AQUANEWS

THE NEWSLETTER OF THE POND DYNAMICS/AQUACULTURE COLLABORATIVE RESEARCH SUPPORT PROGRAM

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EGYPTIAN SCIENTISTS RESEARCH IN OREGON

By Martin Fitzpatrick

In late July, Martin Fitzpatrick and Carl Schreck welcomed Khaled Hussein Hassan and Gamal Abd El-Nasser to Oregon State University's Department of Fisheries and Wildlife. The two Egyptian scientists from the Central Laboratory for Aquaculture Research at Abbassa collaborated for two weeks on research conducted at OSU as part of the Biotechnology Research Target area of the CRSP/ Egypt Project.

After a short orientation, Khaled and Nasser joined a major experiment on alternative methods for masculinization of tilapia fry with 17α-methyltestosterone (MT). Although feeding fry for several weeks with MT-treated feed is a well-established technique for production of all male tilapia, CRSP researchers are searching for improved technologies to minimize steroid exposure to the fish and to workers. OSU graduate student Bill Gale is investigating the potential of fry immersion in MT-containing solutions as a means to masculinize tilapia. As part of this investigation, Fitzpatrick, Khaled and Nasser conducted an experiment looking at a single immersion of fry at six days after the eggs were fertilized.

In addition, Nasser and Khaled collaborated with Grant Feist to study fish uptake of MT and persistence of MT in the tank water. This experiment will help to determine if additional immersions are necessary and if the hormone persists in the aquatic environment. The scientists used High Performance Liquid Chromatography to track the levels of MT in the water through 24 hours of exposure.

Khaled Hussein Hassan and Gamal Abd EL-Nasser from the Central Laboratory for Aquaculture Research join Bill Gale, graduate student at Oregon State University, in examining a biofilter for a tilapia recirculation system at OSU.

JENSEN: PD/A CRSP COMMENDED

By Gary Jensen

I have recently completed my contribution to the development of the report, "An Evaluation of the USAID/ Universities Collaborative Research Support Programs" being finalized by Tropical Research & Development, Inc. as contracted by USAID's Bureau for Global Programs. The last comprehensive evaluation of the CRSP was conducted in the mid-1980s and did not include the PD/A CRSP.

I want to extend my sincere gratitude to those of you too numerous to mention who were so generous with your time and were forthright in providing information and perspectives that were essential for this task. Personally, I learned much from the many visits and opportunities to witness the many accomplishments resulting from PD/A activities. As with any program with restricted funds, difficult decisions abound in identifying priorities and addressing the varied concerns of a broad international and domestic constituency. I commend those of you who have expended many years of your careers in support of the PD/A CRSP. More challenges lie ahead undoubtedly.

More noteworthy achievements can be anticipated to further the development of aquaculture globally. Your experience, your interdisciplinary approach to collaboration in programmatic design and implementation, the expansion of your international and domestic networks, the involvement of the private-sector and of research scientists and students whose high scientific standards–will all contribute to commercial and subsistence development and responsible natural resource stewardship.

From the DIRECTOR'S DESK

The PD/A CRSP has been evaluated twice this year. Nick Parker, USFWS, and Nabil Fahmy, Al-Azhar University, Cairo, reviewed Egypt Project activities at the Central Laboratory of Aquaculture Research at Abbassa (CLAR) and Oregon State University as part of a Technical Review of NARP Collaborative Research activities. They gave the project a favorable rating and recommended extending the CRSP/Egypt project.

USAID organized an evaluation to provide an assessment of each CRSP's impact on increasing agricultural production and development, and improving natural resource management by developing and disseminating new or more appropriate sustainable agriculture technologies. The final report, due to USAID in August, will assess how well the CRSP framework has responded to USAID expectations and objectives, and if the CRSP model can be used to meet future needs and requirements.

Members of the evaluation team were: Les Swindale, Team Leader and Institutional Management Specialist; John Ericksen, Agricultural Economist; Charlotte Miller, USDA Rural Sociologist; George Marlowe, Plant Scientist; Rattan Lal, Soil Scientist; Richard Gray, Animal Scientist; Gary Jensen, USDA Aquaculture Specialist, and Izadore Barrett, Fisheries Specialist. The team visited the ME, U.S. universities and host country sites in Thailand, the Philippines and Honduras.

The PMO created extensive informative materials for USAID/Washington and for CRSP field sites, as well as for the evaluators. Evaluators met with researchers and ME administrative officers at OSU. The PD/A CRSP organized activities for all CRSPs at the Thailand site and helped coordinate activities in Honduras. The team visited AIT and Udorn Thani in Thailand and the Freshwater Aquaculture Center at Central Luzon State University in the Philippines. In Honduras, they visited El Carao (the freshwater research station), medium- to large-scale tilapia producers on the north shore, and the brackish water research project on estuarine water quality and aquaculture management.

PD/A CRSP PROJECT REPORTS

Individual CRSP projects continue working toward the goal of understanding the dynamics of pond aquaculture, using both the Global Experiment and the locally driven research studies. The following project reports summarize activities through June1994; further detail can be found in the PD/A CRSP Quarterly Reports, which can be ordered from the Management Office (address on back page).

HONDURAS

The drought in Honduras has restricted production of hydroelectric power, shattering the country's fragile economy. CRSP research in Honduras continues, despite the electricity rationing of 12 hours per day which is in effect to delay the imminent disaster that awaits the country if the drought is not broken immediately by the arrival of the seasonal rains.

Baseline information on water quality has been established for major estuaries of the shrimp production regions of southern Honduras. Monitoring will continue at a reduced frequency to ascertain changes in water quality over time.

Researchers are working to quantify nutrient flow into and out of four farms located on two different estuarine types. Nutrient flows, including feeds and fertilizers applied to ponds and the harvested shrimp, are sampled every two weeks.

Researchers are studying relationships among stocking density, mean shrimp size, survival and carrying capacity in order to increase feeding efficiency and reduce water pollution. Chemical budgets for ponds of varying stocking densities are calculated to determine the most ecologically and economically efficient level of operation. A study to determine the relative growth potential of tambaquí *(Colossoma macropomum)* in polyculture with tilapia, and the optimum stocking rate for tambaquí. is also underway.

In addition to organizing a regional conference on *Sustainable Development of the Gulf of Fonseca and its Watershed,* David Teichert-Coddington taught a workshop on tilapia production techniques for Peace Corps volunteers in May.

RWANDA

Establishing contact and ensuring the safety of CRSP personnel, collaborators, and families in Rwanda has been the foremost activity this summer. JJ Newman, CRSP expatriate researcher, and her husband have both returned to the U.S. Lieven Verheust, a CRSP collaborating student from Catholic University in Leuven, and his family have returned to Belgium. Eugene Rwangano, former CRSP Rwandan PI, also is in Belgium. Researchers at OSU and Auburn worked on evacuating personnel, revising work plans, writing up completed studies, establishing communications with Rwanda collaborators and attempting to minimize losses to the project. A revision of the Rwanda activities was completed and submitted to the Technical Committee co-chairs, the Board of Directors and the Program Director. Contacts and arrangements were made to conduct revised experiments at other sites, including one in Kenya. Other African sites are under consideration.

The abrupt suspension of activities in Rwanda left several studies unfinished. An on-farm study of supplemental feeding in private ponds at five elevations was suspended within one month of completion. Five workshops for extension agents were completed before evacuation of U.S. personnel. Data entry from a study designed to tabulate and analyze production data from private fish farmers had begun at the Rwasave station, but it is not now known whether the data sheets have been lost during the on-going war. A special on-site project was conducted in Rwanda to determine the minimum effective treatment duration for sex reversal of Nile tilapia at sub-optimal temperatures. The hormone treatment was completed, but the experiment was suspended before the fish had been reared to a size allowing verification of phenotypic sex.

THAILAND

In Thailand, studies are underway to determine the effects of stocking density on fish size and total net yield in ponds receiving fertilization and supplemental feeding and to quantify the rates of

exchange of carbon dioxide between pond water and the atmosphere.

Another study addresses the question of how decreasing total alkalinity can best be managed in fertile ponds during a growth cycle. Researchers examine the potential of added soluble carbonate for decreasing total alkalinity, and document the relationship among medium-term net CO_2 balance, trends in total alkalinity, and fish growth and production.

Because 500g tilapia fetch a higher price per pound than the 250-300g tilapia common in ponds using CRSP technologies, a study is underway to determine if caging tilapia for final growout can efficiently produce a number of large tilapia while the nutrients produced from feeding the caged tilapia are utilized to grow smaller tilapia.

THE PHILIPPINES

A study to determine the growth and yield of genetically improved tilapia at the Freshwater Aquaculture Center (FAC) in the Philippines is continuing. The four treatments all use CRSP standard on-farm protocols for sampling and water management and the most current CRSP fertilization guidelines in 500 m^2 ponds for three months. Fish are stocked at the rate of $2/m^2$. Three of the treatments use different strains of *Oreochromis niloticus*–the Philippine strain, the Thailand strain and the strain from the University of Wales Swansea Research Project on Genetically Manipulated Improvement of Tilapia (GMIT). The fourth treatment uses the GMIT fish and a lower fertilizer rate. A study to link CRSP research experiments with outreach and extension programs is underway in the Philippines. Part of the study–to determine if the CRSP fertilization guidelines are socially acceptable and economically viable under Philippine conditions–has been completed. Potential farmer/participants have been identified and preliminary contact has been made.

DAST

The UC Davis team continued work on the respiration dynamics in aquaculture ponds. Data collected in Thailand are being analyzed, and a series of tests to measure respiration rates and phytoplankton response to light in laboratory algal cultures was completed. Results of this work are being written up in a doctoral dissertation and in papers to be submitted for publication. Procedures have been developed for using the CRSP data in developing predictive tools. Work on the development and revision of the aquaculture pond model continues, and long-term simulations (full growth season) will be undertaken shortly by incorporating the weather estimation procedures.

The OSU DAST has continued refining the fertilization guidelines in POND, a user-friendly computer-assisted decision support system for pond management. Refinement of the guidelines will proceed as the data sets from field experiments using PONDCLASS are received. The fish bioenergetics model in POND has been validated against results from CRSP experiments at different sites. Fish growth predicted by this model is consistently within the ranges reported from these sites for a variety of grow-out conditions. Some components of the water quality model have been implemented. These include steady state descriptions of carbon, nitrogen, and phosphorus dynamics in ponds.

The User's guide for POND has been completed, and the software is available for distribution to CRSP participants as well as other researchers/aquaculturists. The fish bioenergetics and water temperature models have also been documented, and preparation of the documentation for other models in POND is in progress. Computer code pertinent to all the models is also available upon request. Requests for POND, including requests for documentation or code, should be directed to Shree Nath, Dept. of Bioresource Engineering, OSU, Corvallis, OR 97331.

EGYPT

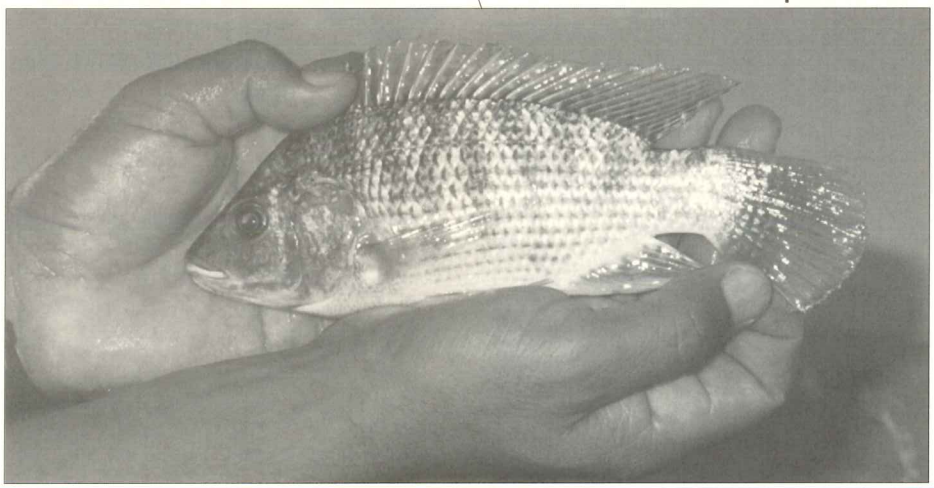
A study is underway to compare the growth and yield characteristics for Nile tilapia *(Oreochromis niloticus)* and blue tilapia *(O. aureus)* in different pond environments. Efforts to date to produce black carp fry in Israel have not been successful, but a new attempt at spawning black carp was undertaken in July at Gan Shmuel. Data analysis of bioconversion studies conducted last year is on-going. Tilapia and mullet were stocked in June, and *Clarias*, another species used in these experiments, were successfully spawned during April and May and were stocked this summer. Some of the *Clarias* experiments are being conducted at the Asian Institute of Technology in Thailand.

Progeny testing to identify "YY" male tilapia is underway at Auburn University. Eight spawns from "YY" males were obtained this spring, cultured to a sexable size, and sex reversed to obtain "XY" females.

Researchers at the Central Laboratory for Aquaculture Research in Abbassa, Egypt participated in the 1993 clinical field trials under U.S. FDA INAD 8479 C-002 and C-003 to collect efficacy and safety data in support of preparation of a New Animal Drug Application. Twenty-six reproduction pond harvests have yielded approximately 280,000 newly-hatched fry. Handling mortality during harvest and stocking was about 10%; survival during sex-reversal trials was about 48%. Efforts have been initiated to determine the cause of fry mortality.

A study to characterize the growth-promoting effects and sex-reversal effects of 17α-methyltestosterone (MT) on

Continued on p. 4



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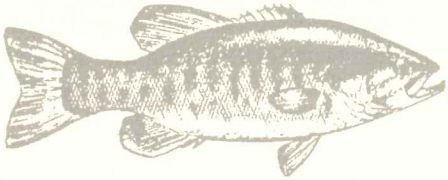
O. aureus and *O. mossambicus*, is underway at the Hawaii Institute of Marine Biology. In all treatments, *O. aureus* are significantly larger than *O. mossambicus*. *O. aureus* shows significantly better growth than *O. mossambicus* at higher doses (10 and 25 mg methyltestosterone/kg of feed) when compared with the control animals. However, the *O. aureus* brood stock are not reproducing, and efforts are underway to find the cause for this behavior.

At Oregon State University, experiments continue to determine the efficacy of immersion of tilapia fry in solutions containing 17α-methyltestosterone (MT) and 17α-ethynylestradiol. Fish from the first MT-immersion experiment were sampled and processed for histological examination of gonadal development. Water samples from the treatments were collected to analyze the residency of MT by High Performance Liquid Chromatography (HPLC). Efforts to develop methods of sperm collections for the cryopreservation of tilapia sperm are on-going.

SOCIAL SCIENCES PROJECT

Data from surveys conducted in Thailand and Philippines have been keypunched, edited and merged into a common format. Diagrams were developed to summarize the knowledge system for tilapia technology in each country, including the major institutional actors in the industry, the organization of private sector marketing and infrastructure and the role of the CRSP in this larger context. Economic information is being synthesized across the three project sites. Efforts will be made to utilize the economic module in the new DAST model POND.



MEETINGS

FishAsia '94 Exhibition & Conference, 26-29 Oct 1994, Singapore. Contact May Loo, ITP Services Pte Ltd., 2 Jurong East St. 21, #05-19/22, IMM Building, Singapore 2260. Phone (65) 291-3238; Fax (65) 296-5384.

NFI 49th Annual Conference, 2-5 Nov 1994, San Diego, CA USA. Contact Thayer Reback. Phone (703) 524-8882; Fax (703) 524-4619.

ExpoPESCSA'94, 30 Nov-3 Dec 1994, Santiago, Chile. Contact EMAP Heighway, Meed House, 21 John Street, London, WC1N 2BP, England. Phone (44) 71 404-5513; Fax (44) 71-831-9362.

PD/A CRSP Annual Meeting, 28-31 Jan 1995, San Diego, CA USA. Contact Naomi Weidner, Oregon State University, Snell Hall, Corvallis, OR 97331-1641 USA. Phone (503) 737-6417; Fax (503) 737-3447.

Aquaculture '95 Conference & Exposition, 1-4 Feb 1995, San Diego, CA USA. Contact Sea Fare Expositions, Inc., 850 NW 45th St., Seattle, WA 98107 USA. Phone (206) 547-6030; Fax (206) 548-9346.

Sustainable Aquaculture '95, 11-14 June 1995, Honolulu, HI USA. Contact Pacon Int'l, Box 11568, Honolulu, HI 96828 USA. Phone (808) 956-6163; Fax (808) 956-2580.

PROGRAM MANAGEMENT

The PMO participated in the CRSP Evaluation (see *From the Director's Desk*, p. 2). The review process for new CRSP book, *Dynamics of Pond Aquaculture,* was initiated this summer. Director Hillary Egna reviewed the Office of Technical Assessment Aquaculture Work Order and coordinated the revision of the Rwanda work plan. The PMO is actively involved in coordinating the Continuation Proposal for the PD/A CRSP, which will be presented to USAID this fall for funding of the CRSP through the year 2000.

AQUANEWS

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