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Red snapper: an emerging culture in the Philippines



It has long been a favorite of Asians. It is tasty, as fresh as the live reef foodfish trade can make it, and the story is familiar: declining catch from the wild led to an interest in its aquaculture. In central Philippines, self-acclaimed seafood capital of the country, at least four fish farmers are trying out red snapper culture in backyard sea cages and ponds. One farmer says fish growth is good but he worries about the market (red snapper is an expensive fish, and, being carnivorous, more expensive to raise, too). Added to that is the problem of sourcing seedstock although there are already experimental multi-species hatcheries, including SEAFDEC/AQD's. **FULL STORY ON PAGE 28**

SEAFDEC and ASEAN on INTEGRATED REGIONAL
AQUACULTURE PROGRAM, starts on page 3

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SEAFDEC/AQD, Tigbauan 5021, Iloilo, Philippines

TESTIMONIAL

Dr. I-Chiu Liao of Taiwan and SEAFDEC/AQD's early history

By Teodora Bagarinao, PhD
Senior Scientist, SEAFDEC/AQD

Dr. I-Chiu Liao, world-renowned aquaculture scientist, made a sentimental journey all the way from Keelung, Taiwan to Tigbauan, Iloilo, Philippines just to see his old friends at the SEAFDEC Aquaculture Department (AQD) on 28-31 July. Dr. Liao had recently retired from the Taiwan Fisheries Research Institute, after 34 years of dedicated and outstanding service, as Director General since 1987, and before that, as Director of the Tungkang Marine Laboratory (TML, a TFRI branch) since 1968. Dr. Liao was born in Tokyo on 4 Nov 1936 to a Taiwanese father and Japanese mother, grew up and went to school in Taiwan, and obtained his MSc and PhD from the University of Tokyo. He worked as a postdoctoral fellow at the Kuruma-ebi Research Institute with Dr. Motosaku Hudinaga, acclaimed as the 'Father of Shrimp Farming' for having developed hatchery techniques for *Penaeus japonicus*. Check out their photo together on page 11 of the June 2002 issue of *Global Aquaculture Advocate*; Dr. Liao looks so dashing!

I-Chiu Liao is best known around the world for his work on the tiger shrimp *Penaeus monodon* starting in 1968 when he established TML from "nothing more than a beach." His research sparked the rapid development of the tiger shrimp industry in Taiwan, and we all know what happened from there. Aside from tiger shrimp, TML under Dr. Liao did research on several other species in the 1970s – on milkfish *Chanos chanos*, the mullet *Mugil cephalus*, the prawn *Macrobrachium rosenbergii*, the shrimp *P. japonicus*, and the eel *Anguilla japonica*. Dr. Liao's early papers on tiger shrimp (1969), adult milkfish (1971), milkfish fry (1977), and other topics were in Chinese with English abstracts. For details of Dr. Liao's scientific career, see *Journal of Fisheries Society of Taiwan* (volume 29, number 1, pages i-iv, 2002), *Global Aquaculture Advocate* (vol. 5, no. 3, pp 10-13, 2002), and the book *Post-Retirement Careers in Fisheries and Aquaculture*, edited by Michael New and Dr. Liao (2002). ☞ page 2



JV Juario, M Duray, H Nakajima, P Buri, GF Qunitio and others in the milkfish team, AQD Tigbauan, 1978



M Duray, P Buri, GF Qunitio with Dr. Liao, NH Chao, in Tungkan, 1979

In the best tradition of scientific research and exchange, the SEAFDEC Aquaculture Department and Dr. Liao were fated to come together. When SEAFDEC established AQD in 1973, the Council decided to make tiger shrimp the main R&D focus and appointed Dean Domiciano K. Villaluz of the Mindanao State University the first AQD Chief in recognition of his track record in shrimp research. In 1938, DK Villaluz and FJ Arriola published a paper on *Penaeus* taxonomy in *Philippine Journal of Science* (vol. 66, pp 35-41). In 1950, at the Second Meeting of the Indo-Pacific Fisheries Council in Sydney, DV Villadolid and DK Villaluz presented the paper "The cultivation of sugpo *Penaeus monodon* Fabricius in the Philippines." Dean Villaluz was working on the artificial propagation of tiger shrimp at the MSU-Naawan campus at about the same time that Dr. Liao was doing the same at TML. The paper of Villaluz et al. (1969) "Reproduction, larval development, and cultivation of sugpo *Penaeus monodon* Fabricius" appeared in *Philippine Journal of Science* (vol. 98, pp 205-233). Thus it was that from the very start, AQD promoted tiger shrimp hatchery and grow-out through research, training, and extension, including the conduct of the First (1983) and the Second (1996) International Conferences on Penaeid Prawns/Shrimps. DK Villaluz bannered the AQD effort on tiger shrimp until his retirement in 1979 and his lieutenants then are now the AQD leaders: RR Platon (AQD Chief), WG Yap (Head of Technology Verification and Commercialization), PL Torres Jr. (Head of Training and Information), JH Primavera (Head of Farming Systems and Ecology), and AC Villaluz (consultant). JH Primavera visited TML in 1977 and indeed she was at the top of Dr. Liao's list of friends to see during his visit.

The Philippines (in terms of total volume) and Taiwan (in terms of yield per unit area) have been the leading producers of milkfish long before tiger shrimp became fashionable. In 1975, SEAFDEC AQD started its research program on milkfish and co-hosted the National *Bangus* Symposium to determine the research and technology gaps. AQD's Milkfish Program was funded by the International Development Research Centre of Canada. AQD conducted surveys to understand the life history of milkfish in the wild, and started projects to first capture and spawn wild *sabalo*, and later raise and spawn captive broodstocks, in order to produce milkfish fry in the hatchery. The artificial propagation project was led by Canadian WE Vanstone and was based at AQD's Pandan Station. In May 1976, AQD held the International Milkfish Workshop-Conference in Tigbauan. Among the many papers presented, Vanstone, LB Tiro, and AC Villaluz reported on the capture, transport, do-

mestication, and spawning (without fertilization) of wild adults;

Dr. Liao and YS Chang on the gonadal development in milkfish broodstock raised in concrete tanks in Tungkan, and CE Nash and CM Kuo on the capture, husbandry, and induced breeding of milkfish in Hawaii.

In April 1977, Vanstone's group captured gravid male and female milkfish from Hamtik, stripped them, incubated the eggs, reared the larvae (12 fingerlings were alive on day 74), and photographed morphological

development along the way. In May 1977, another AQD group, led by H Chaudhuri, JV Juario, and JH Primavera working at Tigbauan Main Station, also spawned wild milkfish and reared the larvae to day 6. The Tigbauan team published their results as Chaudhuri et al. (1978) in *Aquaculture* 13: 95-113 and thus made the information widely accessible.

Meanwhile, the ecology project led by JICA Experts S Kumagai and T Senta successfully gathered data on the milkfish life stages found in different habitats and they also reported their results at the 1976 milkfish conference. A parallel ecology project led by JICA Expert H Motoh also worked out the ecology and life history of tiger shrimp and other penaeids in the Philippines. Kumagai shared an office with Dr. JV Juario, who had become the leader of the milkfish breeding team in 1977. Dr. Juario recruited me, fresh out of Pre-Med, to join Kumagai's ecology project in Jan 1978. At the time, AQD also hired Prasit Buri, a German-Thai ecologist who had an incredible talent in scientific illustration. Kumagai was very interested not only in the ecology but also in the artificial propagation of milkfish, having bred a variety of fish at the Kagawa Aquarium. He worked with the Vanstone group in spawning and rearing milkfish in Pandan in 1977.

In May-July 1978, Dr. Liao came to AQD to work with the milkfish breeding team, at that time composed of Juario, M Natividad, JM Almendras, VM Duray, and JF Nacario. Dr. Liao had just then met Dr. Juario and his team, but he had become friends with Kumagai during the 1976 milkfish conference. Another JICA expert, H Nakajima, was at the time engaged in natural food production for the larval rearing of tiger shrimp. Liao, Kumagai, and Nakajima, all wearing their trademark hand towels from the belt, had long discussions about milkfish spawning and larval rearing (I guess!), in Nihongo, during and after 8-5, more often in the hot hallways and hatchery than in the cool office. Dr. Liao was handsome and always smiling, but he was very serious on the job and for him, there was only one way to finish everything—successfully. He went for days with only 2-3 hours of sleep a night, many times on a folding bed in the lab, with nary a dent in the energy level nor the wide smile. Juario, Kumagai, Buri, Nakajima, Duray, and everyone on the milkfish breeding team could not but do the same.

Thus I witnessed a tremendous hustle and bustle that summer of '78. Gravid male and female milkfish were caught in the Buyuan fish corral on 22 May and were induced to spawn the next day. About 36,000 larvae hatched and larval development and behavior were carefully monitored, described, and illustrated (by Prasit). A larval rearing protocol was developed and about 2,670 fry were produced at day 21. This breakthrough at the

SEAFDEC and ASEAN jointly address poverty alleviation through aquaculture

Representatives from nine countries convene in Bangkok mid-September to work out SEAFDEC-ASEAN's integrated regional aquaculture program



SEAFDEC Secretary-General Mr. Panu Tavarutmaneegul (right) and SEAFDEC/AQD Chief Dr. Rolando Platon preside over the discussion on poverty alleviation through aquaculture in the region

SEAFDEC and ASEAN have jointly pooled their resources to address food security and alleviate poverty in the rural areas through aquaculture.

Member countries of the two organizations are now preparing for the implementation of the *Integrated Regional Aquaculture Program* (IRAP), the flagship aquaculture program component under the ASEAN-SEAFDEC Special Five-Year Program. Developed and coordinated by SEAFDEC/AQD, IRAP intends to promote sustainable aquaculture technologies specifically in the rural areas.

IRAP gave priority to two major areas to ensure sustainable development of aquaculture in the region, namely, aquaculture for rural development and supply of good quality seeds with Vietnam and Indonesia as Lead Countries, respectively. For smooth implementation of IRAP, Technical and National Coordinators from each member country were named to take charge of the implementation and monitoring of the projects. AQD Chief serves as the Project Manager and will be assisted by the Head of the Technology Verification and Commercialization Division.

Following the National Coordinators' Meeting in Thailand last June, a four-day seminar-workshop was conducted at the KU

Home, also in Bangkok, Thailand last September 17-20 to discuss the aquaculture development in the region (see succeeding pages) and assess the needs of the ASEAN member countries for specific aquaculture technologies.

National and technical coordinators from member countries who participated were from Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Thailand, and Vietnam. AQD officials who shared the status of AQD's research and development program joined them. Each country came up with their respective project proposals deemed as their country's utmost concern (see page 7 for tabulated summary).

In order to promote collaboration with other regional agencies, a Regional Donor Consultation Meeting was jointly organized by FAO (Food and Agriculture Organization), NACA (Network of Aquaculture and Coordinating Agency), SEAFDEC/AQD, and ICLARM (International Council for Living Aquatic Resources and Management); pages 10-11, this issue. Collaboration with other agencies will significantly reduce the national budget requirement of IRAP, otherwise, the participating country, may assume most of the cost to implement the project. Meanwhile, the core budget is being provided by ASEAN Foundation through SEAFDEC.

- ET Aldon

COUNTRY SUMMARIES

Aquaculture development in ASEAN

BRUNEI DARUSSALAM

Aquaculture in Brunei Darussalam is a relatively new industry. Freshwater culture was first tried in 1960, but this developed slowly because of low preference of the people for freshwater fishes. Culture of marine species started only in 1980.

With the all out support of the government, pond culture of shrimp is now a leading industry with a potential to contribute 35% of the total value of the fishery industry. Seed production of fish and shrimp fry constrains the industry from further development.

CAMBODIA

The rich water resource of Cambodia particularly the Mekong, Tonle Sap and Bassac Rivers and a number of lakes makes the country ideal for aquaculture. With little or no opportunity to enhance the declining production from capture fisheries, aquaculture is seen to fill the gap between supply and demand. The Government of Cambodia has been doing measures to address food security in the country, among them promoting aquaculture in the rural areas. The low input rice-fish integrated farming is the country's way to generate income and increase total fish production.

Cage culture is the dominant culture system. Cages are made of locally available bamboo and wood. Small and medium sized cages are common while the relatively large, boat-shaped ones have a built-in house of the owner/operator. These floating households though tend to crowd along the riverside. Fish are towed to the live fish landing at Phnom Penh.

The major culture species are *Pangasius hypothalamus* and *Channa microleptes*. Feeds used are mostly trashfish caught during the open season and plant sources such as rice bran, broken rice, morning glory, and other aquatic plants.

Pond culture, which is the least developed, is found around Phnom Penh and Kandal Province. Ponds range from 300-1,500 m².

Coastal aquaculture was only considered in 1988 when shrimp showed promising export potential. There are approximately 10,000 to 50,000 ha of land available for shrimp farming in the coastal zone. Intensive shrimp farming was introduced by Thailand in 1991 and now covers 950 ha producing 560 tons per yr.

Aquaculture development in Cambodia is constrained by lack of seed supply, efficient extension services and experts, among others.

INDONESIA

Indonesia, being archipelagic, has a great potential for aquaculture development. To promote aquaculture, the government implemented Act No. 22/1999 establishing four centers each for freshwater, brackishwater, and marine culture all over the country.

The common species raised in Indonesia include common carp, Nile tilapia, catfish, giant gouramy and some other species. Marine and brackishwater aquaculture are generally for export especially the shrimp, grouper, seabass, pearl oyster, and seaweed. Milkfish are cultured extensively for tuna bait.

Paddy field aquaculture is a priority program of the government to increase farmer's income and supply of animal protein. Breeding and hybridization for freshwater aquaculture is now being developed for new strains that would suit local areas.

A national program is being introduced to intensify aquaculture development of four culture species: shrimp, grouper, seaweed and Nile tilapia. Local program is focused on locally available species.

Supply of seeds is considered a common problem of the country. Another problem that hinders aquaculture development is control of disease outbreaks.

LAO PDR

Aquaculture in Lao PDR is regarded as a potential industry that needs to be developed. It has about 202,000 km² of the total Mekong catchments. Aquaculture does not only address food security and generate employment but it also has an export potential. A more diversified and intensive farming is now in place, resulting to an additional 8% GDP attributed to the fishery sector. The main fish farming systems being practiced in the country are pond culture and integrated fish-livestock farming.

Lao PDR did not have any hatchery until 1960 when the country got assistance from Vietnam and China. There are now 30 private and state owned hatcheries that are augmenting seed stock from the wild. Seed production and extension are major concerns of the country.

There is enormous potential for development in Lao PDR along the lines of multidisciplinary systems approach where the social, technical, economic and environmental factors are being recognized. Aquaculture management skills of the farmers also need to be upgraded.

MALAYSIA

Fisheries in Malaysia just like in other countries plays a significant role in providing employment and economic growth especially in the rural areas. It offers bright prospects for development and expansion to at least 38,000 ha from the current 18,000 ha in order to meet the target of 600,000 tons of fish.

Major aquaculture species include tilapia and giant prawn (freshwater); barramundi, red snapper, grouper and tiger shrimp (brackishwater). Further development, however, is constrained by lack of good quality seeds, high cost of production and disease control. Of late, limited resources is now included among the constraints since land and water resources have become a source of conflict with other users.

The Government of Malaysia through its Department of Fisheries has identified suitable sites for aquaculture to achieve the target production. Guidelines to the concept have already been introduced with the proposed zoning as a major step taken. The Environmental Impact Assessment (EIA) to standardize procedure to all aquaculture proposal will be applied. An integrated coastal zone management plan involving intersectoral approaches will also be formulated.

Constraints for development were identified as feeds, seed production especially on quality broodstock aspect and survival rate of fry/fingerling, and disease control.

MYANMAR

The climate and environment favor aquaculture for both freshwater and marine fishes in Myanmar. Indigenous species like carps, snakehead, catfish and featherback are the most popular cultured species. There is high demand for these species not only for local markets but also for foreign export.

Integrated agri-aqua farming is now being promoted by the Department of Fisheries. Coastal aquaculture, which is only

National and technical coordinators for the SEAFDEC-ASEAN IRAP who presented the progress of aquaculture in their respective countries:



Brunei Darussalam
Mrs. Hajah Haji Md. Yussof
Mrs. Noraini Haji Anggas



Cambodia
Mr. Chin Da
Mr. Hav Viseth
Mr. Mong Leng



Indonesia
Mr. Maskur
Dr. Ketut Sugama
Mr. Anto Sunaryanto

starting to develop, is being set up in line with the rural development program.

PHILIPPINES

The aquaculture sector in the Philippines is being regarded as crucial considering its potential to fill the gap of increased demand for aquatic products. Its further development will make it a dominant sector in fisheries. Aquaculture is expected to contribute 42% of the total fisheries production in 2004.

Aquaculture is classified into three major industry groups – the freshwater, brackishwater and mariculture or seafarming. Developed aquaculture technologies contribute significantly in the dramatic increase of milkfish and tilapia production. Establishment of hatcheries in the country will ensure a steady supply of fry/fingerlings.

The commercial hatchery production of the freshwater prawn *Macrobrachium rosenbergii*, which started in 2001, will diversify and expand freshwater aquaculture.

Further development, however, is constrained by factors like environmental degradation, seed production, natural calamities and weak implementation of fishery laws to regulate aquaculture activities.

The National Program has identified several aquaculture projects and areas for development where it could focus and address problems that may affect its implementation.

SINGAPORE

Singapore has very little land for agriculture but has optimized land use by developing agrotechnology parks to house modern intensive farms that can produce both freshwater and brackishwater food and ornamental fishes. Mariculture activities are done in floating netcages along East and West Johor Straits.

The Government of Singapore provides adequate legal and administrative framework on the establishment of both sea and land-based farms enjoining fish

☞ next page

farmers to be responsible aquaculture managers.

Aquaculture production contributes less than 4% of the fish supply with the main bulk coming from coastal farming. There are 89 marine fish farms in 57.5 ha of sea space culturing seabass, milkfish, snappers and others in smaller quantities.

Freshwater aquaculture is mainly ornamental fish in ponds and in tanks. There are about 100 ornamental fish farms in agrotechnology parks where produce is intended for export. Ornamental fish export industry made Singapore one of the major ornamental fish exporters supplying countries like United Kingdom, USA, Japan, Germany and many others.

The high production cost, however, makes local hatcheries less competitive. The lack of suitable food organisms for feed of ornamental fish at various stages of development remains a constraint for further development.

THAILAND

Aquaculture in Thailand is well developed. In fact, aquaculture has been instrumental to the annual increase of 7% of the country's economy. The important contribution of fisheries and aquaculture is considered an integral part of the overall National Economic and Social Development Plan.

Inland aquaculture has long been practiced in Thailand with various degrees of success. There are about 27 cultured species in more than 60,000 inland farms which make up 95% of pond and paddy-field type culture systems.

The implementation of the project of the Royal Thai Government called the Village Fish Pond Development Program (VFP) has immensely benefitted rural communities. Started in 1978 as a pilot project in 14 villages of 12 provinces, the VFP has extended to 75 provinces. Under the VFP, DOF is implementing the pilot project in 12 schools with school children participating for them to eventually learn to be self-reliant. Thailand now has 20,096 fishponds all over the country and still expanding.



Lao PDR

Mr. Somphanh Chanphengxay
Mr. Chanthaboune Sirimanothame
Mr. Bounthong Saphakdy



Philippines

Mr. Westly Rosario
Mr. Rafael Ramiscal



Malaysia

Mr. Salehan Bin Lamin
Mr. Abdul Hamid Abdul Shukor
Ms. Thalathia Bte. Saidin



Vietnam

Ms. Nguyen Thi Phuong Lam
Dr. Vu Van Trieu
Dr. Pham Anh Tuan



Myanmar
Mr. U Myint Pe



Singapore
Mr. Hanif Loo
Jang Jing



Thailand
Dr. Cherdasak Virapat
Dr. Choomjet
Karnjanakesorn

VIETNAM

Aquaculture is an important industry in Vietnam with export value of about 50% of the total fishery production. It has also the potential to generate more jobs and income, thus can alleviate poverty especially in the rural areas. There's so much for the Government of Vietnam to do to further

develop its aquaculture potential especially in the rural areas. Potential species include catfish, carp and tilapia for freshwater; black kingfish, grouper, sea bass, and sea bream for marine aquaculture. Other species are molluscs, seaweeds and crustaceans like shrimps, crabs and lobsters.

The need for technical assistance and training of staff on latest culture techniques and seed production is an immediate concern of Vietnam.



Among the meeting's discussants are (above, from left to right) -- NACA Director-General Pedro Bueno, IRAP National Coordinator for Thailand Somsak Chullasorn; FAO/RAP Aquaculture Officer Simon Funge-Smith; AQD delegation composed of training-information head Pastor Torres Jr; technology verification head Wilfredo Yap, research head Dr. Clarissa Marte, and scientist Dr. Zubaida Basiao.

The meeting participants ►



| Country | Identified priority for SEAFDEC-ASEAN IRAP area | Recommendation |
|-------------|---|---|
| Brunei | Grow-out of freshwater prawn <i>Macrobrachium rosenbergii</i> Seed production of mudcrab, <i>M. rosenbergii</i> and ornamental fish | Needs on-site training and technology verification on <i>M. rosenbergii</i> |
| Cambodia | Aquaculture for rural development Polyculture of indigenous species (<i>Pangasius hypothalamus</i> , tilapia, carp) Good quality seeds | Needs technical assistance due to limited knowledge |
| Indonesia | Rural development (catfish) Genetic improvement of <i>Macrobrachium</i> | |
| Lao PDR | Aquaculture for rural development | |
| Malaysia | Quality broodstock management | |
| Thailand | Aquaculture for rural development | School program may serve as model to other countries |
| Philippines | Aquaculture for rural development (<i>M. rosenbergii</i>) Seed production of <i>M. rosenbergii</i> | |
| Vietnam | Training on milkfish / siganid seed production, including component on broodstock management | |

A FISH FARM IN THAILAND To be bigger and better

The **King Giant Siamese Fish Farm** (photos this page) is found on the Klong Luang District. A variety of ornamental fishes and plants is being raised there. The Thai government supports the industry through its Institute of Ornamental Fish and Aquatic Plants, also found in Klong Luang in Pathum Thani Province.



The crowd of visitors are participants of the SEAFDEC-ASEAN meeting on the integrated regional aquaculture program



PHOTOS COURTESY OF VT SULIT

Meanwhile, the WAT-PHO-PRASIT SCHOOL in Maharat District in Ayudhaya Province has been the beneficiary of Thailand's Department of Fisheries extension programs. The school curriculum includes fish culture where children are taught fishfarming. Schoolchildren can demonstrate the small-scale production of feeds using locally available ingredients. The feed costs about 2 baht compared to a commercial one which can cost 20 baht.

Thai students prepare feeds using local ingredients, and their school fishpond



PHOTOS COURTESY OF VT SULIT

DR. I-CHIU LIAO FROM PAGE 2

SEAFDEC Aquaculture Department was promptly written up and published as Liao et al. (1979) in *Aquaculture* 18:75-93 and marked the official birth of the milkfish hatchery technology.

Dr. Liao came back to AQD, together with NH Chao, TI Chen, and SF Liu of TML, during the 1979 milkfish spawning season and went to work at the Pandan Station. Dr. Ching-Ming Kuo of the Oceanic Institute (OI in Honolulu), then working on mullet and milkfish, also visited AQD that season and worked with Dr. Juario at Tigbauan Main Station. But no gravid milkfish were caught that year, and no spawning and larval rearing trials could be made at either station. Kumagai's ecology team was then based in Pandan while conducting plankton surveys at the milkfish spawning ground near Batbatan Island. I saw Dr. Liao and the others at meal times and he always encouraged me to eat garlic for my health. (Indeed, Dr. Liao and Dr. Chao eat and live healthy, and they look great to this day!)

Thus started the informal collaboration between SEAFDEC AQD, TML, and OI for the artificial propagation of milkfish and other marine fishes. In late 1979, Dr. Juario, M Natividad, P Buri, GF Quintio, and H Sitoy spent a few months at TML to work with Dr. Liao on mullet seed production. The next year, Dr. Juario, M Natividad, and J Banno also worked for a few months with CM Kuo at OI. Induced spawning protocols for milkfish continued to be the focus of OI research for several years under Dr. Cheng-Sheng Lee. But at AQD, the focus changed in 1980 when FJ Lacanilao and CL Marte documented the first ever spontaneous spawning of milkfish broodstocks in the floating cages at Igang Station. In Taiwan, farmers (private sector) started growing milkfish broodstocks in big ponds and spontaneous spawning of milkfish in ponds was first documented by farmer LT Lin in 1985.

Fast forward to Nice, France, May 2000 – I met Dr. Liao and Dr. Chao at the World Aquaculture Society meeting. I was pleasantly surprised that they remembered me after 20 years. Indeed, they have such good memory for people and are disarmingly friendly and attentive. Fame precedes them, everybody knows them – from some meeting, cross visit, collaboration, or training course. Dr. Liao told me that the next Asian

Fisheries Forum was to be held in Kaohsiung, Taiwan on 25-30 Nov 2001 and I was to make sure I presented a paper there. And so I did. As outgoing President of the Asian Fisheries Society and host of the Kaohsiung Forum, Dr. Liao was extremely busy and stressed out, but he was gracious and attentive as ever. He later passed the torch to SEAFDEC AQD Scientist Clarissa Marte, the new AFS President. He arranged for me to visit TFRI's Penghu Branch and Aquarium, in line with my current work at SEAFDEC FishWorld.

During his recent visit to SEAFDEC AQD, Dr. Liao met with Dr. Yasuo Inui, his dearest friend from his graduate student days at the University of Tokyo. Dr. Inui is a Visiting Scientist at AQD, in charge of the Fish Health Project under the Japanese Government Trust Fund. Aquaculture is indeed a small big world. Dr. Liao also met with Dawn Jamandre, daughter of a pioneering milkfish farmer in Iloilo, whose family now operates a broodstock and hatchery facility for tiger shrimp and milkfish. There are not many milkfish hatchery operators in the Philippines. During the past 20 years since the milkfish hatchery technology came out of SEAFDEC AQD, Filipino farmers had not adopted the technology and are still now asking AQD and the Philippine government to provide them broodstocks or eggs. In contrast, with typical Chinese initiative, private farmers in Taiwan quickly adapted the milkfish hatchery technology and have produced millions of fry for many years, some of them exported to the Philippines.

In 2002, I have become an old hand at SEAFDEC AQD and this article is as much a story for the young Filipino researchers at AQD as it is a tribute to Dr. Liao. I have learned how personally exciting and fulfilling scientific research can be, but that in the end, it matters even more that we pass on the knowledge and skills and they become part of people's lives. Dr. Liao set out to move Taiwan forward, particularly aquaculture, and he did, by doing good science, yes, but also by guiding institutions, students, and farmers. Dr. I-Chiu Liao is one of my career models and it is my great honor to be considered his student. ###

REGIONAL DONOR CONSULTATION

Support and networking on aquaculture for rural development

High-ranking officials of regional organizations working in aquaculture and aquatic resource management in Asia and the Pacific met with representatives of regional donor organizations from November 27 to 28 in Metro Manila and on November 29 in Iloilo.

The consultation was convened to discuss the role that aquaculture and aquatic resources management play in the rural and coastal livelihoods, and the regional requirements for its development. This would promote collaboration with other regional organizations in order to ensure sustainable development of aquaculture in the region, with emphasis on rural development.

Organizers of this consultation were Food and Agriculture Organization of the United Nations (FAO-UN), Southeast Asian Fisheries Development Center/Aquaculture Department (SEAFDEC/AQD), Network of Aquaculture Centers in Asia-Pacific (NACA), Mekong River Commission (MRC), and The WorldFish Center (formerly International Center for Living Aquatic Resources Management or ICLARM).

Regional donor organizations represented were the Australian Center for International Agricultural Research (ACIAR), Australian Agency for International Development (AusAID), Directorate General for International Cooperation (DGIC) of Belgium, European Union (EU), Deutsche Gesellschaft fuer Technische Zusammenarbeit (GTZ), Japan International Cooperation Agency (JICA), United States

Making their case are Asia-Pacific's program managers (left column, top to bottom): Dr. Paul Teng of The WorldFish Center, Dr. Rolando Platon of SEAFDEC/AQD, Dr. Sang Mu Lee of FAO, Pedro Bueno of NACA, and Jeanineke Kristensen of Mekong River Commission



Agency for International Development (USAID), United Nations Development Program (UNDP), Bureau of Fisheries and Aquatic Resources (BFAR) in the Philippines, and Norwegian Trade Council-Royal Norwegian Embassy in Manila.

The recent emphasis on the role of aquaculture and aquatic resources management in rural development was made in at least five initiatives:

(1) The third *Five-Year Work Programme of NACA* emphasizes rural development, ensures food security, enhances livelihood, and wisely manages aquatic resources. It also promotes healthy environment and aquatic animals, and improves manpower management and technical skills. It aims to set the stage for aquaculture in the region for the next 20 years and beyond.

(2) The *Bangkok Declaration and Strategy* emphasizes the need for the aquaculture sector to continue development towards its full potential. This would contribute to global food availability, domestic food security, economic growth, trade and improved living standards. The *Bangkok Declaration and Strategy* was adopted during the 2000 *FAO-NACA Conference on Aquaculture in the Third Millennium*.

(3) Establishment of the *FAO Subcommittee on Aquaculture* of the Committee on Fisheries in Beijing this year in recognition of aquaculture's increasing contribution to human development.

The donors' representatives listen and express support to the priorities (right column, top to bottom): Masahiko Takizawa of JICA, Dr. Luc Risch of the DGIC of Belgium, Lynn P. Perez of AusAID, Eduardo Niala of the Norwegian Trade Council, and Marc Nolting of GTZ



What's at stake:
 (1) the economic future of poor coastal towns like this fishing village in Parara Norte, Panay Island (left) which could benefit from small-scale aquaculture development; (2) the continuing operation of private fish farms like Huervana's in Leganes (upper right) and community-run initiatives like this mangrove pen culture in Zarraga (now supported by an EU grant) (middle right) which need new technologies to increase production; and (3) the completion of R&D projects like the work program of SEAFDEC/AQD on aquaculture (bottom right).

The donor representatives saw these for themselves when the meeting moved to Iloilo on the third day.



(4) The ASEAN Resolution on Fisheries and Food Security and the Plan of Action on sustainable Fisheries for Food Security. The ministers of ASEAN-SEAFDEC Member Countries who are responsible for fisheries adopted these during the recent Conference on Sustainable Fisheries for Food Security in the New Millennium.

(5) The recently concluded Fish for All Summit coordinated by The WorldFish Center envisions that all people be given the many benefits of wholesome food, livelihoods and environments that are based on fish and other aquatic life.

"It is perhaps paradoxical, that it is only now that we are beginning to realize the importance of the aquatic resources sector and small-scale aquaculture and even larger scale aquaculture on the livelihoods of rural people and the economies of rural areas," Dr. Simon Funge-Smith of FAO said during his presentation of the role of living aquatic resources and aquaculture in sustaining livelihoods of the rural people in Southeast Asia. "Whilst production increase was once a single focus, we are now realizing that it is a wide range of features that make these resources so critical to the livelihoods of the many people."

"This consultation is a first step in the process of increasing awareness of the crucial role that inland fisheries, aquatic resource management and aquaculture play in the region and an opportunity for the regional organizations involved to get feedback from the donor community," Dr. Smith added.

"Aquaculture is the wave of the future," former Department of Agriculture Secretary Leonardo Montemayor said. (His speech was read by AQD Chief Dr. Rolando Platon.) "It is our last resort and hope for increasing fish production to meet the demand of the growing population considering the fast dwindling of marine resources."

Improving aquaculture production requires knowledge of the carrying capacity of an ecosystem and environmental consequences of aquaculture operations. "It is therefore reassuring that groups like SEAFDEC continue to initiate projects and programs that push the frontiers of local aquaculture's development," the

former Secretary added. "The programs and projects spearheaded by SEAFDEC and DA-BFAR are all geared to hasten Philippine aquaculture's development and enable it to reach newer heights."

FAO Representative in the Philippines Dr. Sang Mu Lee gave more factual substance to the Philippine agriculture's stand, citing Asia's consumption of fish (about two-thirds of the world's total 94 million tons). This, Dr. Lee said, provides quality protein, calcium, vitamin A, omega-3 fatty acids, lysine and iodine; livelihood and vital employment opportunities; and cash income and foreign exchange.

"However, it is unfortunate that the sector's livelihood and national economic benefits are often hidden from view, overlooked by agricultural economists and marginalized by export-focused policies ... Yet the reality is that the contribution to national economies is undeniable, particularly for the poorest members of society who are reliant on the open resources of inland fisheries and small-scale aquaculture for household income generation," Dr. Lee concluded.

The Regional Donor Consultation Meeting has been considered by AQD as a forum for possible collaborative support for its Integrated Regional Aquaculture Program (IRAP) under the ASEAN-SEAFDEC Special Five-Year Program.

Madagascar nationals on study tour at AQD

Three Madagascar nationals participated in the study tour on methodologies in shrimp research at SEAFDEC/AQD's main station in Tigbauan, Iloilo, from September 7 until October 4. The study tour program was organized and designed by AQD, and funded by World Bank.

The three participants were Ms. Hanitra Ratsimbazafy, Mr. Mamy Nirina Rajaonarivelo, and Dean Dominique Randriamially, all staff members of the Faculty of Science of the University of Mahajanga, Madagascar.

The study tour program introduced concepts, principles and management of tiger shrimp culture in ponds; feeds and feeding; diseases; and hatchery operations and management. It also included current commercial production methods and practices in pond systems.

The participants were briefed on the current programs, activities, and research projects of AQD. They were also given opportunities to consult with scientists who have been or currently working on shrimps, to observe laboratory and field experiments, to view aquaculture videos, and to conduct library work.

Field trips to various commercial prawn farms in Iloilo, Negros, northern Panay, Cebu, and in Luzon were included to allow them to interact with shrimp farmers and managers and to observe the different shrimp culture systems and facilities in the Philippines.

Senator Magsaysay holds presscon

Senator Ramon Magsaysay and Congressman Alfredo Marañon of the Philippine Legislature gave a press conference on agriculture and fisheries modernization at SEAFDEC/AQD's Tigbauan Main Station on September 10. Both are chairpersons of the Committee on Agriculture and Fisheries Modernization in the Senate and Congress, respectively.

Senator Magsaysay emphasized the need for the government to attract young people into agribusiness by giving them necessary factors for production like land, labor, capital, and farm management technologies. "No matter how much money you have, production would still be low if you have poor management," Senator Magsaysay said. "We (the government) want agriculture to be globally competitive through sound management practices," he added.

In his turn, Congressman Marañon brought home the point that "(Filipinos) should not strive to be number 1 but the only one," with respect to agricultural production.

Also present at the presscon were high-ranking personnel of government agencies, such as Department of Agrarian Reform (DAR) and Department of Agriculture (DA). Afterwards, the guests were toured to AQD facilities where Ms. Grace Garcia and Dr. Wenresti Gallardo ex-



plained the developed technologies and current activities and researches on seahorses and mollusk (top shells and abalone), respectively. "Very good, very good," Senator Magsaysay exclaimed.

Verifying the mangrove-friendly shrimp technology

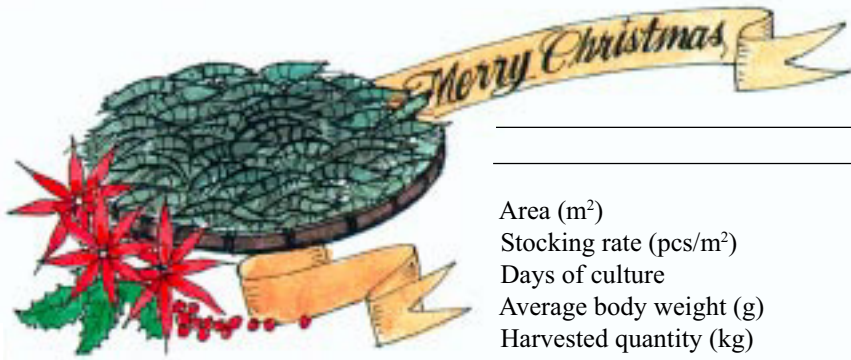
What are the activities on tiger shrimp of the Joint Mission for Accelerated Nationwide Technology Transfer Program (JMANTTP), the collaborative effort of SEAFDEC/AQD and the Philippines' Bureau of Fisheries and Aquatic Resources (BFAR)? Read on.

(1) Third field tests of the environment-friendly shrimp culture schemes at the BFAR demonstration centers in Butong (Taal, Batangas), Pacita (Lala, Lanao del Norte), and AQD's Dumangas Brackishwater. Stocking densities of 15 and 5 shrimp per m² are tested.

(2) Direct technology transfer projects for the same technology (but at stocking density of 20 shrimps per m²) in Nasugbu, Batangas and Banate, Iloilo. AQD technicians were deployed in their farms on a full-time basis to train farm personnel. See related story.

Two other shrimp farms – in Silay City and Ozamiz City – have indicated their interest, and the sites are being evaluated.

(3) Information dissemination for the same technology through lectures for BFAR staff in Laguna and in San Jose, Mindoro. An extension manual will be packaged after the conclusion of the techno-demo runs.



For some shrimp farmers, christmas

is early and they thank AQD

Two private operators got a hefty early Christmas gift from AQD's direct techno-transfer program. Antonio Campos of Banate, Iloilo and Albertito Siochi of Nasugbo, Batangas respectively, earned a net profit of about P800,000 and P1,400,000 from adopting AQD's environment-friendly shrimp farming technology. These were realized from 0.7 and 1.0 hectare farms in just 118 days of culture.

"I am sending you this letter in recognition and deep appreciation of your efforts in technology transfer of viable aquaculture technologies nationwide," Campos wrote AQD Chief Dr. Rolando Platon after the harvest. He thanked the AQD's technology verification staff fielded in his farm for introducing new technology. "I salute them. *Iba talaga sila magtrabaho*," Campos added. Campos' farm, like Siochi's, have been idle since 1996 following disease outbreaks until AQD came along. He had asked for AQD's assistance sometime in April after hearing of the successes of field trials conducted by AQD and BFAR.

Likewise Siochi who later wrote "my family and I would like to extend our heartfelt thanks to you and your TVS staff for having demonstrated with great success the environment-friendly schemes in shrimp farming in my farm ... How we wish you will never get exhausted in helping (to revive) the aquaculture industry."

The technology used in the two farms is the environment-friendly shrimp farming scheme, which has been proven capable of controlling luminous bacteria and resulting to a fast-growing, high quality (large, head-on preferred by the export market) shrimp with high survival. The harvest results are shown in the table above.

In related development, a graduate of AQD's *Skills Development Session* on sustainable shrimp farming expressed similar appreciation as the beneficiaries of the direct techno-transfer program. Marlito Uy, general manager of Marcela Farms in Tagbilaran City, Bohol wrote to the AQD Chief on October 10 to say: "... before the conduct of *Skills Development Session* last December 5-7, 2001 in Tagbilaran, we were beset by luminous bacteria which greatly reduced our production and severely affected our processing plant and feed mill. We had tested all available technology yet to no avail. We, on the other hand, could not quit for we had already poured in big investment and a lot of labor and allied industries in our region would likewise be affected ..."

Uy continued on to say that the technology AQD imparted has greatly improved their production. The use of biomanipulators

| | Campos farm | Siochi farm | | |
|-------------------------------------|-------------|-------------|------------|------------|
| | Pond 1 | Pond 1 | Pond 2 | Pond 3 |
| Area (m ²) | 7,000 | 3,000 | 3,000 | 4,000 |
| Stocking rate (pcs/m ²) | 15 | 25 | 25 | 25 |
| Days of culture | 110 | 117 | 116 | 115 |
| Average body weight (g) | 28.00 | 28.00 | 32.18 | 31.46 |
| Harvested quantity (kg) | 3,734.1 | 1,855 | 1,971 | 2,025 |
| Feed conversion ratio | 1.34 | 1.25 | 1.18 | 1.53 |
| Survival rate (%) | 95.26 | 88.33 | 81.66 | 64.37 |
| Gross sales (P) | 1,208,844 | 667,800 | 750,753 | 764,064 |
| Net Profit (P) | 841,904.45 | 443,871.58 | 526,825.48 | 494,286.25 |

like milkfish in the reservoir ponds had really proven to be an effective deterrent to the outbreak of luminous bacteria that was then their number one problem, and it resulted to a very successful operations.

"We are certain that with the continuing and tireless effort of AQD and BFAR through the *Joint Mission for Accelerated Technology Transfer Program* (JMANTTP), the tiger shrimp industry will again survive to the greater economic benefit of the country," Uy added.

AQD assists in grouper livelihood project

Below is the 30-unit grouper cages at Pamangkulan Bay in Barangay San Lorenzo, Sibunag, Guimaras owned and managed by a council of registered fishers from five coastal barangays. Sibunag Mayor Pedrito Gange adopted this mariculture livelihood project, similar to AQD's demo cages in Igang, Guimaras to address poverty problems aggravated by dwindling wild catch in the area. DA-LGU Counter Parting Program funded the project while AQD is providing technical assistance, including on-site technicians. Grouper fingerlings stocked in the cages -- nearly 6,000 -- are from AQD's hatcheries. These were stocked in three batches -- September, October, and November. First harvest is expected in February 2003.



PHOTO BY SM WEE

Our trainees come from 12 countries: they want to learn ...

SEAFDEC/AQD is conducting the first ever hands-on training in diagnosing important viral diseases of shrimp and marine fish as a component of the *Regional Fish Disease Program: Development of Fish Diseases Inspection Methodologies for Artificially-Bred Seeds* funded by Government of Japan-Trust Fund.

This was attended by 12 trainees, one each from Brunei Darussalam, Cambodia, China, India, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam. The course began November 6 and ended, after two weeks, on November 19.

The course is an offshoot of the regional concern on viral and other diseases that have devastating economic impact on the aquaculture industry in Asia. People skilled in recognizing a disease and containing it have been very much lacking. Hence the collaboration scheme for regional diagnosis and possible scheme of regional network for fish disease control. These were all explained by coordinator Dr. Yasuo Inui.

The 12 participants are national trainers who are expected to train the staff members of national fish disease laboratories in their respective countries as well as representatives from the private sector and the aquafarmers. The training was designed to be given to the same set of trainees for two successive years. A workshop-training on troubleshooting will be conducted as a follow-up. As AQD's research head Clarissa Marte noted, the successful disease surveillance system will depend on the result of this training course. "But I am confident that you will bring a packaged technology to your country," she said.

This training course was the output of a seminar-workshop convened in Iloilo City in 2001. [See page 25, this issue for ordering a copy of the proceedings]. It focused on DNA-based diagnostic methods (polymerase chain reaction or PCR) and other important diagnostic techniques such as cell culture- and antibody-based detection methods, histopathology, and impression smear method.

This training course is in collaboration with Office International des Epizooties (OIE) under the *Program on Improved Aquatic Animal Disease Surveillance*, and NACA under *Regional Program on Regional Aquatic Animal Health Project*. This collaboration scheme promotes the development and dissemination of diagnosis, and disease prevention and control of aquaculture diseases in the region. The overall objective of Regional Fish Disease Program is to develop a regional surveillance and control system for disease problems in the region.

At the closing ceremony, AQD Chief Dr. Rolando Platon conveyed his appreciation of the work of Dr. Inui, and the support of the Government of Japan. In her turn, class chairperson Florence Cubijano said they (the trainees) all acknowledge the significance of the training to their work and their determination to help combat emerging aquaculture diseases that constraint global production.



TCTP trainees learn to survey coral reefs, mangrove stands, and seagrass communities in addition to aquaculture technology modules. As a culminating activity, the trainees present a list of aquaculture opportunities to town officials and fisherfolk of Parara Norte, the local government unit (LGU) nearest SEAFDEC/AQD, based on their socioeconomic survey of the said town

... do things the practical and only way ...

SEAFDEC/AQD has always designed its training courses to have more practical work than classroom lectures. And so, 17 participants representing 10 countries from Nigeria to East Timor (the first time for the newly independent country to be represented) and in between sweated it out learning *Responsible Aquaculture Development*. This is a *Third Country Training Programme (TCTP)* funded by Japan International Cooperation Agency (JICA). It is a two-month course, from October 1 to November 28.

The opening ceremony was graced by Hirohiko Takata, Deputy Resident Representative of JICA; Ambassador Nestor Padalhin, Executive Director and Special Assistant to the Chair, Office of Technical and Cooperation Council of the Philippines, Department of Foreign Affairs; and AQD Chief Rolando Platon.

The general objective of the training course was to enhance the participant's awareness and appreciation of responsible and sustainable aquaculture technology for rural development within the context of coastal zone management.

As a culminating activity, the trainees made a presentation to 25 officials and fisherfolk of Parara Norte, the town nearest AQD, about aquaculture opportunities based on the socio-economic survey they conducted. These opportunities included mud crab fattening, seaweed culture, and cage culture of grouper, tilapia, catfish and milkfish. The trainees' proposals were found acceptable, albeit with the technical assistance of AQD sought. Parara was found to have only P2,700 average family income whilst the official poverty level is pegged at P10,000.

The training course is a joint project of the Governments of Japan and the Philippines through the JICA-TCTP. AQD is the implementing agency while JICA is providing technical and funding support. TCTP started in 1995. The current course is the fourth session in the second phase of the project.



New faces, new responsibilities

Junichiro Okamoto, 50, is the new SEAFDEC Deputy Secretary-General. He was previously the Director of Far Seas Fisheries Division, Fisheries Agency of the Government of Japan. He has also worked at the same agency as Counselor at the Department of Fishery Administration in 2000, Director at the Office of Ecosystem Conservation in 1998, and Director of Seto Sea Fishery Coordinate Office in 1997.

Mr. Okamoto graduated from the University of Tokyo with expertise on fish diseases (bacteriology). He is now residing in Bangkok, Thailand with his wife and two sons.

Melissa Smith is staying at AQD's Tigbauan Main Station from September 23, 2002 to March 20, 2003 as part of her Marine Institute Internship Program. She is assigned at the Mollusc Project (seed production and stock enhancement). Smith is a Bachelor of Science in Marine Biology graduate of Dalhousie University, Canada.



AQD's fish health scientists **Dr. Gilda Po** and **Dr. Celia Lavilla** Torres are the new President and Vice President, respectively, of the Philippine Society for Microbiology (PSM), Visayas Regional Chapter. Dr. Po and Dr. Torres, together with other PSM officers, were inducted during the PSM annual meeting and regional convention on October 17 in Iloilo City. **Ma. Michelle Peñaranda**, technical assistant of Dr. Po, was appointed recording secretary of the same Society.

... and leave with new skills and friendships

Here is another first from SEAFDEC/AQD -- the international training course on crab seed production. This began on October 22, and graduated 8 trainees on September 24.

"I hope that, when you go home, you will be able to apply what you have learned from SEAFDEC/AQD," AQD's research head Dr. Clarissa Marte told the trainees during the closing ceremony. She urged them to continue to communicate with AQD for development and technological advances in aquaculture in their places.

In reply, the representative class chair, Mr. Mohamed Shaji, said that they "are very happy for the relevant knowledge (we have gained from the training course)," and thanked each resource person and the training staff.

The training provided participants with technical knowledge and skills in crab seed production, with emphasis on *Scylla serrata*, so that they can establish or operate a crab hatchery.

Vietnam workshop on marine fish

Six SEAFDEC/AQD scientists were in Halong City, Vietnam to attend the *Workshop on Sustainable Marine Finfish Aquaculture in the Asia-Pacific Region* from September 30 to October 4.

The AQD delegation was composed of the following, with their respective papers:

1. Joebert Toledo – "Environmental factors affecting survival of fertilized eggs and early stage larvae of grouper *Epinephelus coioides*" and "Studies on semi-intensive seed production of grouper *Epinephelus coioides*."
2. Veronica Alava – "Lipid nutrition studies on grouper *Epinephelus coioides* larvae" and "Effect of n-3 HUFA supplementation on reproductive performance, egg, and larval quality of grouper *Epinephelus coioides*."
3. Gerald Qunitio – "Preliminary observations on the histol-



AQD Research Publications

Reprints of papers listed here may be requested directly from SEAFDEC/AQD authors

[names of AQD researchers in boldface] or from the AQD Library

Compiled by the **AQD LIBRARY** <library@aqd.seafdec.org.ph>

Catap ES, Munday BL. 2002. Development of a method for reproducing epizootic ulcerative syndrome using controlled doses of *Aphanomyces invadans* in species with different salinity requirements. *Aquaculture* 209 (1-4): 35-47

Abstract. Lesions typical of epizootic ulcerative syndrome (EUS) were induced in three-spot gourami, *Trichogaster trichopterus*, and sand whiting, *Sillago ciliata*, injected intramuscularly with controlled doses of *Aphanomyces invadans* zoospores, the fungal pathogen associated with the disease. Both species of fish exhibited chronic granulomatous response and inflammatory cells, predominantly macrophages and lymphocytes, infiltrated the muscle and skin tissues, at days 6-8 post-inoculation of 65 to 85 spores/fish. Based on the comparative granuloma counts and percentage of cellular infiltration in a sampled lesion area using image analysis, it was shown that the three-spot gouramis mounted a more vigorous response than the sand whiting. It was also observed that lesions in three-spot gouramis exhibited early signs of resolution than those in sand whiting. However, fish mortality was greater in EUS-affected three-spot gourami than in EUS-affected sand whiting. With this technique, we were able to describe and compare the sequential histopathology of EUS lesions in a freshwater (three-spot gourami) and an estuarine (sand whiting) fish species.

de los Reyes AA Jr. 2002. Development of environment-friendly aquaculture technologies and practices. In: Maeda M, Maeno Y, Yokohama M (eds). 2002. Studies on sustainable production systems of aquatic animals in brackish mangrove areas. Japan International Research Center for Agricultural Sciences

Emata AC. 2002. The influence of broodstock nutrition on the reproductive performance and egg and larval biochemical composition of the mangrove red snapper, *Lutjanus argentimaculatus*, for its sustainable aquaculture program. In: Maeda M, Maeno Y, Yokohama M (eds). 2002. Studies on sustainable production systems of aquatic animals in brackish mangrove areas. Japan International Research Center for Agricultural Sciences

Fujii K, Yahashi Y, Nakano T, Imanishi S, **Baldia SF**, Harada K. 2002. Simultaneous detection and determination of the absolute configuration of thiazole-containing amino acids in a peptide. *Tetrahedron* 58 (34): 6873-6879

Abstract. For the simultaneous detection and determination of the absolute configuration of a thiazole-containing (Tzl-) amino acid in a peptide, we have developed a reliable method using the 'advanced Marfey's method', which includes HPLC with a rational guideline, a sensitive derivatizing reagent, 1-fluoro-2,4-dinitrophenyl-5-L-leucinamide (L-FDLA), and a racemization procedure using DL-FDLA for determination of the absolute configuration of constituent amino acids in a peptide. Tzl-

amino acids could be directly detected in the hydrolysate by this method, although they were racemized under ordinary hydrolysis conditions. In order to depress the racemization, the flash hydrolysis was introduced. As a result, the flash hydrolysis for 1 h was sufficient to detect each constituent amino acid, and it was possible to identify the original peak. Consequently, the absolute configuration of microcyclamide (1) possessing Tzl-amino acids was determined by the advanced Marfey's method combined with flash hydrolysis. Additionally, this method was successfully applied to the simultaneous detection and determination of the absolute configuration of two other naturally occurring peptides, waiakeamide (2) and goadsporin (3). The established method with the flash hydrolysis had an additional advantage in that labile amino acids, such as tryptophan and methionine sulfoxide, during acid hydrolysis can be detected in the intact form.

Lavilla-Pitogo CR. 2001. Disease management in shrimp farming. In: Subasinghe S, Singh T (eds). Production and marketing of shrimp: trends and outlook. INFOFISH. 239 pp

Abstract. Shrimp monoculture systems have been beset with devastating losses due to infectious diseases and environmental deterioration. On a global scale, efforts to make shrimp culture a sustainable industry are warranted because of the high value and demand of shrimp. A Code of Practice for Sustainable Shrimp Farming prepared by the Global Aquaculture Alliance has been adopted by various shrimp producing countries addressing issues like mangroves, site evaluation, design and construction, feeds and feed use, shrimp health management, therapeutic agents and other chemicals, general pond operation, effluents and solid wastes, and community and employee relations.

Shrimp hatcheries have benefited from technological advances in practically every aspect of rearing including implements to control water quality, eliminate pathogens, and improved nutrition through innovative artificial feeds and supplements. These technologies have made postlarval production very successful, although in many cases, high survival cannot exactly be equated with good quality. Thus, a closer look at hatcheries is essential to ensure that rearing protocols match the conditions to which postlarvae will be exposed to upon stocking in ponds. Compiled information on the estimated number of hatcheries and farms in major shrimp growing areas in Asia show a relatively smaller number of small independent hatcheries compared to farms, which demonstrates that effective disease control programmes need to emanate from hatcheries. Presently, three programmes for the hatchery need serious attention. These are (a) the continued implementation of fry analysis procedures, not only as a marketing tool, but so as to exclude pathogenic organisms from ponds, (b) adherence to agreed-upon codes of practice and conformity with accepted guidelines on live transfers to minimise disease spread, and (c) development of a reliable source of domesticated broodstock and incorporating specific pathogen free (SPF) and specific pathogen resistant (SPR) stocks in these programmes to minimise or eliminate dependence on wild broodstock.

One of the main constraints is the lack of cost-effective and efficient methods to prevent and correct environmental deterioration, and to main-

tain biosecurity. In addition to providing primary health care, disease control strategies should be a combination of pathogen exclusion and environmental management: the former for primary pathogens such as viruses and the latter for secondary pathogens like bacteria, whose pathogenicity is heightened by environmental degradation and lowered resistance of shrimps. Shrimp farming should start employing systems to manage and lessen waste and the outflow of organic pollutants that could contribute to self-pollution or deterioration of the quality of receiving waters. These include improved feeds and conversion ratios to make feed utilisation more economical and efficient, implementation of recirculating or zero discharge technology, improving the efficiency of aeration systems, improvement of pond siting, understanding of the pond ecosystem and the role of microbes in the environment. In addition, to implementing disease control measures and ensuring product quality in various industry sectors, approaches need to be welded together for a holistic approach to health management.

Lavilla-Pitogo CR, Catedral DC, Pedrajas SAG, de la Peña LD. 2002. Selection of probiotics for shrimp and crab hatcheries. In: Inui Y, Cruz-Lacierda ER (eds). Disease control in fish and shrimp aquaculture in Southeast Asia - diagnosis and husbandry techniques. SEAFDEC, Philippines and Office International des Epizooties, France. 215 pp

Abstract. A study aimed at obtaining a biological control agent against bacterial diseases, specifically luminescent vibriosis, of hatchery-reared shrimps and crabs was done to find an alternative for chemotherapy as a disease prevention and control method. Bacteria were isolated from crustacean rearing environments where luminescent vibriosis was not observed, from natural food, and from various feed ingredients. From hundreds of purified strains, 80 bacterial isolates were tested in one-on-one mixed cultures in seawater for their ability to suppress the growth of luminescent *Vibrio harveyi*. Of the 10 isolates exhibiting that capability, two strains were further studied: C1 from *Chlorella* culture and P9 from a commercial probiotic preparation. However, due to the indigenous nature of C1 strain from the unicellular alga *Chlorella* sp. and the ease in distinguishing it from other bacteria owing to its colony morphology, most tests were done on C1 strain. To determine the suitability of C1, and to some extent P9, as biocontrol bacteria, their pathogenicity against crab larvae and shrimp postlarvae, and their ability to become associated or incorporated into the larvae were determined. Incorporation into the rotifer, *Brachionus*, was also tested. Due to positive results obtained in the incorporation experiments, the growth of strain C1 in microbiological media and unrefined media prepared from agricultural by-products was also tested.

Leaño EM. 2002. Ecology of straminipiles from mangrove habitats. In: Hyde KD (ed). Fungi in Marine Environments. Fungal Diversity Research Series 7:111-134

Abstract. Straminipiles are common inhabitants of marine, estuarine and freshwater aquatic environments. In mangrove habitats, halophytophthorans and thraustochytrids are abundant, both in tropical and sub-tropical areas. Their abundance is attributed to their wide tolerance to environmental parameters such as salinity and temperature, and their ability to produce abundant zoospores. Fallen mangrove leaves supply the bulk of organic material in any mangrove habitat. Straminipiles are one of the initial colonizers of fallen mangrove leaves. The ability of

their zoospores to respond chemotactically to nutrients released by the leaves, and to attach firmly on the substrata surface by the release of adhesive materials, make them highly competitive in the colonization process. Thus, they are reported to play a significant role in the microbial degradation of fallen mangrove leaves. Moreover, these organisms, especially thraustochytrids, are producers of high amounts polyunsaturated fatty acids (PUFAs). Therefore in the degradation process, they consequently enrich the nutrient content of the leaves for the benefit of other organisms at higher trophic levels, making mangroves an excellent nursery grounds for many fish and crustacean species. Some species of thraustochytrids are also used in the commercial production of PUFAs, for use in aquaculture specifically in larval rearing of marine fish and crustaceans.

Lio-Po GD, Cruz-Lacierda ER, de la Peña LD, Maeno Y, Inui Y. 2002. Progress and current status of diagnostic techniques for marine fish viral diseases at the SEAFDEC Aquaculture Department. In: Inui Y, Cruz-Lacierda ER (eds). Disease control in fish and shrimp aquaculture in Southeast Asia - diagnosis and husbandry techniques. SEAFDEC, Philippines and Office International des Epizooties, France. 215 pp

Abstract. The incidence of unexplained mortalities among marine finfish in the Philippines has been increasingly observed. Considering that outbreaks of viral infectious affecting similarly cultured marine fishes such as grouper and seabass were reported in many countries, a comprehensive diagnostic program to meet this challenge was initiated at SEAFDEC/AQD with funding from the Japanese Trust Fund Disease Project. This activity was further boosted by the Japan International Research Center for Agricultural Sciences (JIRCAS). Overall, the program involved the staff of the marine finfish hatchery and of the Fish Health Section. Cases unexplained mortalities observed in the hatchery were referred to the Fish Health Section. Detailed information on the culture histories of each case were provided by the hatchery staff. Diagnostic tests were performed on each case and those with potential indication of viral etiology were processed for virus detection. Presumptive diagnosis of viral infections was based on typical signs, cell culture isolation, histopathology and *in-vivo* pathogenicity tests. Confirmatory tests to identify specific viruses include RT-PCR, FAT and electron microscopy. The highlights of outbreaks of viral nervous necrosis and other virus-associated infections among marine finfish at SEAFDEC-AQD are presented.

Lio-Po GD, Leaño EM, Usero RC, Guanzon NG Jr. 2002. *Vibrio harveyi* and the 'green water culture' of *Penaeus monodon*. In: Inui Y, Cruz-Lacierda ER (eds). Disease control in fish and shrimp aquaculture in Southeast Asia - diagnosis and husbandry techniques. SEAFDEC, Philippines and Office International des Epizooties, France. 215 pp

Abstract. The "greenwater culture" of the tiger shrimp, *Penaeus monodon*, is an innovative culture technique for the grow-out rearing of shrimps. This culture method involves the use of rearing water of tilapia for the rearing of tiger shrimp in grow-out ponds and or the polyculture of shrimp with tilapia. This culture technique was reported to prevent disease outbreaks attributed to luminescent *Vibrio*. To understand the possible mechanisms of luminous *Vibrio* control in the green water culture system several studies were conducted. This review summarizes the highlights obtained so far from these studies consisting of (a) effect of rearing

➡ next page

waters from tilapia culture and shrimp culture and shrimp cultured with tilapia on *Vibrio harveyi*; (b) estimation and preliminary identification of cultivable bacteria, fungi and phytoplankton flora associated with "green water culture" system and (c) detection of anti-*Vibrio harveyi* metabolites from bacteria, yeast, filamentous fungi and phytoplankton indigenous to the "green water culture" system.

Marte CL. 2002. Grouper research at the Southeast Asian Fisheries Development Center Aquaculture Department. In: APEC/NACA. 2002. Report of the APEC/NACA Cooperative Grouper Aquaculture Workshop; Hat Yai, Thailand; 7-9 April 1999. Collaborative APEC Grouper Research and Development Network (FWG 01/99). Network of Aquaculture Centres in Asia-Pacific, Bangkok. 151 p

Abstract. This paper provides information on grouper research activities that have been carried out in SEAFDEC AQD. It covers various aspects such as broodstock management, seed production, nursery and grow-out culture techniques.

Tendencia EA. 2002. Bamboo back disease in tiger shrimp, *Penaeus monodon*. Bulletin of the European Association of Fish Pathologists. 22(3):222-224

Abstract. This report describes bamboo back disease affecting *Penaeus monodon* in the Philippines. Affected and normal shrimps were processed for bacterial isolation and histopathology. Morphological changes in the external anatomy were also noted. The cuticle of the abdominal segments of shrimp with bamboo back disease do not overlap property which gives them a bamboo-like appearance. The appendages are shorter compared with normal shrimps. No bacteria were recovered from the hepatopancreas, lymphoid organ, and hemolymph thus ruling out bacterial infection. Histopathology shows normal hepatopancreas, but the muscle fibers of the abdominal segments are fragmented and necrotic.

Toledo JD, Caberoy NB, Qunitio GF, Choresca CH, Nakagawa H. 2002. Effects of salinity, aeration and light intensity on oil globule absorption, feeding incidence, growth and survival of early-stage grouper *Epinephelus coioides* larvae. Fisheries Science 68 (3): 478-483

Abstract. A series of experiments were conducted to examine the effects of salinity, aeration and light intensity on oil globule absorption, feeding incidence, and growth and survival of early-stage *Epinephelus coioides* larvae. Newly hatched larvae were transferred to 40-L aquaria at a density of 1500 individuals/aquarium. Larvae were exposed to different levels of aeration (0 mL/min per L, 0.62 mL/min per L, 1.25 mL/min per L, 2.50 mL/min per L, or 3.75 mL/min per L); salinity (8 ppt, 16 ppt, 24 ppt, 32 ppt, or 40 ppt); and light intensity (0 lx, 120 lx, 230 lx, 500 lx, or 700 lx) for 4-6 days. Twenty larvae were sampled daily at 11:00 hours to measure for total length (TL), oil globule volume, and feeding incidence. Survival rates were determined by counting the total number of larvae remaining in each aquarium at the end of the experiment. Significantly higher survival rates ($P < 0.05$) were observed at aeration levels of 0.62 mL/min per L and 1.25 mL/min per L, at salinity levels of 16 ppt and 24 ppt, and at light intensities of 500 lx and 700 lx. The influence of aeration

level, salinity and light intensity on oil globule absorption, feeding incidence, and growth and survival of early-stage grouper larvae are discussed.

Toledo JD. 2002. Status of breeding and larval rearing of groupers. In: APEC/NACA/BOBP/GOI. 2001. Report of the regional workshop on sustainable seafarming and grouper aquaculture; Medan, Indonesia; 17-20 April 2000. Collaborative APEC Grouper Research and Development Network (FWG 01/99). Network of Aquaculture Centres in Asia-Pacific, Bangkok. 224 p

Abstract. Attempts to breed groupers in captivity started about four decades ago. Ukawa et al. (1966) described the successful fertilization and embryonic development of the red grouper *Epinephelus akaara*. Fueled by the high market value of live groupers and the inconsistent supply of juveniles from the wild, research on broodstock development and seed production of grouper has been intensified since the 1980s. Natural or induced spawning in groupers was reported in *Epinephelus tauvina* (Chen et al. 1977, Hussain and Higuchi, 1980), *E. malabaricus* (Ruangpanit et al. 1986), *E. salmonides* (Kungvankij et al. 1986), *E. fuscoguttatus* (Lim et al. 1990), *E. suillus* (= *E. coioides*) (Toledo et al. 1993), *E. polyphekadion* (Sugama, pers.com), and *Cromileptes altivelis* (Sugama and Ikeneoue 1990). Despite these developments, hatchery production of groupers remains unreliable. This paper reviews the status of breeding and larval rearing of groupers. Much of the information presented derives from the research and development studies on *E. coioides* at the Aquaculture Department of the Southeast Asian Fisheries Development Center.

Trino AT, Rodriguez EM. 2002. Pen culture of mud crab *Scylla serrata* in tidal flats reforested with mangrove trees. Aquaculture 211 (1-4): 125-134

Abstract. Growth and survival of mixed sex mud crabs *Scylla serrata* (Forsk.) held in 200 m² pens located in reforested mangrove tidal flats, were evaluated. The effects of stocking density (0.5 or 1.5 m⁻²) and feed (salted fish bycatch or a mixed diet of 75% salted brown mussel flesh and 25% salted fish bycatch) were determined in a replicated factorial experiment. Duration of the experiment was 160 days. There were no significant differences ($P > 0.05$) in growth, apparent feed conversion ratio (FCR), survival, and production among the two types of feed. Regardless of feed, the mean \pm SE FCR of 5.30 ± 0.34 and survival of $56.00 \pm 1.90\%$ at 0.5 m⁻² stocking density were significantly better ($P < 0.05$) than at 1.5 m⁻² stocking density (7.6 ± 0.63 FCR and $33.00 \pm 3.61\%$ survival). However, growth was not significantly affected by stocking density. Cost-return analysis on a per crop per 200 m² basis showed that the use of either of the two stocking densities with either diet was economically viable with a return on capital investment of 49-68%. However, crabs stocked at 1.5 m⁻² and fed a mixed diet of 75% salted brown mussel flesh and 25% salted fish bycatch is more profitable. The integration of crab aquaculture within natural mangroves is therefore feasible in the Philippines, providing both immediate and long-term commercial and environmental benefits.

NOTE: ABSTRACTS FROM JOURNALS COVERED BY CURRENT CONTENTS ARE DOWNLOADED FROM THE CD-ROM VERSIONS (*Agriculture, Biology & Environmental Sciences*, 5 November 2001 - 28 October 2002 or from *Life Sciences*, 5 November 2001 - 28 October 2002). 2002. INSTITUTE FOR SCIENTIFIC INFORMATION, PENNSYLVANIA, USA ###



FROM AROUND THE WORLD

researches from japan

Ultrahigh-density mass culture of rotifers

There's been further development in the mass culture system for marine rotifers. Dr. Takao Yoshimatsu and his colleagues from Kyushu University have previously developed a system using the algae *Chlorella* (rotifers feed on them), oxygen input and pH control which supports tens of thousands of rotifers per milliliter. This system has been gradually prevailing in larviculture in Japan. But now, improvement in the system can support ultrahigh-density.

The novel system incorporates sophisticated water exchange comprised of a microfiltration unit and pumps. Oxygen (95% pure) and freshwater *C. vulgaris* in paste are still continuously added. The latter's culture broth is filtered out of the system at intervals, while the filtration unit is washed daily with NaClO before being reused.

Dr. Yoshimatsu noted that when they batch-cultured S-type rotifers *Brachionus rotundiformis* (20,000 rotifers per milliliter), a very high-density culture (160,000 rotifers per ml) was obtained the fourth day. This filtering culture method with oxygen is probably the current world record for number of rotifers produced when compared to ordinary batch culture with oxygen but no filtration (rotifer population crashed on the third day) or filtering culture without oxygen (stable growth at 159,000 rotifers per ml but nothing compared to the 6.36×10^9 gross and 5.39×10^9 net rotifer production, in 40 l experimental unit, of the improved system.)

Rotifer is the important live food for the larval stage of most fishes. The amount of available rotifer determines the success of the hatchery. [For more information, contact: Dr. Takao Yoshimatsu, takao@brs.kyushu-u.ac.jp]

Protist parasite found in Japan's Pacific oysters

In the 2000 manual published by the Office International des Epizooties or OIE (also known as the World Organization for Animal Health), Japan was not listed among the countries contaminated with *Haplosporidium nelsoni*. But this is no longer the case.



Japanese researchers Dr. Takao Yoshimatsu, Takashi Kamaishi, Dr. Tomohiko Kawamura (L-R)



Researcher Takashi Kamaishi of the National Research Institute of Aquaculture, Fisheries Research Agency of Japan found this out when he examined 100 juveniles of Pacific oyster obtained from a coastal area in northeastern Japan. Through the use of histology and polymerase chain reaction (PCR) techniques, he observed *Haplosporidium*-like plasmodia in histological samples of two juveniles and which positively reacted with a *H. nelsoni*-specific probe through *in situ* hybridization.

Four juveniles, including the two juveniles where the plasmodia were found, showed positive reaction to PCR analysis for detection of *H. nelsoni*. The nucleotide sequence from one of the juveniles was 99.7 percent identical to the sequence of *H. nelsoni* previously reported. Kamaishi noted that these results clearly demonstrate that *H. nelsoni* is distributed in Japan.

H. nelsoni is a spore-forming parasite, but its life cycle and intermediate hosts are still unknown. It is extensively distributed in Eastern oyster, *C. virginica*, at the Atlantic Coast of the United States. It causes mortality in *C. virginica* but transmission is not yet controlled.

How the Japanese abalone is distributed

Researchers have wondered why natural recruitment of the abalone *Haliotis discus hannai* has remained low in most areas of northeast Japan for many years despite the release of millions of abalone seed annually. On the other hand, natural recruitment of abalone has markedly increased in some areas in Iwate and Miyagi.

Researchers may have found the answer after studying early life ecology (such as larval settlement, and post-larval feeding and growth) of abalone. Dr. Tomohiko Kawamura of Ocean Research Institute of the University of Tokyo posits that it is starvation of postlarvae (PL), decreasing survival and further natural recruitment.

When abalone settle (they attach to substrates to grow), Dr. Kawamura said that in the laboratory, they appeared to prefer crustose coralline algae (CCA) and pre-grazed plates with trail mucus from juvenile abalone. The abalones are grown with benthic diatoms, *Ulveella lens* and bacteria.

➡ next page

malaysia: fish-for-all summit

When still young (=shell length of 0.4 mm), abalone use their residual yolks. At 0.28-0.8 mm, they have been found to feed on biofilm materials, extracellular mucus of diatoms, and trail mucus of juvenile and adult abalone. At 0.8 mm to about 2-4 mm, they feed on diatoms; and at 2-4 mm, on macroalgae.

However, diatoms may have low dietary value and are not digested by abalone (some are still found alive after passing through the abalone's gut). Feeding experiment showed that PL could survive up to five days of starvation but survival decreased when PL were starved for over eight days.

Another factor affecting abalone recruitment and distribution is adult density. More adults mean better recruitment because the distance between male and female broodstock should be about 2 meters for fertilization to take place. But this will not happen if less PL survives to adulthood.

Abalone is one of the most commercially important shellfishes and the most expensive seafood in Japan. *H. discus hannai* is the only species found in northeast Japan and is the most heavily harvested of the six commercially fished abalones.

More fish species susceptible to nodavirus



Disease agents, all opportunists, are all around us, including a piscine nodavirus which has been implicated in mass mortality of orange-spotted grouper *Epinephelus coioides* reared in the hatchery. This culprit was brought to light by researchers using transmission electron microscopy, DNA techniques, and reference viral materials isolated in so-called SSN-1 cells.

But the story doesn't end there. It's not just grouper but other fish species which appear to be susceptible. A Japanese researcher, Dr. Yukio Maeno, studying this nodavirus in the Philippines noted that the Asian sea bass *Lates calcarifer*, mangrove red snapper *Lutjanus argentimaculatus*, and milkfish *Chanos chanos* are all susceptible to the nodavirus from diseased grouper.

How was this tested? Dr. Maeno injected into the abdomen of the above marine fishes the filtrate-homogenate of infected organs from diseased grouper while a control group received salt solution. Clinical signs such as lethargy, anorexia, and darkened pigmentation were observed in fish injected with high dose of homogenate ($1 \times 10^{9.5}$ TCID₅₀/g).

Although little mortality occurred after 10 days, severe necrosis and vacuolation of the brain and retina characteristic to nodavirus infection were produced in the test fishes. The virus was reisolated in SSN-1 cells inoculated with the homogenate of survivors in all doses for all test fishes.

Dr. Maeno says that the low mortality rate could be explained by possible differences in virulence of the virus to different species and size of fish.

Nearly 200 eminent development specialists and national policy makers from all over the world attended a summit on fisheries policy in Penang, Malaysia on November 3 to 4. The result is a global initiative, dubbed *Fish for All*, whose mission is to create a platform for greater dialogue, understanding, and cooperation among stakeholders in the fisheries sector.

Over a 10-year period, it is hoped that a coherent and informed public learned dialogue on such issues as fish and development, gender, water, river basins and coasts, trade, and economic growth will be achieved. This will be done by/through:

- Establishment of the highest profile steering committee possible to direct and connect with the highest level policy makers from various parts of the world
- Events such as policy-science-stakeholder workshops and fora, conferences, and dialogues
- Studies, policy analyses, opinion pieces newsletters, and a website on the issues and solutions

And why the initiative?

ICLARM - The World Fish Center, the organizer of the summit and the coordinator of the initiative, says that fish is in the news although rarely on the agenda of economic policy makers. As the world population increases, food demand has escalated from the 80 to 90 million more people in the world every year.

Worldwide, per capita fish consumption nearly doubled from 8 kg in the early 1950s to about 15 kg in the late 1990s. But will the world be able to keep producing the fish needed? Many of the oceans, rivers, and lakes of the world are overfished. Compounded by environmental degradation, the world fish stocks are being severely depleted, threatening supplies of fish for the people who need them most.

There are also the contrasts, says ICLARM. Some enjoy gourmet foods from exotic waters flown halfway round the world and spend idyllic holidays on tropical beaches. But for the poorest in developing countries, fishers compete daily over decreasing catch, families fight over fishing rights, and children suffer from malnutrition. How will these contrasts be reconciled? Are there solutions? How would we envision a future for aquatic life to meet today and tomorrow's needs? How can we ensure fish for all?

Fish for All launching activities have included the release of a short document serving as personal call to world leaders, carrying statements from the Global Steering Committee.

Fish for All

thailand: initiatives

Initiative for aquatic resource management

www.streaminitiative.org

The Support to Regional Aquatic Resources Management (STREAM) Initiative offers support to poor people who manage and depend on aquatic resources for their livelihood (aquaculture or capture fisheries). The who-how-why of this project is more extensively explained in a new website on the internet -- www.streaminitiative.org.

The website covers *The STREAM Summary Booklet*, which summarizes the rationale, the objectives, approach and stakeholders, and issues around implementation. It also contains *STREAM partner profile sheets* of *NACA, DFID, FAO, VSO and AusAID. Also accessible in this website are *Country Strategy Papers* for Vietnam, Cambodia, Nepal, the Philippines and India, wherein STREAM operates, and *Partnership Agreements* with key stakeholders and donors. The website has also *STREAM Journal* and associated *Discussion Forum* as components of STREAM communications strategy to increase impact thru dissemination of lessons learned throughout Asia-Pacific.

STREAM implementation will be an iterative process, initially piloting in Cambodia and Vietnam, but with a commitment to cover up to 15 Asia-Pacific countries as experience is gained, lessons are learned, impact is demonstrated, and additional funding is secured. It is funded by a trust fund and has seed funding from DFID and Asia-Pacific governments. Its regional office is in Bangkok, hosted by the Secretariat of NACA.

* NACA is the Network of Aquaculture Centres in Asia; DFID-Department for International Development; FAO-Food and Agriculture Organization of the United Nations; VSO-Voluntary Service Overseas; AusAID-Australian Agency for International Development

Standards for the live reef food fish trade

What constitute “best practices” so that the result is a sustainable industry? A win-win situation for coral reefs, fish stocks, and fishing communities? For the live reef foodfish trade (LRFFT), the answer must be close after the Network of Aquaculture Centres in Asia (NACA) organized a meeting on October 4 at Halong City, Vietnam.

At the meeting, the International Marinelife Alliance (IMA), Marine Aquarium Council (MAC), The Nature Conservancy (TNC) have agreed to work collaboratively with other stakeholders to develop a set of industry best practice standards over a 2-year time frame. MAC would be in-charge of overall coordination. The Fisheries Working Group of the Asia-Pacific Economic Cooperation has provided funding to support the development of the standards.

It must be noted that an LRFFT workshop was held in Honolulu, Hawaii earlier (February 2001) to coordinate activities and formulate strategies among organizations and stakeholders concerned about this trade. The workshop identified the need to develop a set of industry “best practice standards.”

What will be included in the industry standards? Both wild-caught and cultured fish will receive focus; also, standards and practices relating to assessment of fish stocks, capture and culture methods, holding, transportation, and human health and safety concerns.

The industry standards will be developed through an open, multi-stakeholder consultative process to ensure credibility and stakeholder involvement. This process will include, but is not limited to, compiling existing information on current industry best practices and undertaking workshops and consultations in source and market countries. The results of these efforts will be synthesized and developed into draft standards for review, discussion and revision by stakeholders.

Implementation of any resulting standards and supporting information on options for best practices are of a voluntary nature. They are meant to serve as a basis for strengthening efforts to minimize destructive practices, upgrading capture, culture, handling, and transport practices. These would ensure conservation of reef habitat for target species and minimize human health threats from ciguatera (caused by fish or mollusks with flesh toxic to man) poisoning.

Ultimately, the three organizations working together to lead this project expect that the resulting standards and best practice options for achieving them will be of use to industry, government, and marine conservation organizations alike in ensuring that the live fish trade becomes a sustainable, high-value fishery that provides livelihood for local fishers, a stable and healthy supply of live food fish to the market, and conservation of reef habitats of which are the basis for productive reef fisheries.

What threatens our coral reef

The coral reefs of Southeast Asia and the Western Pacific (world's largest and most biologically diverse) are the center of the growing live reef food fish trade (LRFFT). Primary targets are the grouper species (*Serranidae*) for markets in Hongkong and southern China, where diners choose live fish from tanks for immediate cooking and consumption. In 2001, some 15,000-20,000 tons of live reef fish were imported to Hongkong alone.

While Southeast Asia and Australia are the major suppliers of this trade, operators are now seeking fish in more remote parts of the western Pacific. The LRFFT as it is currently practiced, with the possible exception of Australia, poses a significant threat to the region's reefs.

Live food fish, as well as lobsters, are frequently harvested in Southeast Asia using sodium cyanide – a deadly broad-spectrum poison widely available due to its many industrial uses. The poison is crushed into plastic squirt bottles and applied to wide areas by reef divers. It stuns the fish making them easier to capture. Many exposed fish and invertebrates die in the process. Cyanide also poisons and kills the very organisms that make up the reef itself.

A second threat arises from the tendency of LRFFT operators (whether using cyanide or not) to locally overexploit target species until they are virtually wiped out, then they move on to another area. This is particularly serious in the case of many grouper species that periodically aggregate in large numbers to spawn.

philippines: ethnic food

Most people throw away the shells of shrimps and crabs, but what do you know, these shells can be utilized to make a confectionery called "polvoron."

About two years ago, we

featured polvoron made from milkfish bones (considered offal or waste by the milkfish industry). Now comes another variation on the polvoron confection from the Concepcion, Iloilo satellite campus of the Northern Iloilo Polytechnic State College in the Philippines.

Master teacher Viden V. Elpos came up with the crustacean shell recipe when she observed that there was a surfeit of raw materials. Den, as she is fondly called, explained that in the nearby Butlog Island, *kasag* (crab) shells and carapaces were being dumped right and left along the seashore. She figured that there must be a way to make use of these waste materials. She also added shrimp shells, but in a smaller amount because the volume is much lesser than the crab shells.

Den's students collected about 20 kg of crab carapace in a nearby island. The shells were cleaned by soaking it overnight in water, then sun-dried. According to Den, the longer the crab carapace was dried in the sun, the crispier it became. She experimented on this crispiness by drying the carapace for 5-10 days.

She has had a series of taste tests to find out whether the aroma is agreeable and the texture and flavor are acceptable. The students, teachers, and the housewives in the Concepcion campus were the taste-testers. In La Paz, Iloilo City where Den lives, her polvoron sold briskly. According to Den, her taste tests passed with flying colors. Everybody agreed that the polvoron was delicious. Her polvoron are color-coded: wrapped in red are those made from shrimp waste; the yellow ones, crab; and the blues are combination of crab and shrimp waste powder.

Den earned her BS degree in Fishery Education from the Iloilo State College of Fisheries in 1978, her Master of Arts in Teaching Vocational Education at the West Visayas College of Science and Technology in 1985. She is currently completing her Ph.D. at the University of Iloilo. She teaches among others: ecology of fisheries, limnology, fish diseases, and fish physiology.

Den is married to Salvador Flores Elpos, a native of Igaras, Iloilo. They have three children. - APS



How to make "polvoron" from crab/shrimp shells

Ingredients

- 1 c shrimp/crab powder
- 2 c all-purpose flour
- butter, margarine to flavor
- 2 tsp vanilla
- 1 c refined sugar
- 1 c powdered milk

Preparation

- 1 Soak shrimp shell/crab carapace in fresh clean water
- 2 Wash and clean thoroughly
- 3 Drain and dry (sun-dry for at least 10 days)
- 4 Pound the carapace and shrimp shell, then grind to powder
- 5 Strain or sift

Cooking

- 1 Toast all-purpose flour and powdered milk separately from shrimp/crab powder until golden brown
- 2 Toast the crab/shrimp shell
- 3 Sift together 1 and 2
- 4 Prepare butter solution, and gradually mix in all ingredients
- 5 Cook, wrap, and pack

For more inquiries about the product, contact:

Mrs. Viden Elpos
Concepcion Polytechnic College - NIPSC Campus
5013 Concepcion, Iloilo, Philippines
Tel. (033) 392 0337, 320 8098

Industry gathering

Mark your calendar -- that is, May 7-11, 2003 -- as the aquaculture industry gathers for the *1st Philippine Aquaculture Congress and Exhibition (PACE)* at the Bacolod Convention Plaza Hotel, Bacolod City. It will bring together leading entrepreneurs, researchers, policymakers, representatives from GOs and NGOs, and industry suppliers to discuss technologies and issues that will promote private sector growth and modernization. Topics include mariculture, seafood marketing, shrimp culture update, aquaculture in coastal resource management.

Organized by Cruz Aquaculture Corporation in partnership with U.P. Aquaculture Society and the support of the Philippine Aquaculture Society and the Society of Aquaculture Engineers of the Philippines.

Contact: The PACE Secretariat, telefax (34) 4347263, 4354107; cell (0917) 4972500; pace@lasalletech.com, vizcore@pacific.net.ph. Registration, P4,000; early birds, P3,500 before February 15, 2003. Exhibitors welcome.

AQD NEWS / VIETNAM WORKSHOP ... FROM PAGE 15

- ogy and histochemistry of the development of the digestive system of grouper *Epinephelus coioides* larvae."
4. Perla Eusebio -- "Specific activity of main digestive enzymes in grouper *Epinephelus coioides* larvae" and "Nutritional evaluation of terrestrial protein sources in formulated diets for grouper *Epinephelus coioides* juveniles."
 5. Oseni Millamena -- "Development of practical diet for grow-out culture of grouper *Epinephelus coioides*."
 6. Clarissa Marte - "(Philippine) Country Status Report." ###

THE EMERGING RED SNAPPER CULTURE

CONTINUED FROM THE BACKCOVER

FROM PAGE 28

mongo"-sized net (about 1 cm mesh). After 1.5 months, he transferred them in cages (he has 17 units of 3 x 3 x 2 m) which he provided with styropore shelters. Mr. Panaguition says that when he has available pens, he transfers some from the cages because they grow better in wider spaces.

He transfers 200-150 fry per cage from his nursery. In the nursery, he uses bangus or milkfish floater feed with 30% protein. He feeds three times a day. In the cages, he uses trash fish or fry mash but he says that trash fish is better and fry mash is only used when trash fish is hard to come by during the typhoon season. He feeds twice a day. Trash fish is P10-20 per ganta and fry is P4.50 per 3 or 4 in.

Mr. Panaguition says that red snapper is easier to culture than grouper because "it is not choosy with feed." And so far, he hasn't had disease problems; his biggest problem is "where can he sell his market-sized red snapper"? For now he hasn't dwelt on that because he is five months away from harvesting. "I'll think of a way," he said.

Mr. Rolando Unasin, Punong Barangay of Basiao, owns about 100 floating cages (8 x 10 x 4 m) in the coast of Basiao, Ivisan, Capiz. He has a steady supply of trash fish because his main occu-



Rolando Unasin, his farm, and his trashfish supply



pation is fishing. He thus doesn't buy trash fish; when supply runs low, other fishers can supply his need. He explains, "most red snapper raisers here supply their own trash fish. It is an advantage for us because we don't need to buy formulated feed." They have been raising red snapper with grouper and seabass for so long, he couldn't remember when he started. Lately, he bought his fry stock from a fry dealer (P12-14 per fry). For him, fry supply is not much of a problem because he has enough to supply weekly orders and not deplete his smaller-sized stocks. In fact, he buys small quantities of fry to replace what have been sold.

He stocks 200 fish per cage. He grows the fry in the nursery until 2 in long when he feeds chopped small shrimp *Acetes* (he has steady supply too at P40 per ganta) and transfers them to grow out cages. His culture period is 0.5-1.5 yr. He does selective harvesting every week (250-400 kg) on orders from Iloilo City. He sells at P170 per kg.

In Manjuyod, Bais City, Negros Oriental, Mr. Charles Fortaleza oversees 7 ha snapper, seabass, and grouper ponds devoted to game fishing, the FJE Game Fishing. The ponds used to be shrimp ponds until diseases forced them to stop production. The ponds were then converted to bangus, seabass and grouper, and in the last couple of years, converted to game fishing.

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Charlie Fortaleza's sportsfishing operation; he stocks Lutjanus johnii from the wild

RED SNAPPER ... FROM PAGE 23

Mr. Fortaleza keeps a variety of fish and charges game-fishing visitors at P10 (children) and P20 (adults). For his red snapper stock, he bought 2,000 fry from SEAFDEC/AQD and from Bacolod at P7 per in. But this is the first time that he has stocked red snapper that has not grown to market size.

He stocks the fry in nets for 45 days and feeds mosquito larvae (3x aday). "The growth is very good," he says of the fry. After that he stocks them in ponds (feeding 2x a day, trash fish) until they are fished. He also uses small shrimp, *Acetes*, occasionally. For his grouper stock, he gets orders from nearby restaurants from 2 to 11 kg per order. "Orders are not that frequent," he says. "Perhaps if we advertise regular supply to local restaurants, we may get orders for most of our stocks because we intend to commercially produce," he says further. In the mean time, he has to keep his ponds stocked for his game fishing patrons.

Multi-species hatchery solution

Sometimes, aquaculture can be blessed with so much profit. Take shrimp for example. Farmers became instant millionaires, only to go bankrupt in the later years when they were just starting to enjoy the perks. Laden with problems, few have managed to hang on to their enterprise.

Red snapper culture in Capiz, in its fledgeling state, is not without problems. The first is fry supply, second is uncertainty of market for emerging aquaculture species, and nonexistent local government (LGU) regulation on the number of cages.

Fry supply is not readily available when needed for most species. Mr. Elmer Blasurca of Capiz has a solution. He proposes to construct a multispecies hatchery of all high value species in every province in coastal areas funded by the national government in coordination with local government units. His justification: to provide the impetus for aquaculture growth in the Philippines. Initially, he wants to showcase Capiz, a coastal province and already an established aquaculture "boom town." Short of formally presenting the proposal to the provincial board, he has done



Elmer Blasurca. His suggested solution to the perennial fry supply problem is establishment of multi-species hatchery all over the country

groundworking for the acceptance and endorsement on the local government units of his province.

Mr. Blasurca proposes that the multispecies hatchery should initially be financed by the congressional district's Countryside Development Fund through the various LGUs organized as a cooperative. Operations would be maintained by the LGUs. Government banking institutions (DBP or LDP) would then provide loans to small-scale grow-out farmers that would get their fry stock (2,000 - 5,000) from the government-run hatchery. Again the grow-out farmers would be formed into cooperatives.

Loans, however, would have specific requirements. Applicants would first have to undergo training from reputable aquaculture institutions such as SEAFDEC/AQD for technical know-how, among others. The loans would also have a collateral.

As a fishfarmer himself, Mr. Blasurca knows Capiz aquaculture well. He mentioned that the booming grouper grow-out farms have been greatly reduced (from 1,000 cages three years ago to 300) due to scarcity of fry. He adds mudcrab to the struggling grow out industry because, again, fry is not readily available.

Mr. Blasurca is nothing but emotional when he talks about Capiz aquaculture. Orders are plentiful but they are unable to sustain production. "For as long as the fry problem is not addressed, our aquaculture industry would remain in limbo," he says.

With Mr. Blasurca's proposal, perhaps the problems would be lessened, if not entirely solved. Barring usual personal interests and partisan politics, Capiz aquaculture is perfect for the proverbial "shot in the arm."

Mr. Blasurca is representative to the Provincial Small and Medium-Scale Enterprise Development Council of Capiz.

The SEAFDEC/AQD part

The AQD answer to fry availability more or less dovetails with Mr. Blasurca's proposal. In the past years, AQD has established multi-species hatcheries at the Bureau of Fishries and Aquatic Resources (BFAR) in Puerto Princesa, Palawan, and in Western Samar through the Philippine Business for Social Progress. Through PBSP, the AQD multi-species hatchery technology is duplicated in other coastal towns where PBSP implements coastal resource development programs. The following species will now be duplicated following successful testing and verification in the local environment: green grouper, mangrove red snapper, trevally ("talakitok"), the staking method of mussel culture, mudcrab in sea pen and in mangrove, freshwater tilapia, and the hanging method of seaweed. One hundred eighty-eight beneficiaries are expected to adopt the technology in Samar alone.

In Palawan, the leopard coral trout (P2,390/kg live fish, year 2000), locally known as *suno* was successfully induced to spawn at the Inland Searanching Station of BFAR where a multi-species hatchery is being maintained. This is significant to the government of Palawan's campaign against cyanide fishing. The station would eventually supply the fry needs for the culture of high value marine fish and perhaps even achieve reseeding activities.

AQD first spawned wild-caught mangrove red snapper in captivity in 1992. In 1997, AQD reported the survival of snapper larvae using natural food (*Brachionus*, *Artemia*). Since then, hatchery techniques have been developed. AQD now sells red snapper fry to interested fishfarmers on a limited basis (excess fry from research activities). In most ways, the technology has benefitted the growing popularity of red snapper culture in cages.

Training, websites, EXTENSION MATERIALS

Year 2003 (tentative) SEAFDEC/AQD TRAINING COURSES

Crab Seed Production, 23 April to 22 May
Marine Fish Hatchery, 7 May to 5 June
Management of Sustainable Aquafarming Systems, 4 June to 3 July
Responsible Aquaculture Development (Third Country Training
Program funded by JICA), 2 September to 31 October

DISTANCE LEARNING

Principles of Health Management in Aquaculture, 5 May to 15 August

For application forms and further information on next year's training, please contact

Tel/fax: 63 (33) 336 2891, 335 1008

E-mail: training@aqd.seafdec.org.ph

For local applicants who wish to apply for fellowships, contact

Hon. Cesar Drilon, *SEAFDEC Council Director for the Philippines*
Office of the Undersecretary for Fisheries and Legislative Affairs
Department of Agriculture, Elliptical Road, 1104 Diliman, Quezon City
FAX: (02) 927 8405

For fellowship applicants from other countries, please contact your respective SEAFDEC Council Director

SEAFDEC websites on the internet

- www.seafdec.org
about the SEAFDEC family; regional programs are highlighted, including those of the SEAFDEC Training Department in Samut Prakan, Thailand
- www.seafdec.org.ph
about the SEAFDEC Aquaculture Department based in the Philippines
- www.mangroveweb.net
about the ASEAN-SEAFDEC mangrove-friendly shrimp culture project
- www.agrolink.moa.my/dof/seafdec
about the SEAFDEC Marine Fishery Resources Development and Management based in Malaysia

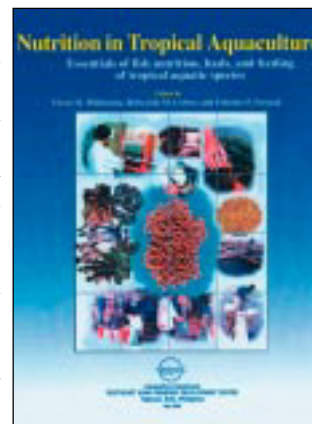
NEW!



Disease Control in Fish and Shrimp Aquaculture in SEA - Diagnosis and Husbandry Techniques, 215 pages, edited by Yasuo Inui and Erlinda Cruz-Lacierda. This volume contains the 14 papers presented at a seminar-workshop held December 4-6, 2001 that was organized by SEAFDEC and the Office International des Epizooties. For a copy,

contact Dr Erlinda Cruz-Lacierda at eclacier@aqd.seafdec.org.ph or fax (63-33) 336 2891, 335 1009.

Good news for fish students, faculty, and researchers in Southeast Asia. Here finally is a textbook on tropical aquaculture nutrition when most textbooks are often on species that are best suited to temperate conditions.



Nutrition in Tropical Aquaculture is edited by SEAFDEC/AQD scientists Dr. Oseni Millamena, Dr. Relicardo Coloso, and Dr. Felicitas Pascual. The contents are research-based information from several years of studies in fish nutrition and feed development at AQD. The textbook is the second title released from AQD's textbook writing program.

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Website for networking with fish health professionals in Southeast Asia and elsewhere

<http://afs-fhs.seafdec.org.ph>

Home of Fish Health Section of the Asian Fisheries Society or AFS which has membership of about 3,000 fisheries professionals from 75 countries and territories. AFS-Fish Health Section's secretariat is presently hosted by AQD.



Website for fishfarmers learning farm tech

<http://www.seafdec.org.ph>

Check out SEAFDEC/AQD's discussion board - *Aquafarmers' Corner*. This is your site for exchanging and sharing ideas and issues to further aquaculture development in the region. Our vast pool of experts, through *Aquafarmers' Corner*, hopes to answer your queries on aquaculture technology at the farm level. We would like to hear about your experiences too, so that we may build on it. Come, visit us!



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For the Filipino and English versions, contact Dr Erlinda Cruz-Lacierda at eclacier@aqd.seafdec.org.ph or fax (63-33) 336 2891, 335 1009.

The book was prepared in 2001 by SEAFDEC/AQD for the Asia-Pacific Economic Cooperation (APEC) Fisheries Working Group FWG 01/2000.

The Southeast Asian Fisheries Development Center (**SEAFDEC**) is a regional treaty organization established in December 1967 for the purpose of promoting fisheries development in Southeast Asia. Its Member Countries are Japan, Malaysia, the Philippines, Singapore, Thailand, Brunei Darussalam, the Socialist Republic of Viet Nam, Union of Myanmar, and Indonesia.

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Contributions

We accept articles that focus on issues, developments, and information on all phases of sustainable aquaculture for publication in this newsletter. Photographs and line drawings must be camera-ready, glossy B&W prints or colored slides. The newsletter editor reserves the right to edit contributed articles for brevity and style.

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THE EMERGING RED SNAPPER CULTURE



Red snapper is a favorite food fish in many Asian countries. In the Philippines, most table-sized snappers are from wild catch while a limited amount is cultured in floating net cages offshore or in ponds. A new trend is starting to emerge where red snapper are grown in ponds for game fishing.

Most fry are wild caught; a diminishing seed supply having already been experienced by snapper farmers. Be that as it may, snapper continues to be raised either for domestic or provincial consumption and has been so practiced through the years.

For years, red snapper had been stocked in cages and ponds only when fry from the wild are available. But this is slowly changing with the recent introduction of hatchery-produced fry.

The road marker at the boundary entrance to Roxas City says that it is the seafood capital of the Philippines



A look into some farms might give an indication of whether or not cultured red snapper in the Philippines can be considered promising given that it is relatively unknown to most fish users as a favorable kind of fish suitable for the live markets to restaurants and for value added products. In 1999, *Infofish International* predicted an increase in the live markets for other species that are not so expensive. Hong Kong is the main Asian market for the live fish trade but demand from southern China has also increased resulting in Hong Kong's reshipping of about 50% of its import. Further, the report states that "a large proportion of live fish (mostly Malabar grouper and snapper) enters China through Hong Kong via legal and illegal means. Fish farmers with farms on the China/Hong Kong border are permitted to land their product in China at a minimal cost." Thus, cages belonging to Hong Kong fishfarmers serve as holding facilities for live fish from foreign suppliers.

Red snapper culture in west central Philippines

The province of Capiz has been conferred the seafood capital of the Philippines perhaps because of the variety of fish that is being cultured in commercial quantity within the province - shrimp, mudcrab, grouper, milkfish, snapper, seabass, tilapia. Even the minuscule *agiis*, a shellfish suitable as live whole feed for shrimp and mudcrab, are gathered and restocked in muddy substrates until harvestable, and sold on a per ganta basis.

In Barangay Dayao in the Bara River, Mr. Panaguition raises red snapper in cages and pens (above photos). Five months earlier, Panaguition, manager-owner of several cages and pens, stocked red snapper fry which he bought from Alson's Aqua Technologies, Inc, a firm based in General Santos City. He stocked them in cages and pens. He first stocked the fry (0.75 in) in cages with a "mongo-

👉 page 23, please

Support sustainable aquaculture