



## The CRSP Central Database: Integrating Aquaculture Information

### *An Interview with Doug Ernst*

by John Hayes

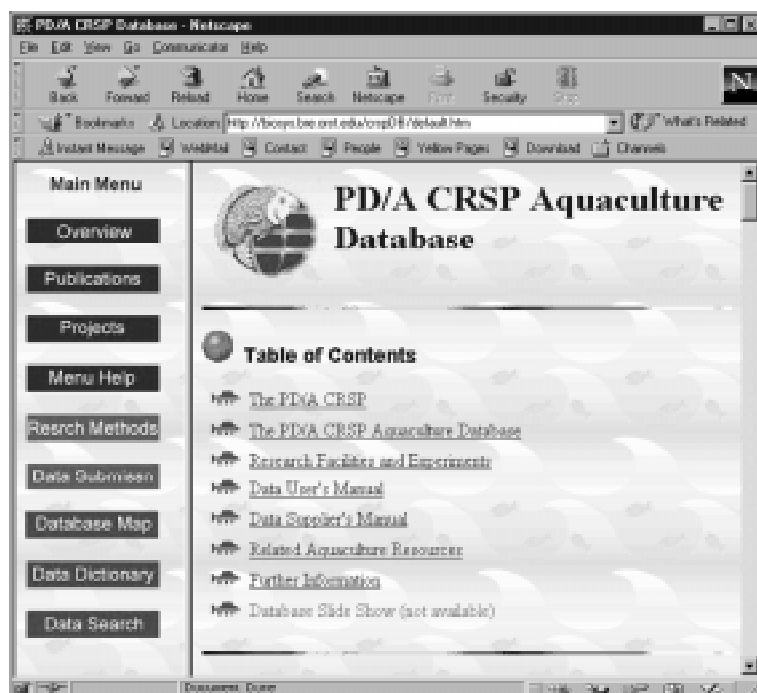
The PD / A CRSP Central Database is a centralized data storage and retrieval system for PD / A CRSP research and for other aquaculture research programs with compatible objectives and

standardized methodology. The Database contains more than one million observations of pond variables obtained from over one hundred production studies conducted at PD / A CRSP research sites located in the Philippines, Thailand, Indonesia, Egypt, Kenya, Rwanda, Honduras, Panama, and Peru. The studies contained in the Database pertain to the tropical and subtropical production of tilapia, penaeid shrimp, and other warmwater culture species in solar algae ponds that receive inputs such as plant materials, inorganic and organic fertilizers, and prepared feeds.

Started in 1983, the Database was maintained by the Program Management Office of the PD / A CRSP at Oregon State University (OSU) until May 1993, when it was transferred to the University of Hawaii at Hilo to be managed by Kevin Hopkins.

Following Hopkins' withdrawal from the CRSP in 1995, the program's Technical Committee voted in favor of a proposal submitted by John Bolte—Associate Professor in the Department of Bioresource Engineering at OSU—to move the Database back to OSU to be managed under Bolte's direction. After relocating to OSU in the spring of 1996, the Database went online in January 1997.

Doug Ernst is the manager of the PD / A CRSP Central Database and a doctoral candidate in Bioresource Engineering. The following interview took place in late November 1999.



Home page of PD/A CRSP Central Database website, located at [biosys.bre.orst.edu/crspDB/default.htm](http://biosys.bre.orst.edu/crspDB/default.htm).

*How has the CRSP Central Database changed since coming online at OSU in January of 1997?*

Originally, the Database simply stored raw data related to aquaculture production. Very little contextual support existed for this empirical

framework. The first step taken to address this problem was to integrate the Database with information about the materials and methods used to acquire the raw data. The second thing we did to provide contextual support for the Database was to link data to relevant publications generated by the

CRSP and scientific journals outside the CRSP. Finally, we added profiles of the PD / A CRSP research sites that supplement the data with physical characteristics of the site and contact information. These additions were made so that end users would be

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## Central Database

... from p. 1

better able to interpret and utilize data sets and benefit from related publications and correspondence with researchers.

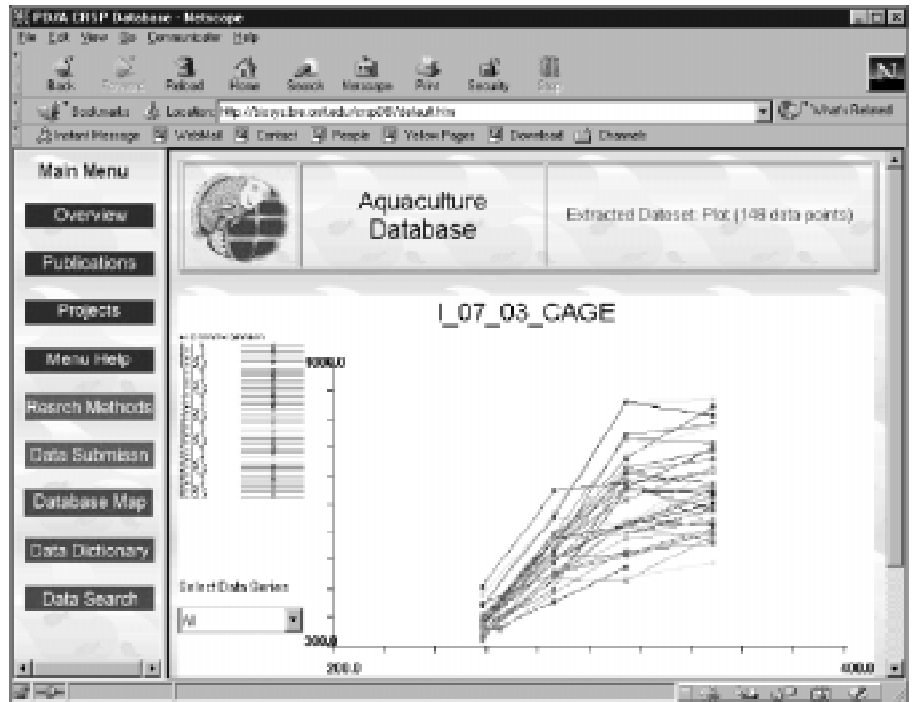
*Has Database use over the Internet been monitored? If so, what do the user statistics reveal?*

We monitor the visits to the website and we can monitor, to some extent, where users go on the website, but it's hard to know how much the data themselves are actually being used. At the moment, we don't categorize website "hits," but I suspect that members of the research community primarily use the Database. The Database still provides an empirical benchmark for producers, but it remains difficult to interpret given, for example, the stochastic variability that exists between replicates for a similar treatment.

Throughout the website, Database users are encouraged to contact the Database Manager with specific questions. On average, I get about four requests per month, which fall under varied headings including pond management questions, publication ordering, related aquaculture software, and inquiries regarding the availability of data sets for intensively fed production systems.

*How can the data be queried?*

Publications can be searched by keyword, author, year, site, and publication type. The data themselves can be searched by site, date, species, and data type. An additional data search constraint based on fish production



*Sample query results of fish weight vs. time from a study conducted at the Asian Institute of Technology, Thailand*

methods is near completion and will soon be added to the interface.

Query results can be viewed on the screen or downloaded as tab-delimited text files. At present, queries over the Internet can be time consuming due to the size of certain raw data sets. Our plan is to create statistical summaries of these data sets that combine treatment replicates, thus reducing query time by reducing the size of the files being queried.

*What if a user wanted to query the entire Database? Does a master file exist that covers all the parameters for all the experiments across all sites?*

No. Multiple queries would have to be run if the question of interest involved multiple parameters, multiple sites, etc. The constraint of querying such a large file over the Internet presents an argument against serving a master file that is integrated across all data for all sites. However, that will change as we develop statistical summaries that are smaller and more manageable than raw data, making the possibility of serving a master file of summary statistics over the Internet a feasible alternative. In the meantime, a master file containing all the data for all the sites can be generated by the Database Manager at the request of the Database user.

*Are the data available only on the website or is the Database available on other media?*

The data reside in a relational database in Microsoft Access and can be provided on floppy disks or zip disks depending on the size of the data set requested by the user.



JOHN HAYES

*How often is the content of the Database updated?*

The Database is updated any time new data come in, which is usually about every six months. Submissions tend to coincide with the end of a work plan, as researchers are contractually obligated by the PD/A CRSP to submit data on current work plans before receiving funding for future work plans.

Data submissions for tilapia production systems outside the CRSP are encouraged. Intensively fed systems are of particular interest. I am currently talking with researchers in Louisiana and other southeastern states about such additions to the Database.

There is no data entry at the website, only data extraction. Data are submitted on a disk or via FTP. However, the website does provide researchers with a means of reviewing and changing the information in the materials and methods section.

*What procedures are in place to quality-control the data?*

Researchers must submit data in a standard format, per data submission guidelines, so our first check involves making sure data are in this format. Second we try to determine if data values fall within acceptable ranges. For example, if we find a pH below 5 or above 11, we know we have a problem.

*Has the Database ever been infected by a virus?*

No. We use anti-virus software to protect the Database from viruses. Our system administrator updates the software with the latest virus profiles as needed and keeps us apprised of software patches that might provide added protection.

*Is the Bioresource Engineering Department involved with other groups in collaborative applications of the Database?*

Yes. We are currently talking with ICLARM about a near-future collaboration. We would like to integrate the upcoming CRSP data summary statistics with Fishbase—ICLARMs aquaculture and fisheries database. ICLARM would then serve as an additional publication outlet for the CRSP database.

PD/A CRSP Central Database website  
<[biosys.bre.orst.edu/crspdb/default.htm](http://biosys.bre.orst.edu/crspdb/default.htm)>

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*When do you expect to have the summary statistics completed?*

We expect to have the summary statistics by June 2000. What we will do is write programs in Visual Basic that read the Microsoft Access files and generate summary data sets. In addition to integrating this information with Fishbase, these treatment statistics would then be added to the Database website allowing users to choose between raw data sets and summary tables.

*What do you have planned next for the Database?*

Once we complete the summary statistics, we would like to focus our efforts on expanding the group of Database users to include people closely involved with end production, and educators and students of aquaculture science and engineering, rather than just basic researchers or modelers. This involves promoting the use of the Database by contacting people in the education, extension, and research communities—which is already taking place to some degree. We would also like to create a Database user manual that helps guide the implementation process by providing ideas for applications of the data. 

## Graduate Student Profile: Charles Hillyer

by Matt Niles

Charles Hillyer is a PD/A CRSP-sponsored Ph.D. graduate student here at Oregon State University. Drawn to OSU by the work of John Bolte, PD/A CRSP Principal Investigator and Associate Professor in the Bioresource Engineering Department here, Hillyer began his Ph.D program in the Fall of 1998.

Hillyer completed his B.S. degree in Biological Engineering at Mississippi State University, and his decision to come to Oregon State was due in large part to his desire to continue previous research in agricultural engineering and modeling begun at Mississippi State.

Hillyer's research currently focuses on software maintenance for POND®, a PD/A CRSP-developed software decision support tool for analyzing and projecting various aspects of warmwater aquaculture production systems. Hillyer's POND® work is not confined to any specific component of the software. Rather, he is involved with general maintenance and upgrades to the current program.

Hillyer is also collaborating with researchers in Arkansas on an inventory management project for catfish, which involves modeling various parameters of catfish growing operations to help pond managers plan feeding rates, harvest dates, and other production events to optimize catfish production rates.

Hillyer's initial research upon arrival at OSU and the PD/A CRSP consisted primarily of work completing POND® Version 4.0, which differs from previous versions mainly by expanding on the enterprise budget capabilities. Hillyer assisted with several additional new components of POND®, including a new weather component and user manual, and worked on a variety of bug-fixes. Announcements about the new version were mailed out in August 1999.

Hillyer's previous work at Mississippi State involved the modeling of cotton crops. His interest in Bolte's aquaculture modeling work and the CRSP Decision Support research team stems from an interest in the modeling aspect of the work itself, however, and Hillyer feels that warmwater aquaculture systems lend themselves naturally to modeling research because they are typically carried out in confined areas.

Bolte's progressive approach to modeling is what initially drew Hillyer to OSU. Many agriculture modeling approaches employ standardized, established methods that have long been used in agricultural modeling research. While many of these methods are successful, Hillyer wanted to focus on developing new techniques and using new approaches to modeling.

POND® does just that, in part by using a parameter-estimation tool based on the principals of evolution theory, taking various sets of parameters, selecting the best, and starting over.

According to Hillyer, one aspect of POND® that makes it such a good product is the fact that it's very user-oriented, so that it approaches a real software

product, rather than just a research tool accessible only to the relatively small number of people carrying out aquaculture research. POND® is designed to be a powerful tool for a wide audience, including farmers, educators, extension agents, managers, and planners, in addition to researchers.

"The agricultural research models that I've worked with in the past seem to have two identities. One is for the researchers and one is for the users." According to Hillyer, "Researchers often do not pay much attention to models developed specifically for the users, which is [unfortunate] because the users are what

ultimately guide the development of the models."

"For example," Hillyer says, "in many models it's unlikely that researchers will ever produce a really well-developed economic model for agriculture, because that's more of a user-oriented thing, and in the current system, researchers are unlikely to focus on user-oriented aspects of models."

Hillyer notes that POND® is not without its weaknesses, however, and like all models, must make certain, necessary assumptions that may limit its effectiveness. There will always be trade-offs between making assumptions to make the model easy to use and limiting assumptions to maintain accuracy. The key is to maintain the accuracy of the model while keeping it at a level of complexity accessible to its users.

After completing his doctorate, Hillyer foresees remaining within the academic community and continuing research in modeling. 🐟



CRSP Graduate Student Charles Hillyer

See related story on PD/A CRSP Central Database, p. 1.



## Farewell to Gary Jensen

by Deb Burke

After serving for more than four years on the PD/A CRSPs External Evaluation Panel, Gary Jensen is moving on. Jensen brought a long history of aquaculture-related expertise to the EEP, beginning with his work in fish culture as a Peace Corps volunteer in the early 1970s. Since that time highlights of his career have included earning a Ph.D. in aquaculture, holding an assistant professorship at Auburn University involving short- and long-term international assignments with the International Center for Aquaculture, and being employed with the Louisiana and Kentucky extension services as an aquaculture specialist. In 1990 Jensen stepped into the position of National Program Leader for Aquaculture with the Cooperative State Research, Education, and Extension Service (CSREES) of the United States Department of Agriculture, where he currently works.

Of his time serving as an EEP member Jensen said, "People are the driving force for the successes of any program who contribute their vision, resources, talents, and time for the

public good. Committed, capable individuals and collaborative teams are the strength of the PD/A CRSP. The opportunity to interact as a member of the EEP in this unique program with both old and new colleagues has been by far the most enjoyable [aspect of my work with the EEP]."

Jensen says he will continue his work as National Program Leader for Aquaculture with CSREES, which involves interactions with federal agencies, commodity groups, and a diversity of stakeholders with interests in aquaculture. In addition, Jensen chairs a new federal Joint Subcommittee on Aquaculture Effluents Study Task Force, which will report science-based information in response to the EPAs Animal Aquaculture Study Objectives. On the international scene, Jensen will be

involved in post-hurricane Mitch reconstruction projects in Central America with the shrimp farming sector in collaboration with the National Oceanic and Atmospheric Administration (NOAA), the United States Geological Service (USGS), and land grant universities.



Former CRSP EEP member Gary Jensen

## Another One Escapes the Pond

by Danielle Clair

PD/A CRSP staff at the management offices bid a reticent and very fond farewell to Deb Burke, whose graduate research assistantship with the program resulted in a successfully defended Anthropology thesis, "An analysis of the social relations at an aquaculture development site in Kenya." After her defense last year, Deb was invited to stay on, at least until she was able to get her bearings on more Deb-like ground.

Deb's contribution to the program in her official capacity has been as technical editor, assisting in the highly intensive yearly compilation, editing, and final production of CRSP research progress reports submitted by the program's principal investigators. She has been a staff writer for

Aquanews as well as made numerous other outreach efforts—ranging from program brochures to on-campus public events—come to pass. These endeavors hardly capture Deb's charm, wit, and high spiritedness, those elements of personality that ultimately make up the more significant part of why she has such a loyal and devoted following.

Fortunately for us, Deb's greener pastures are quite nearby, as she recently accepted a position with OSUs Office of Student Affairs to design and implement a website envisioned as a multi-media venue for expression by and among OSUs minority student community and interested others.

We wish Deb the absolute very best.



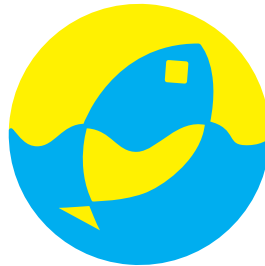
Departing CRSP Research Assistant Deb Burke

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## IIFET 2000 Conference

The tenth biennial conference of the International Institute of Fisheries Economics & Trade (IIFET 2000) will take place 10–13 July 2000 at Oregon State University in Corvallis, Oregon, USA. The conference theme, Microbehavior and Macroresults, reflects the relationship of individual behavior to the aggregate consequences of that behavior. The conference will include presentations by historians, legal scholars, industry spokespeople, policy-makers, biologists, nutritionists, and social and behavioral scientists. As at past conferences, there will be both formal and informal opportunities for interaction among the participants. A tentative list of conference topics includes: fishery biology and the social sciences; aquaculture: past, present, and future; fisheries in economic development; issues in international trade; consumer demand for seafood; seafood market behavior; and seafood consumption and human health.

The PD/A CRSP is a co-sponsor of this event, providing an opportunity for scholars from CRSP host countries to attend and present.



The final deadline for abstracts is 31 January 2000 and for final papers 14 July 2000. Abstracts of prospective presentations will be reviewed by a panel as they are received, and submitters will be notified by 1 March whether their abstracts are accepted. The early registration deadline for the conference is 30 April 2000.

To present at the conference, submit a brief (250 words max.) abstract to the following address. Additionally, if you are not an IIFET member and wish to receive further information by email or regular mail, please contact the following address with your postal and email addresses:

Debi Mandigo


Dept. of Agricultural & Resource Economics

Oregon State University  
Corvallis, OR 97331-3601 USA

Fax: 541-737-2563

Email: [Debi.Mandigo@orst.edu](mailto:Debi.Mandigo@orst.edu)

A \$500 prize will be presented for the best student paper.

For details, please visit the website <[osu.orst.edu/Dept/IIFET/2000](http://osu.orst.edu/Dept/IIFET/2000)> or contact [Ann.L.Shriver@orst.edu](mailto:Ann.L.Shriver@orst.edu), or write to the address above. 

## Conference Announcement & Call for Papers

### ISTA V ~ Fifth International Symposium on Tilapia in Aquaculture

September 3–7, 2000

Sofitel Rio Palace

Rio de Janeiro, Brazil

Conference website: <[ag.arizona.edu/azaqua/ista/announce.htm](http://ag.arizona.edu/azaqua/ista/announce.htm)>


Sponsors: American Tilapia Association  
International Center for Living Aquatic Resources Management  
Co-Sponsors: Pond Dynamics/Aquaculture Collaborative Research Support Program  
Tilapia International Foundation  
CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement)  
Host: Panorama da Aquicultura

This will be the fifth of the highly successful series of symposia that have brought together tilapia biologists to review the latest discoveries in tilapia biology, ecology, improvements in production systems, and other fields related to tilapia and their use in aquaculture. The first of the symposia to be held in South America after earlier meetings in Israel, Thailand, Côte d'Ivoire and the US, this meeting will focus on the rapid advances in large-scale commercial farming and the development of international markets. In addition to the presentation of scientific information, the conference venue will feature a trade show for industry suppliers, seafood marketers and the aquaculture press to meet directly with researchers and producers. Field trips are being organized to nearby aquaculture sites.

The Symposium Proceedings will be prepared before the meeting and distributed to the participants in Rio. Papers

will be accepted for review by the proceedings editors when paper and electronic copies of the article have been received. The editors may request revisions of the papers. It is anticipated that each of the papers submitted will be scheduled for an oral presentation. There will also be facilities for poster presentations and oral presentations of work not included in the Proceedings.

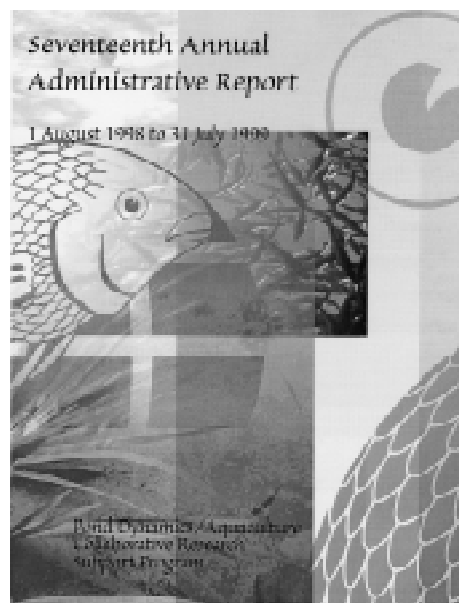
The early, regular, and late registration fee will be US\$300, 350 and 450, respectively. This fee will cover all symposium expenses including banquet, reception, program sessions, admission to trade show, and conference proceedings. Tours and pathology workshop may require addition fees.

For registration and any other information, please see the conference website at <[ag.arizona.edu/azaqua/ista/announce.htm](http://ag.arizona.edu/azaqua/ista/announce.htm)> or contact Kevin Fitzsimmons by email at <[kevfitz@ag.arizona.edu](mailto:kevfitz@ag.arizona.edu)>. 

## Seventeenth Annual Reports Available Now

Hot off the presses and ready for ordering are the annual reports of the Pond Dynamics/Aquaculture CRSP. The Seventeenth Annual Administrative Report, a 128-page bound volume, summarizes program information and includes abstracts of technical reports for the period 1 August 1998 to 31 July 1999. The Seventeenth Annual Technical Report contains progress or final reports on all research projects underway during the reporting period. Each technical report can be ordered individually; the unbound, 184-page complete volume is also available. A table of contents listing all the reports will be included with all report orders; it also comprises an appendix in the Administrative Report.

As always, these reports are free of charge. Ordering information is listed on p. 16.



## Tilapia Nutrition Information

courtesy of ATA website

<ag.arizona.edu/azaqua/ata.html>

### Nutritional Facts

Serving Size 113 grams  
Servings per Container 8

#### Amount Per Serving

**Calories:** 93    **Calories From Fat:** 9

|                             | % Daily Value |
|-----------------------------|---------------|
| <b>Total Fat:</b> 1 g       | 2%            |
| Saturated Fat 0.5g          | 2%            |
| <b>Cholesterol</b> 55 mg    | 18%           |
| <b>Sodium</b> 40 mg         | 2%            |
| <b>Total Carbohydrate</b> 0 | 0%            |
| Dietary Fiber 0             | 0%            |
| Sugars 0                    | 0%            |

#### Protein 21 g

|           |    |           |    |
|-----------|----|-----------|----|
| Vitamin A | 0% | Vitamin C | 0% |
| Calcium   | 1% | Iron      | 7% |

Percent Daily Values are based on a 2000 calories diet. Your daily values may be higher or lower depending on your calorie needs:

| Calories     | 2000    | 2500    |
|--------------|---------|---------|
| Fat          | 65 g    | 80 g    |
| Sat. Fat     | 20 g    | 28 g    |
| Cholesterol  | 300 mg  | 300 mg  |
| Sodium       | 2400 mg | 2400 mg |
| Carbohydrate | 300 g   | 375 g   |
| Fiber        | 25 g    | 30 g    |

Calories per gram:

Fat 9    Carbohydrates 4    Protein 4

## Tilapia with Sherry Mushroom Sauce

**Preparation Time:** 10 minutes

**Cooking Time:** 15 minutes

**Yield:** 4 servings

¼ t salt  
1½ lbs tilapia fillets  
1 T butter or margarine  
4 cups mushrooms  
½ t black pepper  
2 T dry sherry  
¾ cup chicken broth  
¼ cup milk  
1 t cornstarch

1) Sprinkle ½ t salt over fillets. Melt 1½ t butter in large non-stick skillet over medium heat. Add fillets and sauté 4 minutes on each side or until fish flakes easily when tested with fork. Remove fillets from skillet and cover to keep warm.

2) Melt 1½ t butter in skillet. Add ½ t salt, mushrooms, and pepper. Sauté for 4 minutes or until golden. Add sherry and cook for 30 seconds, stirring constantly.

3) Combine broth, milk, and cornstarch and stir with a whisk. Add broth mixture to skillet and bring to a boil, stirring constantly. Reduce heat to medium and cook 1 minute. Spoon sauce over fish.

*Recipe courtesy of John Hayes*



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## Fishellaneous Items

### Aquaculture Facilities Turn to Dogs to Protect Fish

The newest employee at Florida Fish Farms works like a dog. In fact, Cabo is a dog, a 2-year-old Border collie specifically trained to chase birds away from aquaculture ponds. His owners believe Cabo may be the first dog in the United States to be used in a bird reduction program at a commercial aquaculture facility. Although the concept may be funny, the problem the owners want Cabo to solve is not. Aquaculturists reports that fish-eating birds cause significant economic losses annually; Florida Fish Farms estimates its losses to birds at \$100,000 a year.

Because Cabo runs at speeds of up to 30 miles per hour, he is perceived as a stealth predator by the birds and,

thus, they do not become desensitized to him as they do other methods of bird harassment, say trainers. Border Collie Rescue, a national non-profit organization, says a single Border collie and a handler can easily maintain a 2-square-mile area, which is one reason Border collies are the fastest and most popular form of bird control on golf courses, airports, and other venues. Trainers teach owners how to use a herding whistle and verbal commands to guide the dogs. For more information contact 352/473-0100.

Source: *Fisheries*, Vol. 24, No. 11, November 1999

### Tuna Carp?

Supplies of tuna are running so low that the Agricultural Research Service (ARS) in the USA is working on an alternative: bighead carp, *Parade* magazine reports.

The species, which is now being raised in Arkansas, is lighter, less oily, and lower in calories than tuna. Taste tests have been successful, with 60-70 percent of consumers saying they would pay as much for carp as for canned tuna.

There is a drawback, however. US chefs will not put the name 'carp' on a menu. "They wish we'd call it something else," the ARS said.

Source: *Seafood International*, Vol. 14, No. 11, November 1999

### Tilapia Fingerlings Planted in Llano El Espino

Fifty thousand tilapia fry have been planted in the lagoon of Llano El Espino, Ahuachapan, with the aim of aiding the recovery of several crustacean species which inhabit these continental waters.

The work was carried out by the Ministry of Agriculture and Livestock (MAG) and the National Centre of Fisheries Development (CENDEPESCA), with the support of the local municipality. Mr Lin Ming Hsien, from Taiwan, who is collaborating with the government agencies, supervised the labours.

Tilapia planting is expected to benefit the people from the nearby communities, such as El Carmen, Las Viñas, Llano La Laguna, Chancuyo and Rio Frio, among others, who will be able to use and commercialise the resource.

Mayor Julio Eduardo Guillén said CENDEPESCA has recommended a ban on fishing in the lagoon for three or four months, to prevent the fingerlings from being caught before they fully mature.

The official warned that anybody caught fishing during the ban will be severely fined.

Source: *Fish Info Service*, <[www.fish-net.com](http://www.fish-net.com)>

### Government Focuses on Fisheries

Reports in the Filipino press claim that President Joseph Estrada has ordered a study on the creation of a Department of Fisheries and Oceans to enable the country to achieve self-sufficiency in fish.

Estrada is reportedly considering appointing Secretary William Dar of the Department of Agriculture (DA) as head [of] the new department once it is approved by Congress.

Estrada said: "More than half of our

municipalities are in coastal areas. So, it is important for us to take care of our aquatic resources. We have ordered a thorough study on the possibility of creating a new Department of Fisheries that will focus on our coastal resources and fisheries sector."

For 1999, the government allocated P1.3 billion of the estimated P19 billion agriculture budget to the fisheries sector, although in the first

quarter [1999], the fisheries sector accounted for nearly P20 billion of the country's food output.

The government claims that it also intends to modernise the country's fishing industry and closely monitor fishing activities in coastal waters to guard against destructive methods.

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



# Notices of Publication

These Notices of Publication announce recently published work carried out under PD/A CRSP sponsorship. To receive a full copy of a report, please contact the author(s) directly unless it is otherwise noted.

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## CRSP Research Report 99-136

### **GOOD MANAGEMENT PRACTICES (GMPs) TO REDUCE ENVIRONMENTAL IMPACTS AND IMPROVE EFFICIENCY OF SHRIMP AQUACULTURE IN LATIN AMERICA**

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A list of practices that can be used to improve the efficiency and reduce the negative environmental impacts of shrimp farming is presented. The practices are called good management practices (GMPs) instead of best management practices (BMPs), because the best ways of reducing environmental impacts in shrimp farming are still evolving. The practices were developed specifically for shrimp culture in Latin American countries with the assistance of the Honduran Shrimp Producer's Association, but many of the practices are applicable to shrimp farming anywhere in world and to most other types of pond aquaculture. Further modifications and refinements are anticipated for these GMPs as a result of continued collaboration with shrimp producers and aquacultural scientists.

This abstract was excerpted from the original paper, which was published in B.W. Green, H.C. Clifford, M. McNamara, and G.M. Montaña (Editors), V Central American Symposium on Aquaculture, 18–20 August 1999, San Pedro Sula, Honduras, pp. 9–33.

## CRSP Research Report 99-137

### **ESTIMATION OF CARRYING CAPACITY FOR SHRIMP AQUACULTURE IN THE EASTERN ESTUARIES OF THE GULF OF FONSECA**

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International Center for Aquaculture & Aquatic Environments  
Department of Fisheries and Allied Aquacultures  
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An intensive data collection and modeling study has been underway for the past several years addressing two of the channel estuaries draining into the Gulf of Fonseca, namely Estero El Pedregal and Estero San Bernardo. Data have been compiled on the shrimp farm configurations, exchange rates, and effluent chemistry. Temperature / salinity / dissolved oxygen profiles have been measured in the estuary channels in both rainy and dry seasons. Physiographic, hydrographic and meteorological data have been obtained to supplement the estuary data. We examine the assimilative capacity of these estuaries with respect to dissolved oxygen (DO). The oxygen demand of organics is measured by biochemical oxygen demand (BOD). Shrimp farm BOD loadings were estimated from effluent data and exchange. A transport model for salinity and DO in the estuaries was applied to predict the tidal-mean, section-mean concentrations of salinity and DO. The model predictions of DO given 1995 BOD loadings were satisfactory. Future loadings based upon full shrimp farm development along these two estuaries were then input to determine the resulting DO under these conditions. It was found that the 1995 configuration is already pressing the carrying capacity of both systems, and the DO will be worsened at full development. Shrimp farms placed farther upstream than about 20 km from the mouth will most likely have excessive impact on the DO in the estuary. The impact is exacerbated under dry season conditions. Negative impacts of a specific farm can be ameliorated by reducing or eliminating pond discharges during the dry season, and by reducing the level of water exchange employed. This work needs to be extended to address additional water-quality parameters, and to incorporate larger spatial scales, especially to establish the interaction between different estuaries draining into Fonseca.

This abstract was excerpted from the original paper, which was published in B.W. Green, H.C. Clifford, M. McNamara, and G.M. Montaña (Editors), V Central American Symposium on Aquaculture, 18–20 August, San Pedro Sula, Honduras, pp. 34–63.

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# Notices of Publication (cont.)

## CRSP Research Report 99-138

### NON-PARAMETRIC ESTIMATION OF RETURNS TO INVESTMENT IN HONDURAS SHRIMP RESEARCH

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This paper reports the results of a study to evaluate the economic returns on the investment in shrimp research in Honduras. The goal of this study was to estimate the economic returns to shrimp research investment by the Pond Dynamics / Aquaculture CRSP, a USAID-funded program involved in global pond aquaculture research in Honduras since 1993. The research program was implemented by Auburn University researchers under the auspices of the PD / A CRSP in order to improve shrimp production efficiency. The analytical technique used in this study is a non-parametric approach to estimate the returns to research investment, based on Varian's Weak Axiom of Profit Maximization (WAPM). Shrimp production data from 21 farms in Honduras were collected by survey techniques. Each farm indicated yield, post-larva (PL) stocking rate, and feeding rate during its first production year and 1997 (the survey year). For the combined investments, the Internal Rate of Return (IRR) was 17% (45% with Taura Syndrome Virus (TSV) correction); considering only public-sector investment gave an IRR of 6,532% (13,412% with TSV correction). These results suggest a very effective leveraging of US federal research funds with private-sector capital. Results from this study clearly point toward technical progress in Honduran shrimp cultivation. Non-parametric total productivity indices evaluated from the output technological indices, indicated proportionately higher yields in the post-research years. This study also illustrates the importance that commercial shrimp farms place on the Auburn University PD / A CRSP research program, which is evident from the significantly higher private-sector over public-sector investment.

This abstract is based on the original paper, which was published in B.W. Green, H.C. Clifford, M. McNamara, and G.M. Montaño (Editors), V Central American Symposium on Aquaculture, 18–20 August, San Pedro Sula, Honduras, pp. 201–203.

## CRSP Research Report 99-139

### RISK ANALYSIS OF SHRIMP FARMING IN HONDURAS

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Current realities (disease issues, environmental concerns, unstable market) are encouraging shrimp farmers worldwide to review traditional management strategies and look for tools that help optimize current practices. Uncertainties and risks associated with shrimp production also need to be recognized. The present study is a risk analysis of activities carried out by shrimp farmers in Honduras. Results of the analysis are intended to provide the farm manager–decision maker with a compendium of possible outcomes that could be obtained under different scenarios, which are modeled according to the characteristics of the Honduran shrimp industry. A survey was conducted to obtain information on production parameters and costs of shrimp farms in Honduras. Data were collected from 21 farms ranging in size from 20 to 1,800 hectares. The survey was aimed at obtaining information on stocking densities, feeding rates, and other production parameters in addition to operational costs. Collected data correspond to the production of 1997. Data from the survey showed that large farms (more than 400 ha) typically produce less than 1,000 lb ha yr<sup>-1</sup> and have the lowest costs per unit area and break-even yields. Yields are higher for medium farms (150 to 300 ha) than for large farms. Results of the analysis suggest that under current strategies followed by farm managers in Honduras, there is more risk associated with adopting conservative practices and a low-cost-per-hectare approach than with intensifying shrimp culture by increasing stocking densities and feeding rates.

This abstract is based on the original paper, which was published in B.W. Green, H.C. Clifford, M. McNamara, and G.M. Montaño (Editors), V Central American Symposium on Aquaculture, 18–20 August, San Pedro Sula, Honduras, pp. 236–239.

# Notices of Publication (cont.)

## CRSP Research Report 99-140

### MASCULINIZATION OF NILE TILAPIA (*Oreochromis niloticus*) BY IMMERSION IN SYNTHETIC ANDROGENS: TIMING AND EFFICACY

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A variety of methods have been developed for producing single-sex populations of tilapia; however, dietary treatment with synthetic androgens such as 17 $\alpha$ -methyltestosterone is the most common technique. The objectives of our study were to determine the period at which masculinization via immersion can be accomplished, and to determine if multiple immersions during critical days can produce all-male populations. We also wanted to determine if masculinization via immersion can be accomplished on a large scale using fry collected from multiple families in spawning tanks. Fry were immersed in 500  $\mu\text{g l}^{-1}$  of trenbolone acetate (TA) for 3 h on days 12, 13, or 14 after fertilization (experiment 1) or in combinations of days between 12 and 15 days postfertilization (dpf; experiment 2). The results of these experiments confirm that significant masculinization of tilapia can be achieved through short-term immersion of fry in water containing synthetic androgens. Multiple immersions during the critical period of sensitivity consistently achieved greater than 80% masculinization. The results indicate that 3-h immersions are sufficient, and suggest that including an immersion on 15 dpf does not improve masculinization.

This abstract is based on the original paper, which was published in B.W. Green, H.C. Clifford, M. McNamara, and G.M. Montaña (Editors), V Central American Symposium on Aquaculture, 18–20 August, San Pedro Sula, Honduras, pp. 246–248.

## CRSP Research Report 99-141

### FATE OF THE MASCULINIZATION AGENT METHYL-TESTOSTERONE IN THE POND ENVIRONMENT

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Use of all-male tilapia populations prevents unwanted reproduction and produces the sex with the greatest growth potential. One common method for producing all-male populations is to feed developing fry with food impregnated with the synthetic androgen 17 $\alpha$ -methyltestosterone (MT). Although previous studies have shown that MT is rapidly cleared from the fish, little attention has been paid to the possible contamination of the environment by steroid-treated food. Such contamination could pose an exposure risk to workers as well as to other organisms in and around the pond environment. We tested the hypothesis that MT persists in the environment after its use for masculinizing Nile tilapia. Fry were treated with a masculinizing dose of MT (60 mg kg $^{-1}$ ) for four weeks beginning at the initiation of feeding in model ponds. Water and soil samples were taken before the onset of treatment and weekly beginning on the last day of treatment (water samples were also taken weekly during the four-week treatment period). The concentrations of MT in water and soil were measured by radioimmunoassay. Concentration of MT in water decreased to background level by 35 days after the onset of feeding (one week after the end of treatment with MT-impregnated food). In contrast, the levels in the soil were 1.4 to 1.7  $\mu\text{g kg}^{-1}$  at 28 days after the onset of feeding with MT-impregnated food and remained detectable in the soil at between 0.8 and 1.6  $\mu\text{g kg}^{-1}$  through 49 days (three weeks after ending treatment with MT-impregnated food). These results suggest that MT persists in sediments for at least weeks after cessation of MT treatment, which indicates that unintended exposure to MT may occur.

This abstract is based on the original paper, which was published in B.W. Green, H.C. Clifford, M. McNamara, and G.M. Montaña (Editors), V Central American Symposium on Aquaculture, 18–20 August, San Pedro Sula, Honduras, pp. 249–250.

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# Notices of Publication (cont.)

## CRSP Research Report 99-142

### SISTEMAS DE PRODUCCIÓN DE TILAPIA EN HONDURAS (TILAPIA PRODUCTION SYSTEMS IN HONDURAS)

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Following a period of rapid expansion in the early 1990s, tilapia farming in Honduras continues to be a growing industry. This survey of management systems employed at tilapia farms in Honduras, based on interviews conducted between July and September 1998 with managers from 11 farms that supply both domestic and export markets, examines the species cultivated in largest quantity—a hybrid of *Oreochromis mossambicus*, *O. urolepis hornorum*, *O. aureus*, and *O. niloticus* known as Jamaican red tilapia. The survey revealed that while many farms originally harvested production for the export market, limited and/or irregular production necessitated a scaling back to local distribution. Large farms were found to contain an average of 54 ponds compared with small farms, which operated an average of 33 ponds. In general, ponds in a farm were distributed by total area in the following manner: 5.9% for reproduction and sex inversion, 21% for pre-grow-out, 31.8% for grow-out I, and 41.1% for grow-out II. Sex inversion of fry was practiced on all farms, with varying degrees of success, using daily treatments of 17 $\alpha$ -methyl-testosterone administered through feed. For most farms, water exchange was the primary method of maintaining water quality during grow-outs I and II. Farms that also implemented water exchange during pre-grow-out reported larger biomasses at the end of this stage of production.

This abstract is based on the original Spanish-language paper, which was published in B.W. Green, H.C. Clifford, M. McNamara, and G.M. Montaña (Editors), V Central American Symposium on Aquaculture, 18–20 August 1999, San Pedro Sula, Honduras, pp. 254–257.

## CRSP Research Report 99-143

### EVALUATION OF INTEGRATED TILAPIA CULTURE BY RESOURCE LIMITED FARMERS IN PANAMA AND GUATEMALA

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The purpose of this study was to evaluate the current status of tilapia pond projects initiated in the 1980s by the

governments of Panama and Guatemala, with financial support from the United States Agency for International Development (USAID) and technical support provided by Auburn University. Projects in both countries were designed to improve the nutrition and increase the income of poor farmers by teaching them the skills required to become self-sufficient pond managers. During June and July 1998 the authors visited 21 cooperatively managed fish pond projects in Panama, and 37 family and 2 cooperatively managed fish ponds in Guatemala. The evaluation team found that in Panama, 6 of the cooperative projects were abandoned and the remaining 15 were being used to grow rice and/or fish, while in Guatemala, 39% of the ponds were abandoned, 48% were under-utilized, and 13% were well managed. Fish ponds did not have the intended impact on household nutrition and income for a combination of technical, economic, social, and political reasons. However, participants found ways to profit from the existence of ponds as 15 of 21 cooperatively managed pond projects in Panama and 28 of 46 individual household pond projects in Guatemala were still used at some level of proficiency.

This abstract is based on the original paper, which was published in B.W. Green, H.C. Clifford, M. McNamara, and G.M. Montaña (Editors), V Central American Symposium on Aquaculture, 18–20 August 1999, San Pedro Sula, Honduras, pp. 258–261.

## CRSP Research Report 99-144

### EFFECTO DEL RECAMBIO DE AGUA EN LA PRODUCCIÓN SEMI-INTENSIVA DE *PENAEUS VANNAMEI* (EFFECT OF WATER EXCHANGE ON SEMI-INTENSIVE PRODUCTION OF *PENAEUS VANNAMEI*)

Bartholomew W. Green, David R. Teichert-Coddington, and  
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Daily water exchange at 10% of pond volume is common practice in semi-intensive shrimp culture in Central America. Rationales for water exchange are to improve dissolved oxygen concentrations in the pond and to remove nutrients before they reach toxic levels. However,



## Notices of Publication (cont.)

the benefit of water exchange in semi-intensive shrimp culture has been poorly demonstrated. Two experiments were conducted on a commercial shrimp farm in Honduras to determine the effects of daily water exchange and emergency water exchange on shrimp production. Ten 0.93-ha ponds stocked with hatchery-spawned post-larval (PL) *Penaeus vannamei* at 150,000 PL ha<sup>-1</sup> were used for this completely randomized design study to test two water exchange regimes: daily water exchange at 10% pond volume, six days per week; and water exchanged at up to 25% pond volume when early morning dissolved oxygen concentrations were  $\leq 2.0$  mg l<sup>-1</sup>. The above experiments were conducted in both the rainy and dry seasons. Gross shrimp yields, shrimp survival, and individual growth and weight showed no difference between water exchange regimes for both seasons considered.

This abstract is based on the original Spanish-language paper, which was published in B.W. Green, H.C. Clifford, M. McNamara, and G.M. Montaña (Editors), V Central American Symposium on Aquaculture, 18–20 August 1999, San Pedro Sula, Honduras, pp. 209–212.

## Upcoming Conferences and Expositions

| Date                        | Topic/Title  | Event Location              | Contact Information  |
|-----------------------------|--|-----------------------------|--|
| February 2–5, 2000          | Aquaculture America 2000   | New Orleans, Louisiana, USA | WAS Conference Manager, World Aquaculture Society, 21710 7th Place West, Bothell, WA 98021; Phone: 425-485-6682; Fax: 425-483-6319; Email: worldaqua@aol.com   |
| February 9–10, 2000         | Aquaculture Technology Expo 2000   | Chiba City, Japan           | Phone: 03-5775-2855; Fax: 03-5775-2856; Email: kazexhb@sannet.ne.jp  |
| February 21–24, 2000        | Aquaculture and Seafood Fair 2000  | Bangkok, Thailand           | Phone: 66-2 561-1728; Fax: 66-2561-1727; Email: naca@fisheries.go.th   |
| February 21–26, 2000        | Conference on Aquaculture in the Third Millenium                           | Bangkok, Thailand           | Aquaculture in the Third Millenium Conference, PO Box 1040, Kasetsart Post Office, Bangkok, Thailand 10903; Phone: 662-561-1728; Fax: 662-561-1727; Email: naca@fisheries.go.th                                      |
| March 7–9, 2000             | International Boston Seafood Show  | Boston, Massachusetts, USA  | Phone: 207-842-5504; Fax: 207-842-5505; Email: food@divcom.com   |
| March 23–26, 2000           | Fish International 2000  | Bremen, Germany             | Phone: 49-421-3505-260; Fax: 49-421-3505-681; Email: info@fishinternational.de   |
| May 2–6, 2000               | World Aquaculture 2000   | Nice, France                | WAS Conference Manager, World Aquaculture Society, 21710 7th Place West, Bothell, WA 98021; Phone: 425-485-6682; Fax: 425-483-6319; Email: worldaqua@aol.com   |
| May 9–11, 2000              | European Seafood Exposition  | Brussels, Belgium           | Phone: 207-842-5599; Email: registration@divcom.com  |
| June 15–18, 2000            | 2000 Taipei International Food Show  | Taipei, Taiwan              | Phone: 886-2-2725-1111; Fax: 886-2-2725-1314   |
| June 15–18, 2000            | IFAF 2000—International Fair for Aquaculture, Fisheries, and Fish Products | Izmir, Turkey               | Phone: 31-30-295-5321; Fax: 31-30-295-5585; Email: molhd@jaarbeursutrecht.nl   |
| July 10–13, 2000            | IIFET 2000   | Corvallis, Oregon, USA      | Debi Mandigo, Dept. of Ag. & Resource Economics, Oregon State University, Corvallis, OR 97331-3601; Phone: 541-737-1414; Fax: 541-737-2563; Email: Debi.Mandigo@orst.edu; Website: osu.orst.edu/Dept/IIFET/html/2000 |
| July 20–23, 2000            | 3rd International Conference on Recirculating Aquaculture                  | Roanoke, Virginia, USA      | Dr. George Libey, Recirculating Aquaculture Conference 2000, Virginia Tech, Blacksburg, VA 24061; Phone: 540-231-6805; Fax: 540-231-9293; Email: CFAST@vt.edu  |
| July 23–26, 2000            | International Congress on the Biology of Fish                              | Aberdeen, Scotland          | Don MacKinlay; Phone: 604-666-3520; Email: MacKinlayD@pac.dfo-mpo.gc.ca; Website: www.fishbiologycongress.org  |
| July 31–August 3, 2000      | 4th International Symposium on Fish Endocrinology                          | Seattle, Washington, USA    | Walton Dickhoff, NWFSC, 2725 Montlake Boulevard East, Seattle, WA 98112-2097; Email: walton.w.dickhoff@noaa.gov  |
| August 20–24, 2000          | 130th American Fisheries Society Annual Meeting                            | St. Louis, Missouri, USA    | Betsy Fritz; Phone: 301-897-8616/212; Email: bfritz@fisheries.org  |
| October 31–November 3, 2000 | 3rd World Fisheries Congress   | Beijing, China              | Phone: 86-10-6419-4233; Fax: 86-10-6419-4231; Email: scfish@agri.gov.cn  |
| January 21–25, 2001         | Aquaculture America 2001   | Orlando, Florida, USA       | WAS Conference Manager, World Aquaculture Society, 21710 7th Place West, Bothell, WA 98021; Phone: 425-485-6682; Fax: 425-483-6319; Email: worldaqua@aol.com   |
| August 19–23, 2001          | 131st American Fisheries Society Annual Meeting                            | Phoenix, Arizona            | Betsy Fritz; Phone: 301-897-8616/212; Email: bfritz@fisheries.org  |

## Workshops and Short Courses

| Date                         | Title/Topic/Site  | Contacts   |
|------------------------------|---|--|
| Year-round                   | Various courses and study tours tailored to meet the training needs of a specific group or agency / Asian Institute of Technology, Thailand                   | Training and Consultancy Unit (TCU), Aquaculture and Aquatic Resources Management Program, School of Environment, Resources and Development, Asian Institute of Technology, PO Box 4, Klong Luang, Pathumthani 12120, Thailand; Phone: 66-2-524-5219; Fax: 66-2-524-5484; Email: tcuaasp@ait.ac.th; Website: www.agri-aqua.ait.ac.th/tcu |
| Year-round                   | Training and Research in Fisheries and Stock Management / Wageningen Agricultural University, the Netherlands   | G. van Eck, Dept of Fish Culture & Fisheries, PO Box 338, 6700 AH Wageningen, The Netherlands; Phone: 31-8370-8330; Fax: 31-8370-83937; Email: gerrie.van.eck@alg.wenv.wau.nl  |
| Year-round                   | Tropical Aquaculture Advanced Training in a Third World 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; Phone: ++49-8157-38-0; Fax: ++49-81-57-38-227  |
| January 24–February 18, 2000 | Coastal Planning and Management for Aquaculture Development / Asian Institute of Technology, Thailand   | Training and Consultancy Unit (TCU), Aquaculture and Aquatic Resources Management Program, School of Environment, Resources and Development, Asian Institute of Technology, PO Box 4, Klong Luang, Pathumthani 12120, Thailand; Phone: 66-2-524-5219; Fax: 66-2-524-5484; Email: tcuaasp@ait.ac.th; Website: www.agri-aqua.ait.ac.th/tcu |
| June 5–30, 2000              | Hatchery Management for Finfish / Asian Institute of Technology, Thailand   | Training and Consultancy Unit (TCU), Aquaculture and Aquatic Resources Management Program, School of Environment, Resources and Development, Asian Institute of Technology, PO Box 4, Klong Luang, Pathumthani 12120, Thailand; Phone: 66-2-524-5219; Fax: 66-2-524-5484; Email: tcuaasp@ait.ac.th; Website: www.agri-aqua.ait.ac.th/tcu |
| August 14–September 8, 2000  | Advances in Tilapia Fry Production and Grow-Out / Asian Institute of Technology, Thailand   | Training and Consultancy Unit (TCU), Aquaculture and Aquatic Resources Management Program, School of Environment, Resources and Development, Asian Institute of Technology, PO Box 4, Klong Luang, Pathumthani 12120, Thailand; Phone: 66-2-524-5219; Fax: 66-2-524-5484; Email: tcuaasp@ait.ac.th; Website: www.agri-aqua.ait.ac.th/tcu |
| March 20–31, 2000            | Coastal Aquaculture Study Tour / Asian Institute of Technology, Thailand  | Training and Consultancy Unit (TCU), Aquaculture and Aquatic Resources Management Program, School of Environment, Resources and Development, Asian Institute of Technology, PO Box 4, Klong Luang, Pathumthani 12120, Thailand; Phone: 66-2-524-5219; Fax: 66-2-524-5484; Email: tcuaasp@ait.ac.th; Website: www.agri-aqua.ait.ac.th/tcu |
| May 1–12, 2000               | Inland Aquaculture Study Tour / Asian Institute of Technology, Thailand   | Training and Consultancy Unit (TCU), Aquaculture and Aquatic Resources Management Program, School of Environment, Resources and Development, Asian Institute of Technology, PO Box 4, Klong Luang, Pathumthani 12120, Thailand; Phone :66-2-524-5219; Fax: 66-2-524-5484; Email: tcuaasp@ait.ac.th; Website: www.agri-aqua.ait.ac.th/tcu |

## WWW: Who/What/Where

Did you ever wonder just who looks at a website? We did too, and found that web usage statistics gather more information than just the number of visits to the site. We took a quick look at the use statistics for the PD / A CRSP website during four weeks over the course of three months and found that residents of at least 64 countries visited the site. Canadian and Australian servers hosted the most users, with about 300 and 250 hits,

respectively, over the four-week period we looked at. Regionally, North America accounted for the greatest number of visits to our site, at 28 percent of the hits. Twenty-four percent of hits came from Europe, followed by Latin America with 15 percent, Southeast Asia with 14 percent, and Oceania with 13 percent of hits. All told, the site received over 2,300 hits during the four-week period, an average of over 80 per day. 📺

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*Aquanews* is published quarterly by the Information Management & Networking Component of the Pond Dynamics/Aquaculture Collaborative Research Support Program, Oregon State University, 400 Snell Hall, Corvallis OR 97331-1641.  
<[osu.orst.edu/dept/crsp/homepage.html](http://osu.orst.edu/dept/crsp/homepage.html)>

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The Pond Dynamics/Aquaculture Collaborative Research Support Program is funded in part by the US Agency for International Development under CRSP Grant No. LAG-G-00-96-90015-00 and by participating US and host country institutions.

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