role and practice of fish culture in their communities. Although an

environmental non-governmental organization concluded that fish farming involved high risks and high labor costs from a small pond project study, results of the CRSP field study suggested that "[fish] ponds are

*I quitos is a city of more than 300,000 people. The city is a regional trade center, serving small communities located on the Amazon River and its tributaries. Additionally, a number of humanitarian and environmental non-governmental organizations that operate in Loreto are based in I quitos.*

popular among farmers and do contribute to income and food security in these communities [referring to the Tahuayo river system]." The outcome of this CRSP study also showed that the quality of pond construction, culture conditions, and the species cultured are variable; farmers typically polycultured "three to five different

... continued on p. 5

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## CRSP Cross-Pollination

... from p. 4

species of wild-caught fry or juveniles for grow-out." Overall, fish farmers appeared happy with their fish culture systems; several farmers were planning to construct additional ponds, and only a few small ponds, which tended to have water supply problems, had been abandoned.

This field study also indicated that



Fish culture in hapas in Philippines

pond construction falls into the realm of work assigned to men, though women were reported to sometimes provide pond inputs and to participate in harvests, while "women and children are central beneficiaries of enhanced protein availability, income, and food security associated with fish ponds in the Selva." Study participants did not participate in group or collective fish farming; however, in some communities groups of families would cooperate in a *minga*—a labor exchange agreement that involves the joint construction of a fish pond on one family's land.

A second phase of this study is planned for 1999 in the Napo, Tamshiyacu, Tahuayo, and Nauta Road areas. The study will be conducted by graduate students from the Universidad Nacional de la Amazonia Peruana (UNAP; also a CRSP collaborating Host Country institution), under the supervision of Alcántara and Llosa, and will include structured interviews with 50 fish farmers who have completed at least one harvest in the past two years.

Several organizations conducting work in aquaculture near Iquitos were identified during Molnar's travel to Peru—CARE International (a relief assistance organization), Agencia Española de Cooperación, CARITAS (a catholic assistance agency), the Peruvian Ministry of Fisheries, and FONDEPESC (a Peruvian fisheries development agency). CARE has established demonstration ponds that are used for training in the Napo

tributary of the Amazon, approximately 20 km north of Iquitos. The demonstration pond and trainings are part of a project intended to increase food security and raise family income. Agencia Española de Cooperación, as part of an agricultural and community development project, provides technical support to approximately 75 ponds located along the Iquitos-Nauta Road. CARITAS, an

organization that focuses on poorer communities, has an aquaculture specialist who spends two weeks in target communities that do not receive governmental or non-governmental assistance. FONDEPESC, a Peruvian fisheries development agency, is constructing a fingerling production station for a variety of species. The station plans to feature Boquichico, a fish species that requires relatively less intensive cultivation and is best suited for home cultivation and local markets.

### KENYA

During September, Kenya project researchers James Bowman from Oregon State University and Tom Popma of Auburn University visited the PD/A CRSP prime site in Kenya to review the project's progress, identify project constraints, and discuss possibilities for future implementation of Ninth Work Plan research and activities. During their stay Bowman, Popma, and Karen Veverica, CRSP on-site researcher, attended the PARADI (Poissons Africains: Rôle et

Applications de la Diversité) Association and FISA (Fisheries Society of Africa) Conference in Grahamstown, South Africa. The PD/A CRSP was well-represented at this conference with the following presentations:

- A review of lime requirement determination methods for aquaculture ponds, by J.R. Bowman
- Use of grasses from pond levees to promote *Oreochromis niloticus* (Cichlidae) production: Application rates, methods, and resulting water quality, by K.L. Veverica and E. Rurangwa
- Semi-intensive *Oreochromis niloticus* and *Clarias gariepinus* (Clariidae) polyculture in ponds receiving rice bran and chemical fertiliser in Kenya, by W.M. Gichuri, K.L. Veverica, J.G. Omondi, P.N. Mwau, P.I. Bilal, and K.N. Mavuti
- Current status and problems of fisheries in Kenya, by F. Pertet (presented by Dr. Luc de Vos, Head of the Department of Ichthyology at the National Museum of Kenya, on behalf of Mr. Pertet)
- Present status of the fish fauna and fisheries of Lake Baringo, Kenya, by F. Pertet (presented by Dr. Luc de Vos, Head of the Department of Ichthyology at the National Museum of Kenya, on behalf of Mr. Pertet)

Additionally, CRSP publications were distributed to representatives from Cameroon, Eritrea, Gabon, Mali, Mozambique, Nigeria, Tanzania, Uganda, and Zaire.

The researchers also participated in a small organizing group, facilitated by Dr. John Balarin, Aquaculture and Fisheries Advisor, based in Harare, Zimbabwe, to "develop a set of development objectives and strategies" that was presented at the conference for discussion. A discussion document is being drafted by Balarin, Dr. Peter Britz, a senior fisheries lecturer at the Department of Ichthyology and Fisheries Sciences at Rhodes University (the host institution for the conference in Grahamstown, South Africa), Veverica, and Bowman.



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## Fishellaneous Items

### Chocolate Tilapia Is Record Breaker

US - September 25, 1998

Tilapia Aquaculture International says it has beaten previous world growth records for tilapia growth and total yields, with its latest hybrid tilapia—the Chocolate Hybrid(TM). The species was released to a few growers last year, and has shown remarkable growth rates in outdoor cages, compared with fingerlings from several other suppliers. The Chocolate Hybrids(TM) grew 45% faster than the Pennyfish(TM)—also being distributed by Tilapia Aquaculture International and which previously held all of the world growth records for tilapia growth and total yields—reaching 1.45 kg in the same time the Pennyfish took to reach 1 kg. In the same 120 days of growth the Pennyfish(TM) attained only 1,000 g, from 10 g, compared with the Chocolates' 1,450 g. Tilapia Aquaculture International president, Mike Sipe, said: "In the six months of growing, the 600 Chocolate Hybrids(TM) showed very impressive uniformity of growth, high fillet yields, disease resistance and cold resistance. "It makes it possible for farmers to produce three or four crops per year in the same space in which they are currently producing only one." The Chocolate Hybrids(TM) are a cross between Red *T. nilotica* and improved yield *T. hornorum*.

Source: *Fish Info Service*, [www.sea-world.com](http://www.sea-world.com).  
Reprinted with permission.

### Fish Scale Extraction

A Japanese company is extracting collagen and apatite from fish scales that are normally thrown away. It is also producing Collagetite tablets (that taste like yogurt) and canned food containing both substances.

The products are made by pulverizing fish scales and extracting hydroxyapatite, which contains both substances.

Experimental results show that dairy cows, horses and pigs fed with Collagetite grow less tired in summer, do not suffer from mastitis, show improved conception rates in artificial fertilization, and [have] improved hair growth and heartbeat.

Source: *Seafood International* Vol. 13, No. 9, September 1998.

### The Eel That Returned from Beyond the Grave

A fishmonger was forced to close his shop after he was attacked by a 308 kg conger eel that came back from the dead, according to a report in *The Daily Telegraph*.

The fishmonger, whose store is in Tyne and Wear, in the UK, went to inspect a delivery of fresh fish when the conger eel "snapped its powerful jaws just inches from his face."

Conger eels can survive for about an hour out of water, but this one suddenly flipped up out of the fish box and onto the floor of the store.

"I was certain it was dead, otherwise I would have been more careful. It was so big and powerful," the fishmonger reportedly said.

"Conger eels are vicious and this one had razor-sharp teeth and strong jaws that could easily snap your wrist," he continued.

"My first thought was to catch it, but when it turned round and stared me out I decided to run for it."

The store was shut for several hours, the proprietor unwilling to return until he was absolutely sure the conger eel would be well and truly dead.

Source: *Seafood International* Vol. 13, No. 6, June/July 1998.

### Thai Ban Angers Shrimp Farmers

Thai shrimp farmers have protested against a government ban on inland shrimp farming. The ban is in reaction to speculation that saline water used in the farms harms soil and crops, especially rice, which is one of Thailand's major foreign exchange earners.

The Inland Shrimp Farmers Group (ISFG) claimed the ban could endanger exports targets at a time when overseas sales are needed to boost the country's revenue. It added that the ban may also affect related industries, including feed mills and frozen food production.

Agricultural department statistics indicate that about 2000 hectares in the freshwater zone will be affected—a small sector of the 100,000 hectare industry. But farmers claim that the ban will affect nearly 5000 hectares.

Commenting on the ban, executive director of the Thai Shrimp Association in southern Surat Thani, Surapol

Prateungtham, said: "The ban will not benefit Thailand at a time when it needs to earn more foreign exchange to help in economic recovery, especially when Indonesia is less competitive and shrimp prices are rising.

"Last year, the country exported 137,000 tonnes of shrimp and had forecast total exports this year to rise to 170,000 tonnes, worth US\$1.5 billion. Our export target will be affected for sure if the government insists on this policy."

In the first four months of 1988, Thailand exported 44,800 tonnes of shrimp, mainly to the European Union, the US and Japan.

According to ISFG president Manoon Suthijinda, an agreement has been reached to set up a committee to study the alleged adverse environmental impact of inland shrimp farming.

Source: *Fish Farming International* Vol. 25, No. 9, September 1998.

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## Insulin from Tilapia

Canadian scientists are now experimenting with tilapia as a possible source of insulin used for treatment of diabetes. According to the Philippine Council for Aquatic and Marine Research and Development (PCAMRD), a visiting Canadian scientist stated that his team chose tilapia after finding it was a cheaper alternative and achieved initial success using advanced genetic engineering.

"Tilapia require only one-fifth of the oxygen that human cells demand, have two pancreases—one working solely for digestive enzymes while the other is dedicated

to insulin," he said.

A spokesperson for PCAMRD added: "Tilapia are well-known in the Philippines, can be raised cheaply at a high density in relatively small ponds, and thrive under intensive conditions.

"There is no reason why local tilapia cannot be used to produce insulin once a commercial process has been developed."

Source: *Fish Farming International* Vol. 25, No. 6, June 1998.

## Shrimp Robberies Out of Control

*Ecuador - September 13, 1998*

The National Chamber of Aquaculture (CNA), reports 33 shrimp robberies between January and August, for a total of 309,992 lb—up 170% from last year's figure. Exporklore was robbed five times and lost 58,000 lb of shrimp, while Expalsa lost 18,080 lb. The long list of affected companies included Docmalsa, Marisec, Ecuamar, Inexpac, Coepesa, Calvi, El Rosario, Oceanpac, Caesa and Bilbosa.

Source: *Fish Info Service*, [www.sea-world.com](http://www.sea-world.com). Reprinted with permission.

## EEP, BOD—Not Just Funny Monosyllables

The CRSP is pleased to welcome Edna McBreen to the External Evaluation Panel. McBreen is Associate Vice-Chancellor of the Institute of Agriculture and Natural Resources at the University of Nebraska. She has previously served on the EEP of the INTSORMIL CRSP.

Representation on the program's Board of Directors rotates among CRSP institutions according to a schedule in the CRSP grant. On August 1, Auburn University rotated "off" the Board and the University of Oklahoma (UO) rotated "on." The CRSP therefore bids goodbye to Bryan Duncan, who served as Board Chair during the past year and has been a CRSP participant since 1988. (The new UO member has not yet been named.) Russ Moll, CRSP Board member from The University of Michigan, has assumed the duties of the Chair of Board for the next year (through July 31, 1999).

## Article Balances Shrimp Controversy

Both sides of the shrimp aquaculture controversy are presented in a paper entitled "Shrimp aquaculture and the environment" co-authored by CRSP researcher Claude Boyd and World Wildlife Fund research fellow Jason Clay. The article, which appeared in the June 1998 issue of *Scientific American* (pp. 58-65), presents information on the impacts of shrimp farming—from larval bycatch in areas where larvae are not raised in hatcheries to the uncontrolled spread of viral diseases—and steps taken by farmers to address these impacts, such as proper siting of shrimp farms and improved feeds and water exchange regimes. The article then outlines recommendations to lessen eutrophication, biodiversity threats, chemical usage, and social impacts. 🐟

## CRSPy Kudos

Congratulations to Martin Fitzpatrick, recipient of the 1998 Savery Outstanding Young Faculty Award. A PD/A CRSP principal investigator and associate professor of Fisheries and Wildlife at Oregon State University, Fitzpatrick was honored on 18 September 1998 at the annual recognition ceremony of OSU's College of Agricultural Sciences. The award recognizes excellence in teaching as well as Fitzpatrick's research on fish reproduction. 🐟



MARTIN T. ROSENBAUM

Martin Fitzpatrick receives Savery Award from Dan Edge, acting for Erik Fritzell, Head of Fisheries and Wildlife Department at Oregon State University

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# Notices of Publication

## CRSP Research Report 98-125

### ACUTE AND SUBLETHAL GROWTH EFFECTS OF UN-IONIZED AMMONIA TO NILE TILAPIA *OREOCHROMIS NILOTICUS*

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East Lansing, Michigan 48823

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This study investigated the acute effects of un-ionized ammonia ( $\text{NH}_3\text{-N}$ ) on 11 g fingerlings of Nile tilapia *Oreochromis niloticus* at two temperatures (23 and 33°C); and at 28°C with two sizes of fish, 3 and 45 g. In addition, sublethal effects of un-ionized ammonia on growth of Nile tilapia at 28°C were evaluated. All tests were conducted in flow-through bioassay system.

In acute toxicity tests at 23 and 33°C, the 96-h LC50's ( $\pm$ SD) were  $2.25 \pm 0.07$  and  $2.51 \pm 0.16$  mg/L  $\text{NH}_3\text{-N}$ , respectively. There was not a significant effect between the two temperatures on acute toxicity of  $\text{NH}_3\text{-N}$  in these tests ( $P > 0.05$ ). Estimates of the 96-h LC50's ( $\pm$  SD) at 28°C were  $1.36 \pm 0.45$  mg/L  $\text{NH}_3\text{-N}$  for the small fish and  $2.65 \pm 0.09$  mg/L  $\text{NH}_3\text{-N}$  for the large fish. In these tests, there was a significant difference between the two sizes of fish tested ( $P < 0.05$ ). In 35-day study of the effects of sublethal concentrations of  $\text{NH}_3\text{-N}$  at 28°C, there was a linear decrease in fish weight gain with increasing un-ionized ammonia concentrations ( $r^2 = 0.90$ ,  $P < 0.001$ ). The concentrations of un-ionized ammonia that cause no reduction in growth, 50% reduction in growth, and 100% reduction in growth were 0.06, 0.73, and 1.46 mg/L  $\text{NH}_3\text{-N}$ , respectively. These data suggest that Nile tilapia has tolerance to un-ionized ammonia similar to that of tilapia species, somewhat greater than that of channel catfish, and greater than that of many other warmwater fish and salmonids.

This abstract was excerpted from the original paper, which was published in D. Randall and D. MacKinlay (Editors), Nitrogen Production and Excretion in Fish. International Congress on the Biology of Fish, Symposium Proceedings, July 27-30 1998, pp. 35-44.

## CRSP Research Report 98-126

### A WATER BUDGET MODEL FOR POND AQUACULTURE

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A water budget simulation model that can be used for forecasting water requirements for aquaculture ponds has been developed. Water sources considered in the model include regulated inflow, precipitation and runoff, whereas water losses include evaporation, seepage, effluent discharge, and overflow. The model has been validated for ponds located at the Asian Institute of Technology (AIT), Thailand and at El Carao, Honduras which are, respectively, located in the humid and dry tropics. Simulation results indicate that precipitation accounted for 69.8% of the total water gains for the AIT and 43.2% for El Carao. Regulated inflow provided 27% of the gains for AIT and 52.8% for El Carao. Runoff gains were minimal at both locations due to small watershed areas. Evaporation accounted for 54.9 and 40.1% of the overall water loss predicted for the AIT and El Carao locations, with seepage accounting for the remaining loss. Predicted water requirements at AIT over a 5-month period exceeded actual amounts by 14.9%, apparently because seepage loss was over-estimated. For El Carao, however, predicted water requirements were only 78.2% of the amount actually added, apparently due to poor estimates of evaporative water loss which averaged  $0.32 \text{ cm day}^{-1}$  compared to pan evaporative measurements of  $0.43 \text{ cm day}^{-1}$ . In contrast, the predicted evaporative water loss for the AIT pond ( $0.47 \text{ cm day}^{-1}$ ) closely matched pan evaporation measurements ( $0.45 \text{ cm day}^{-1}$ ). The availability of relative humidity and cloud cover data for AIT explain the higher accuracy in evaporative water loss estimates, and therefore water requirements, compared to El Carao. If comprehensive weather datasets are available, the water budget model developed herein is a useful tool for estimating pond water requirements at individual facilities located in different geographical regions.

This abstract was excerpted from the original paper, which was published in Aquacultural Engineering, 18(1998): 175-188.

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# Notices of Publication (cont.)

## CRSP Research Report 98-127

### A STRATEGIC REASSESSMENT OF FISH FARMING POTENTIAL IN AFRICA

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The present study is an update of an earlier assessment of warm-water fish farming potential in Africa, by Kapetsky (1994). The objective of this study was to assess locations and areal expanses that have potential for warm-water and temperate-water fish farming in continental Africa.

The study was based on previous estimates for Africa by the above author, and on estimates of potential for warm-water and temperate-water fish farming in Latin America by Kapetsky and Nath (1997). However, a number of refinements have been made. The most important refinement was that new data allowed a sevenfold increase in resolution over that used in the previous Africa study, and a twofold increase over that of Latin America (i.e. to 3 arc minutes, equivalent to 5 km x 5 km grids at the equator), making the present results more usable in order to assess fish farming potential at the national level.

A geographical information system (GIS) was used to evaluate each grid cell on the basis of several land-quality factors important for fish-farm development and operation regardless of the fish species used. Protected areas, large inland water bodies and major cities were identified as constraint areas, and were excluded from any fish farming development altogether. Small-scale fish farming potential was assessed on the basis of four factors: water requirement from ponds due to evaporation and seepage, soil and terrain suitability for pond construction based on a variety of soil attributes and slopes, availability of livestock wastes and agriculture by-products as feed inputs based on manure and crop potential, and farm-gate sales as a function of population density. For commercial farming, an urban market potential criterion was added based on population size of urban centres and travel time proximity. Both small-scale and commercial models were developed by weighting the above factors using a multi-criteria decision-making procedure.

A bioenergetics model was incorporated into the GIS to predict, for the first time, fish yields across Africa. A gridded water temperature data set was used as input to a bioenergetics model to predict number of crops per year for the following three species: Nile tilapia (*Oreochromis niloticus*), African catfish (*Clarias gariepinus*) and Common

carp (*Cyprinus carpio*). Similar analytical approaches to those by Kapetsky and Nath (1997) were followed in the yield estimation. However, different specifications were used for small-scale and commercial farming scenarios in order to reflect the types of culture practices found in Africa. Moreover, the fish growth simulation model, documented in Kapetsky and Nath (1997), was refined to enable consideration of feed quality and high fish biomass in ponds.

The small-scale and commercial models derived from the land-quality evaluation were combined with the yield potential of each grid cell for each of the three fish species to show the coincidence of each land-quality suitability class with a range of yield potentials. Finally, the land quality-fish yield potential combinations were put together to show where the fish farming potential coincided for the three fish species.

The results are generally positive. Estimates of the quality of land show that about 23% of continental Africa scored very suitable for both small-scale and commercial fish farming. For the three fish species, 50-76% of Africa's land has the highest yield range potential, and the spatial distribution of this yield is quite similar among the species and farming systems. However, the spatial distribution of carp culture potential was greater than for Nile tilapia and African catfish. Combining the two farming system models with the favourable yields of the three fish species suggest that over 15% of the continent has land areas with high suitability for pond aquaculture.

The final fish farming potential estimates for the three species together show that about 37% of the African surface contains areas with at least some potential for small-scale farming, and 43% for commercial farming. Moreover, 15% of the same areas have the highest suitability score, and suggest that for small-scale fish farming, from 1.3 to 1.7 crops/y of Nile tilapia, 1.9 to 2.4 crops/y of African catfish and 1.6 to 2.2 crops/y of Common carp can be achieved in these areas.

Estimates for commercial farming range from 1.6 to 2.0 crops/y of Nile tilapia, 1.3 to 1.7 crops/y of African catfish and 1.2 to 1.5 crops/y of Common carp.

From a country viewpoint, the results are also generally positive. For small-scale farming of the three species, 11 countries scored very suitable in 50% or more of their national area. The corresponding results for commercial farming were that 16 countries scored very suitable in 50% or more of their national area.

Farm location data from Zimbabwe, Kenya, Uganda and Malawi were used to verify the GIS-based predictions of fish farming potential, from the standpoint of the farming system models combined with fish yields. This verification procedure indicated that the models used in the study are in general fairly accurate for strategic planning of aquaculture development.

This introduction is from CIFA Technical Paper No. 32(1998), FAO, 170 pp.

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# Notices of Publication (cont.)

## CRSP Research Report 98-128

### A BIOENERGETICS GROWTH MODEL FOR NILE TILAPIA (*OREOCHROMIS NILOTICUS*) BASED ON LIMITING NUTRIENTS AND FISH STANDING CROP IN FERTILIZED PONDS

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A bioenergetics growth model for Nile tilapia in fertilized ponds, which linked Nile tilapia growth with limiting nutrients in pond water, was developed. The model incorporated six key variables affecting Nile tilapia growth in fertilized ponds: body size, water temperature, photoperiod, dissolved oxygen, unionized ammonia and food availability. In the model, food availability was estimated by a relative feeding level parameter, which was a function of potential net primary productivity based on limiting nutrients, and standing crop of Nile tilapia. The model was validated using

growth data of Nile tilapia in 30 fertilized ponds, and successfully detected growth variations among ponds receiving the same nitrogen and phosphorus inputs. The model described 76% of the variance in growth in these ponds, and the relationship between predicted and observed growth rates had a slope of 0.93 and an intercept of 11.51, not significantly different from 1 and 0, respectively. The model indicated that the growth variations were caused by carbon limiting primary production during 55-99% of the culture period. Sensitivity analysis indicated that the parameters related to net energy from feeding were more sensitive than those related to fasting catabolism, and that the growth was most sensitive to photoperiod and then food availability when DO was above its critical limit (1.0 mg l<sup>-1</sup>), but was most sensitive to DO when it was below the critical limit. Tilapia growth was more sensitive to DO than UIA. Initial tilapia size was the least sensitive variable when UIA was above the critical limit in the model. Compared with previous models, this study provides a more reasonable and accurate way to estimate relative feeding level (*f*) based on fish standing crop and potential net primary productivity derived by a limiting nutrient.

This abstract was excerpted from the original paper, which was published in *Aquacultural Engineering*, 18(3):157-173.

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## International Course on Sustainable Rural Aquaculture for Small-Scale Farmers

A three-week course designed for development managers, planners, senior field staff, extension workers and others working in rural development will be held 20 February to 12 March 1999 in Dhaka, Bangladesh. This training is a collaborative effort of the International Institute of Rural Reconstruction (IIRR), CARE-Bangladesh, International Center for Living Aquatic Resources Management (ICLARM), and Bangladesh Rural Reconstruction Association (BARRA). These four organizations believe that experiences in small-scale aquaculture in Bangladesh exist from which others who are currently involved in these types of projects can learn.

At the end of the course, the participants will have:

1. Established the relationship between food security, environmental conservation, and aquaculture;
2. Identified the requirements of an implementation plan for a small-scale aquaculture project which seriously considers participation of local communities;
3. Developed a monitoring and evaluation plan for a small-scale aquaculture project which considers active participation of local partners; and
4. Developed an action plan which would incorporate important things learned from the course.

Course content includes: understanding issues affecting small-scale aquaculture; managing small-scale aquaculture projects; participatory approaches and extension strategies; and considerations in planning small-scale projects.

The training uses a roving workshop strategy to expose participants to existing aquaculture practices in South Asia. This approach also allows participants to interact directly with farmers and local extensionists or project managers. Combined with this are classroom lectures, discussions, and group exercises. Field-based learning will be emphasized. Participants will prepare an action plan relevant to their area/region and organization which can be implemented or further developed upon their return.

This course will benefit managers, extension workers, NGOs, and senior field staff. It will also benefit others working in rural development and government, nongovernmental, and academic institutions who have to tackle problems of food security and sustainable agriculture. Participants should have been actively involved in the field for over three years. Women candidates are encouraged to apply.

Course fee for international participants is US\$1,800 and for local participants (from Bangladesh) is US\$1,000. This already covers training costs, course-related local travel, materials, meals, and lodging.

For more information and/or for applications, write to:

Aquaculture Course Coordinator  
Education and Training Department  
IIRR, Y.C. James Yen Center  
Silang, 4118 Cavite, Philippines  
Tel: (63-46) 414-2417; Fax: (63-46) 414-2420

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## Upcoming Conferences and Expositions

Date	Topic/Title	Event Location	Contact Information
Nov 11-14	5th Asian Fisheries Forum	Chiangmai, Thailand	Dr. Padermsak Jarayabhand, Aquatic Resources Research Institute, Chulalongkorn University, Bangkok 10330, Thailand; Tel 66-2-2188160-62; Fax 66-2-2544259; email ardic@chulkn.car.chula.ac.th
Nov 13	Asian Fisheries Society, Symposium on Women in Asian Fisheries	Chiangmai, Thailand	Asian Fisheries Society, MC PO Box 2631, 0718 Makati, Metro Manila, Philippines; Tel 63-2-818-9283; Fax 63-2-816-3183; email e.tech@cgnet.com
Nov 16-18	IV Simposium Internacional de Nutrición Acuicola	La Paz, Baja California, México	Tel (8)-352-63-80; Fax (69)-88-01-57/58
Nov 18-19	Northeast Aquaculture Conference and Exposition	Rockport, ME, USA	Sydney Jane Brittain, Master Promotions Ltd., PO Box 565, St John, New Brunswick E2L 3Z8, Canada; Fax 506-658-0750; email show@nbnet.nb.ca
Nov 19-21	Fish Expo Seattle	Seattle, WA, USA	Diversified Expositions; Tel 207-842-5508
Dec 2-5	ExpoPESCA '98, Latin America's Total Fish Show	Santiago, Chile	Sue Hill, Emap Heighway, Meed House, 21 John St., London WC1N 2BP, England; Tel 44-171-470-6340/6302; email sueh@meed.emap.co.uk
Jan 27-30, 1999	Aquaculture America	Tampa, FL, USA	Florida Aquaculture Association, PO Box 1519, Winter Haven, FL, 32882; Tel 941-293-5710; Fax 941-299-5154
Mar 3-5, 1999	V Central American Symposium on Aquaculture—Aquaculture and the Environment: Together Into the New Millenium	San Pedro Sula, Honduras	John Cooksey; Tel 425-485-6682; Fax 425-483-6319; email: worldaqua@aol.com Alberto Zelaya; Tel 504-882-0986; Fax; 504-882-3848; email: andah@hondutel.hn

## Workshops and Short Courses

Date	Title/Topic/Site	Contacts
Year-round	Work Experience in Hatcheries Techniques/ Asian Institute of Technology, Thailand	Training and Consultancy Unit, Aquaculture and Aquatic Resources Management Program, School of Environment, Resources and Development, Asian Institute of Technology, PO Box 4, Klong Luang, Pathumthani 12120, Thailand; Tel (66 2) 524-5445; Fax (66 2) 524-5484; email tcuaasp@ait.ac.th
Year-round	Training & Research in Fisheries & Stock Mgmt/Wageningen Agricultural University, the Netherlands	G. van Eck, Dept of Fish Culture & Fisheries, PO Box 338, 6700 AH Wageningen, The Netherlands; Tel 31-8370-8330; Fax 31-8370-83937; email gerrie.van.eck@alg.venv.wau.nl
Year-round	Tropical Aquaculture Advanced Training in a Third Country/Escuela Agrícola Panamericana (EAP), Honduras, and Asian Institute for Technology, Thailand	Zentralstelle fuer Ernährung und Landwirtschaft (ZEL) Feldafing/Zschortau, Deutsche Stiftung fuer Internationale Entwicklung (DSE), D-82336 Feldafing, Germany; Tel ++49/8157/38-0; Fax ++49/81 57/38-227
Dec 1, 1998	Seafood HACCP Alliance/AFDO Training Course, Fargo, ND, USA	Don Aird; Tel 612-334-4100 (142); Fax 612-334-4134; For more information refer to < <a href="http://seafood.ucdavis.edu/haccp/training/schedule.htm">http://seafood.ucdavis.edu/haccp/training/schedule.htm</a> >. Deadlines are five days prior to scheduled workshop.
Dec 1, 1998	Seafood HACCP Alliance/AFDO Training Course, Southern California (site tba), USA	Mas Hori; Tel 213-580-5758; Fax 213-580-5750; For more information refer to < <a href="http://seafood.ucdavis.edu/haccp/training/schedule.htm">http://seafood.ucdavis.edu/haccp/training/schedule.htm</a> >. Deadlines are five days prior to scheduled workshop.
Dec 7, 1998	Seafood HACCP Alliance/AFDO Training Course, Brunswick, GA, USA	Keith Gates; Tel 912-264-7268; Tel 912-264-7312; For more information refer to < <a href="http://seafood.ucdavis.edu/haccp/training/schedule.htm">http://seafood.ucdavis.edu/haccp/training/schedule.htm</a> >. Deadlines are five days prior to scheduled workshop.

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## From the Editor

**A**s the largest international warm water research program in the US, the PD/A CRSP holds a record of significant research impacts and has received highly positive technical and administrative evaluations since its inception in 1982.

August 1, 1998, marked the beginning of the PD/A CRSPs third year of operations under its current—the fourth—5-year USAID grant. Since the program is structured around biennial work plans, this third year also coincides with the commencement of new research under program's Ninth Work Plan.

Unfortunately, the program is not positioned to carry out the full scope and breadth of the research portfolio described in the grant owing to a substantial budget cut. Last spring the PD/A CRSP was informed of a \$1.2 million budget cut as compared to the amount authorized in the program's grant. (After discussions

with USAID, the Director was able to obtain an additional \$200,000 for special projects.)


One significant consequence of the funding reduction is that not all of the meritorious proposals put forward by participating researchers will receive funding in the new work plan cycle. Program management has already responded to the cut by reducing staffing at Oregon State University's administrative headquarters.

The Information Management and Networking Component, the arm of the program that disseminates technical and programmatic information and collects and analyzes information relating to program impacts, is also readjusting to a leaner, more austere funding picture.

Our goal is to maintain the same high standards for editorship and quality of work to which we have always held our reports and publications. On the other hand, we

will also be looking for ways to achieve the same ends much more economically. One place to start is with *Aquanews*—thus our new, more homespun, look. We will also be turning more and more toward the Internet as a medium for making information available—recognizing, of course, that many people still do not have access to electronic information and that distribution by hard copy will likely never become entirely obsolete.

If you haven't already checked out the wide assortment of PD/A CRSP publications that are web-accessible, please accept this cordial invitation to visit the site at <[www.orst.edu/Dept/crsp/pubs/publications.html](http://www.orst.edu/Dept/crsp/pubs/publications.html)>.



Danielle Clair  
Information Manager

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# AQUANEWS

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