Environment-friendly shrimp farming

NOTES ON THE PLANNING WORKSHOP
HELD 12-13 MAY 2000; ILOILO CITY, PHILIPPINES

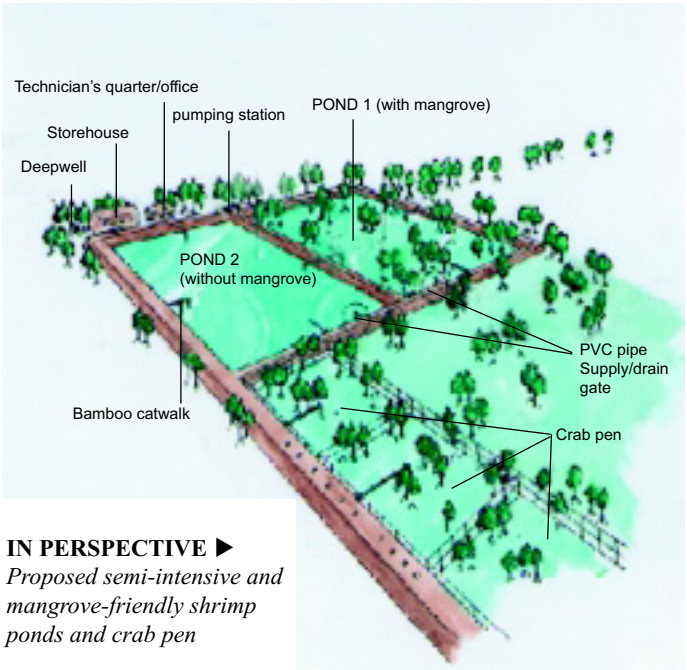
SEAFDEC convened the *Mangrove-Friendly Shrimp Culture Planning Workshop* at Days Hotel in Iloilo City from 12 to 13 May 2000. The planning workshop reviewed the status of mangrove-friendly shrimp culture technologies in Southeast Asia, and finalized the research, demonstration and extension components of the subproject on shrimp under SEAFDEC-ASEAN's Mangrove-friendly Aquaculture Program. The technologies developed by the project (with funding assistance from the Government of Japan) will be promoted within the ASEAN member-countries.

It was attended by 37 representatives from Vietnam, Thailand, the Philippines and as well as SEAFDEC officials and researchers.

A backgrounder

Southeast Asia holds more than a quarter of the world's 18 million hectares of mangroves. But human activities, including aquaculture, have put these mangroves at risk. In the last three decades, mangrove loss has ranged from 25% in Malaysia to 50% in Thailand. In the Philippines, only about 50,000 has remain from about 400,000 ha in the 1920s; most of the destruction have happened during the last 15 years because of conversion to ponds. Shrimp farming in particular has been perceived to be destructive to mangroves, to produce substances potentially harmful to marine organisms, and to send excessive organic load to downstream riverine and marine ecosystems during regular water change. This has raised concern among shrimp-producing countries including SEAFDEC member countries.

▲ **ON TRIAL**
The mangrove vegetation are left unharmed in this semi-intensive shrimp farm in Vietnam



IN PERSPECTIVE ▶
Proposed semi-intensive and mangrove-friendly shrimp ponds and crab pen

This prompted SEAFDEC to launch a *Mangrove-Friendly Aquaculture Program*. Under this program is an environment-friendly shrimp culture project (see box next page). The Philippine-based Aquaculture Department (AQD) of SEAFDEC has been designated as the lead institution for technology development and verification, and Thailand the coordinating country for promoting the technology within ASEAN. The shrimp project is funded by the Japanese Trust Fund. Collaborators include Thailand's Department of Fisheries and Vietnam's Research Institute for Marine Products.

Mr. Damrong Silpachai
SEAFDEC's program and policy coordinator

Dr. Jurgenne Primavera
AQD Senior Scientist

Mr. Siri Tookwinas
Department of Fisheries, Thailand

ASEAN/SEAFDEC Project on the Development of Mangrove-Friendly Shrimp Culture Technology (1998-2002)

The project's primary objective is to develop sustainable shrimp culture technology packages. It also aims to disseminate these techno-packages through actual demonstration and training; prepare position papers that can be used to shape policies to encourage the adoption of responsible shrimp culture techniques; and launch a multi-media information campaign to make the international market aware of the "green" culture technology being pursued by SEAFDEC member-countries.

The project will pursue research and verification runs side-by-side. For the research component, studies will be conducted on nutrient cycles, capacity of mangroves to absorb nutrients, the "greenwater" technology (microbial and phyto flora), and probiotics or bioaugmentation.

The verification runs, on the other hand, will determine whether techniques known to be successful in a particular country or area can be adopted in other countries or locations. One of these techniques is the use of mangrove irrigation and recirculating systems for intensive culture. Another is the use of bio-filtering organisms like tilapia in semi-intensive culture. Economic analyses will be made.

Dissemination of technology developed can take many forms, such as: technical papers for scientific journals; popular articles in newspapers and magazines; position papers; website on the internet; video-documentaries; and training. A hands-on manual on sustainable shrimp farming system will later be translated to Thai, Malay, Vietnamese, and Filipino.

The project sites are in the Philippines (semi-intensive and intensive); Thailand (intensive shrimp grow-out); and Vietnam (semi-intensive).

Dr. Rolando Platon
SEAFDEC/AQD Chief

Mr. Fred Yap
Aquaculture expert, AQD

Mr. Dan Baliao
Aquaculture expert, AQD

Review of available technologies in Southeast Asia

The first session of the planning workshop dealt with the review of available shrimp farming technologies. The resource speakers included Dr. Jurgenne Primavera (AQD's mangrove expert), Mr. Dan Baliao (head of AQD's technology verification program), Mr. Siri Tookwinas (director of the Thai government's shrimp research institute).

*Extensive shrimp culture system***.** Dr. Primavera described two models -- (1) the low-density culture of fish, shrimps, crabs integrated with mangroves; and (2) the use of mangroves to process effluents from high-density aquaculture ponds. The first model can give substantial profit to poor families; for instance, more than US$300 per crab pen of size >150 m^2 per month in Malaysia, about a Rp 1 million per ha of milkfish-shrimp pond per year in Indonesia, over P55,000 per crab pen of size 4,000 m^2 per year in the Philippines, or about US$250 per ha of shrimp pond in Vietnam. Mangroves, usually nipa, are also harvested and sold.

The second model is under study by AQD.

Semi-intensive systems. Mr. Baliao described the current improvements to the semi-intensive systems as follows: use of reservoirs, use of greenwater, and use of probiotics. He noted that the reservoir pond is set aside from the existing grow-out ponds. This reservoir has netcages where biomanipulators (tilapia, milkfish, siganids, for example) are stocked.

He said that researchers theorize that biomanipulators, especially tilapia, can directly help shrimp when the fishes produce enzymes or slime that inhibit the growth of luminous bac-

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teria. In addition, these fishes feed on the plankton that bloom with increased nutrient input in ponds, indirectly reducing organic load.

Baliao also noted that the grow-out ponds are stocked with biomanipulators, too. These ponds also have long-arm paddle wheels that continuously drive the water towards the netcages where sludge collectors are installed. The shrimp farm has independent supply and drain gate or canal system so that incoming and outgoing water do not mix. The farm only partially discharges water to the surrounding environment.

The test sites for the semi-intensive system are in the Philippines -- AQD's Dumangas Brackishwater Station in Iloilo and the government ponds in Pagbilao, Quezon; Cadiz, Negros; Calape, Bohol; and in Lala, Lanao del Norte -- and in Phu Long, Cat Ba island, northern Vietnam.

The Vietnam site (see the diagram on page 6) tests the same set-up as the Philippine sites except that there are mangroves in one pond and the culture of mud crab is integrated in the farm. The mangrove species is mostly *Kandelia candel*, widespread in northern Vietnam.

Intensive system. Mr. Siri Tookwinas talked about Thailand's R&D efforts in making the shrimp intensive system sustainable. He said that many experiments for the treatment of effluents have been conducted, and that the closed system (or water recycling system) has been successfully tested. The set-up is very similar to semi-intensive -- the use of air paddle wheels for surface aeration and air compressor line for bottom aeration of shrimp pond; pumping of shrimp water to a treatment pond where biofilters are kept; and pumping of the cleaned-up water from a sandfilter in the treatment pond back to the shrimp pond. The biofilter or clean-up organisms are algae and tilapia, with seabass thrown in to control tilapia population.

Project workplan

The second session of the workshop discussed the progress already made in research and verification runs. AQD's Nelson Golez presented his results on nutrient cycles (phase 1 in tanks has been completed; phase 2 in ponds is ongoing); Ms. Teresa Mallare, the results of the probiotics study in tanks (a pond study is planned); and Dr. Primavera, the study on the capacity of mangroves to absorb nutrients. Technology verification activities in the Philippines, Thailand, and Vietnam (presented by Dr. Varin Tanasomwang of DOF-Thailand)

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Trial site in Songkhla, Thailand: a pond with bottom air diffusers ▶

Dr. Varin Tanasomwang
Government of Thailand

Dr. Le Xan
Government of Vietnam

Ms. Kwanruethai Thanomkiat, *Thailand*

Mr. Nelson Golez
SEAFDEC/AQD

▲ *Trial site in Chachaengsao, Thailand: young mangroves and brackishwater weeds are maintained in a pond*

◀ *Workshop participants pose for a souvenir photo*

People in aquaculture ... from page 13

Dr. Nadala, it was originally used in pregnancy tests because of convenience and almost instantaneous results. But over time, it became an ideal testing detection particularly for sexually transmitted diseases (STDs).

Dr. Nadala was previously involved in the surveillance study of the White Spot Syndrome Virus (WSSV) while he was still at the University of Hawaii together with Dr. Philip Loh. The study was in collaboration with the National Institute of Biotechnology, University of the Philippines at Los Baños, the University of Tsukuba and the Bureau of Fisheries and Aquatic Resources (BFAR). - *APS*

AQD scientific publications ... from page 5

Spawning salinity or previous rearing salinity was 32 ppt, except for Z5 which were previously reared at 26 ppt. The mean median lethal time or LT50 values were compared between salinities. for Z1 and Z2, highest values were obtained at 20-32 ppt. Z3 had highest LT50 values at 20-24 ppt and Z4 at 24-32 ppt. For Z5, highest LT50 values were obtained at 20-32 ppt. Another batch of Z3 and Z4 were subjected to the same abrupt salinity transfers and reared to the megalopa stage. Significantly higher percentages of larvae metamorphosed to the megalopa stage at salinities of 20-28 ppt when transfer to test salinities was at Z3. When transfer was at Z4 or Z5, the highest percentage of larvae moulted to the megalopa stage at 24-28 ppt or at 28 ppt. respectively.

Quinitio ET, Parado-Estepa F, Alava V. 1999. Development of hatchery techniques for the mud crab *Scylla serrata* Forskal): Comparison of feeding scheme. In: Keenan CP, Blackshaw A (eds.) Mud Crab Aquaculture and Biology: Proceedings of an International Scientific Forum, 21-24 April 1997. Darwin, Australia. ACIA Proceedings no. 78; Canberra: Australian Center for International Agricultural Research. PP 125-130.

Abstract. Scylla serrata larvae were reared in 3 L plastic containers and fed various amounts of artificial diets (AD) with or without natural food (NF: *Brachionus rotundiformis* and newly-hatched *Artemia*). The amounts of AD fed alone to zoea in treatments (T) 1 to 4 were as follows: 1) 2.0 mg/L/day + 0.25 mg/L/day increment/substage; 2) 2.0 mg/L/day + 0.5 mg/L/day increment/ substate; 3) 4.0 mg/L/day + 0.5 mg/L/day increment/ substage; 4) 4.0 mg/L/day6 + 1.0 mg/L/day increment/substage. NF were given in addition to the respective amounts of artificial diet in T5, T6, T7 and T8. T9 served as the control (NF only). Based on three experimental runs, only larvae in T5, T6, and T9 survived until the megalopa stage. Thus, only these three treatments were compared in succeeding experiments using a commercial shrimp diet in 250 L fiberglass tanks. Of the three runs conducted using a commercial diet, two runs showed significant differences (P<005) in survival. T5 gave higher survival (3.71% and 1.33%) than T9 (1.84% and 0.45%) and T6 (1.37% and 0.45%). Population development index did not differ among treatments in three runs.

Triño AT, Millamena OM, Keenan CP. 1999. Monosex culture of the mud crab (*Scylla serrata*) at three stocking densities with *Gracilaria* as crab shelter. In: Keenan CP, Blackshaw A (eds.) Mud Crab Aquaculture and Biology: Proceedings of an International Scientific Forum. 21-24 April 1997; Darwin, Australia. ACIAR Proceedings no. 78; Canberra: Australian Center for International Agricultural Research: pp 61-66.

Abstract. The effects of three levels of stocking density (.5, 1.5 or 3.0/m^2) and monosex culture (male or female) on the growth survival and production of *Scylla serrata* were investigated. Juvenile crabs were stocked in 150 m^2 enclosures in earthen ponds with *Gracilaria* as shelter and fed a mixed diet o 75% fresh brown mussel flesh and 25% fish by catch. There was no interaction between stocking density levels and monosex culture (P<0.05) so the data were pooled for each sex or stocking density treatment. Results showed that highest survival was obtained from a stocking density of 0.5/m^2 (P<0.05). Crab growth at different stocking densities was not significantly different (P>0.05). Highest return or investment (ROI) and lowest production costs were attained from 0.5/m^2. Partial budgeting analysis showed that no net benefit accrued from stocking be beyond 1.5/m^2. Male crabs attained significantly better (P<0.05) final weight and specific growth rate than female crabs. Length, width, suvival and production between male and female crabs were not significantly different (P<0.05). Male and female monoculture gave high net revenue and ROI of more than 100 but male monoculture is more profitable. Overall the results suggest that the culture of male or female mud crabs at 0.5-1.5/m^2 with *Gracilaria* is economically viable.

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were also finalized. Likewise the training component and the plans for the production of instructional materials.

The workshop sessions were moderated by Mr. Damrong Silpachai of the SEAFDEC Secretariat in Thailand and by Mr. Wilfredo Yap, an AQD consultant. The AQD Chief, Dr. Rolando Platon, summarized the workshop recommendations. ###