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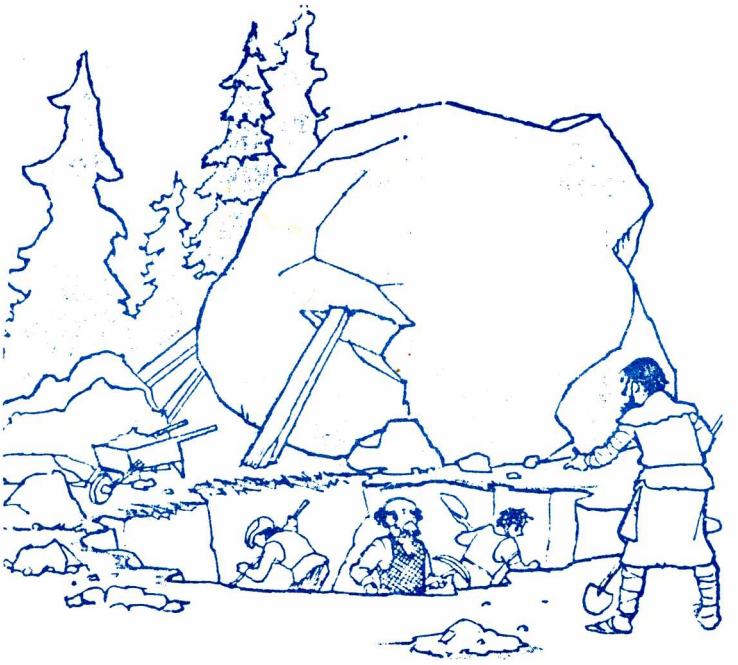
Aquaculture and its human elements

First of all, a story:



When St. Petersburg, one of the most splendid and harmonious cities in Europe, was being laid out early in the 18th century, many large boulders brought by a glacier from Finland had to be removed.

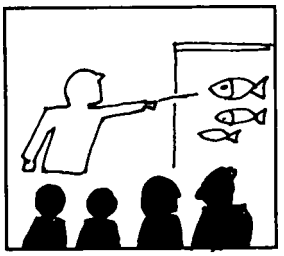
One particularly large rock was in the path of one of the principal avenues that had been planned, and bids were solicited for its removal. The bids submitted were very high. This was understandable, because at that time modern equipment did not exist and there were no high-powered explosives. As officials pondered what to do, a peasant presented himself and offered to get rid of the boulder for a much lower price than those submitted by other bidders. Since they had nothing to lose, officials gave the job to the peasant.

The next morning he showed up with a crowd of other peasants carrying shovels. They began digging a huge hole next to the rock. The rock was propped up with timbers to prevent it from rolling into the hole. When the hole was deep enough, the timber props were removed and the rock dropped into the hole below the street level. It was then covered with dirt, and the excess dirt was carted away.

It's an early example of what creative people or creative thinking can do to solve a problem. The unsuccessful bidders only thought about moving the rock from one place to another on the city's surface. The peasant looked at the problem from another angle. He considered another dimension - up and down. He could't lift it up, so he put it underground. (Source: **Bits & pieces,** Oct. 15, 1992. The Economic Press, New Jersey.)

This issue assesses aquaculture education and training in Southeast Asia, especially for entrepreneurs to have a general view of manpower available to them. For technical staff and fishfarmers, available information and training programs are noted. This issue focuses in particular on the SEAFDEC Aquaculture Department.

Fisheries education and training in Asia



Historical development. If one word were to embrace the education and training systems in Asia, it would be **diversity.**

Countries like Australia, India, Malaysia, Singapore, and Sri Lanka followed British educational traditions in view of their previous colonial ties. Malaysia recently changed the language of undergraduate education from English to Bahasa Malaysia while India went on to follow the American Land Grant Universities system. Indonesia did not adopt a Dutch system, using instead an American group of advisors, while the Philippines closely followed American university programs. Thailand had an American group reformulate the education programs in (*inter alia*) fisheries at Kasetsart University.

China began modest fisheries schools for two private companies in 1904 and 1906, and the first public fisheries schools after the 1911 revolution. Other countries developed their fisheries education after World War II. In Australia, it was in the form of courses for returned soldiers, but a fisheries degree was not offered until 1980. In India, two fisheries training courses began in 1945, but not until 1961 were national institutes established; university-level courses started in 1969. Before World War II, only extension courses were available in Indonesia. A "study program" of the Department of Agriculture in Indonesia started shortly after the country's independence in 1945. The University of Indonesia began two Departments of Fisheries (marine and inland) during 1960-62, which became the Faculty of Fisheries of Bogor Agricultural University in 1963. Now 16 universities in Indonesia offer fisheries degrees. In the Philippines, a postsecondary school of fisheries began in 1946. The Philippine Institute of Fisheries Technology under the Bureau of Fisheries was elevated to a college under the University of the Philippines in 1958, and began awarding the B.S. degree. Since then, there was an explosion of Philippine institutions offering fisheries courses at various levels - 66 in 1986.

Other countries have even more recent histories of fisheries education. In Singapore, formal fisheries teaching began in 1962 with establishment of the Fisheries Biology Unit (FBU) which provided diploma/certificate courses until 1973. The Southeast Asian Fisheries Development Center (SEAFDEC) began training courses in 1970 and the Zoology Department - (now) National University of Singapore - offered fisheries subjects but not fisheries degrees. In Malaysia, fisheries training did not begin until 1959, in the form of short courses for fisheries officers; fisheries schools for fishermen began the next year. By 1974, diploma-level courses were available and by 1979, B.S. courses. Sri Lanka is the most recent addition: a department of fisheries biology began in 1987, but fisheries degrees are not offered.

Courses. At present, Ph.D. degrees in fisheries are offered in China (1 institution), India (10), Indonesia (1), Japan (9), Malaysia (1), and Taiwan (2). Other countries have institutions with M.S. level degrees: 14 in Japan, and 2 each in the Philippines and Thailand. Institutions in other countries offering B.S. as their highest level include 3 in India, 15 in Indonesia, 7 in Thailand, and 32 in the Philippines. Australia offers only diploma and bachelor's programs. Many diploma/certificate courses are available in India and the Philippines; 1 in Australia; several in Indonesia; and 8 in Malaysia. Courses for extension workers are available at six training centers in Malaysia, one in India, and one in Taiwan. The Philippines offers extension courses at government centers but these seem to be for farmers rather than extension workers themselves. In-service training is widespread in nearly all countries. The institutions offering these courses range from universities to vocational high schools.

Facilities. One indication of the state of commitment by a country to fisheries education

B.S. Fisheries

Minimum requirements for a 4-yr program in the Philippines

I. **General Education**: Botany and Zoology (6 units), Mathematics (9), Statistics (3), Physics (6), Chemistry (10), Pilipino (6), English and Speech (12), Spanish (12), Humanities/Philippine Institution (6), and Social Science (6).

II. **Major**:

A. Inland Fisheries. Freshwater Aquaculture (5), Brackishwater Aquaculture (5), Fishpond Construction (5), Fish Diseases (5), Fish Feeds and Feeding (5), Pond Management and Fertilization (4), Fish Physiology (4), General Fisheries (3), Ecology of Fishes (3), Inland Fisheries Management (3), Ichthyology (5), Aquatic Invertebrates (3), Fisheries Economics (3), Fisheries Extension (3), Fisheries Marketing (3), and Electives (10).

B. Marine Fisheries. Fisheries Gear Design and Construction (5), Biological Oceanography (3), Fisheries Economics (3), Marine Ecology (3), Navigation and Seamanship (10), Marine Fisheries Management (3), Marine Machineries (3), Offshore and Coastal Fisheries (5), Fishing Boat Management (5), Marine Instrumentation (5), Fisheries Extension (3), Fishing Boat Construction and Design (4), Electives (10).

C. Fish Processing. Fish Processing (10), Fish Handling and Refrigeration (5), Fish Microbiology (5), Fish Chemistry (5), Fisheries Economics (3), Food Processing Plant Management (5), Fisheries Extension (3), Fisheries Marketing (3), Quality Control (5), Fish Processing Machinery and Appliances (5), Electives (10).

III. **Practicum**: 120 hours.

'Tis education forms the common mind,
Just as the twig is bent, the tree's inclined.

- Alexander Pope

is the number of training vessels, since these are major capital items to acquire and maintain. Australia and the Philippines each have one, Indonesia has three, Malaysia 10, and Japan 12, while India has 20. Thailand educational institutions support one and also use space on naval and SEAFDEC vessels.

In general, the state of the various training facilities is said to be adequate in Australia, Malaysia, and Thailand; good in India (except for the lack of field equipment in "traditional" universities) and in Japan; and poor in Indonesia (literature rather than practical degrees), the Philippines (including insufficient faculty and poor laboratory and fisheries equipment), and Taiwan.

Manpower. There is little information at the national level on the number of teachers or faculty. The annual numbers of fisheries students range from 30 in Sri Lanka to 5,000 in China. Indonesia has some 4,000 students and 340 teachers in the 11 public universities. In Malaysia, 64 faculty members are involved in teaching fisheries-related subjects at three universities. Only one university offers fisheries degrees, with some 68 diploma and B.S. graduates and one or two M.S. and Ph.D. awardees each year. Staff-student ratios appear good in Indonesia (1 in 12) and Malaysia (1 in 6).

India provided figures from an extensive manpower requirements study, which showed that some 180,000 persons would be required for the sector as a whole over the next ten years.

Indonesia needs some 9,600 fisheries technicians and 10,750 extension workers.

Graduates from the universities can probably be absorbed as technicians, but there is no indication of where all the extension workers will come from.

Employment. The rate of subsequent employment is a good guide to the usefulness of a course. Few data on this subject are available. In Thailand, the information on university graduates is interesting: about 50% of aquaculture graduates find employment, 20% of fisheries technologists, and 8% of fisheries biologists. Some 110 (22/year) fisheries graduates are needed in Malaysia between 1986 and 1990, suggesting that there is an oversupply (68/year) at present. If Kitasato University is a good guide to the Japanese situation, university graduates are highly employable in a wide variety of industries.

Weaknesses. The state of education in Australia seems to be adequate while in India it is said to be quite satisfactory, apart from some lack of management skills of graduates and a declining quality of students. Indonesian universities all suffer from lack of practical training. The main problems in Malaysia are the lack of tertiary specialization into fisheries or aquaculture or management, the poor quality of students, and lack of subprofessional training for, e.g., fish farm workers. In the Philippines, there are too many substandard schools, with poor student quality in secondary and postsecondary schools; there are also poor curricula and text books, as well as a lack of practical training in aquaculture. Taiwan colleges suffer from too many narrow courses and insufficiently trained teaching staff. Fisheries students in Thailand need more practical knowledge; lack of access to international literature is also a problem.

It should be mentioned that the available literature on fisheries education is also very poor. Few studies of relevance have been made. UNESCO is the major producer in the field but most of its efforts are directed towards marine science rather than fisheries *per se*.

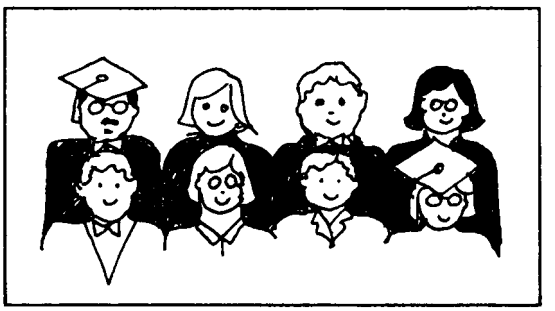
Neither is there evidence of any ongoing commitment by any agency to improve fisheries education in the region, although interest in the broad subject area may be increasing.

The Future. Lack of demand inhibits further development of fisheries education in Australia, Malaysia, and Singapore. In India, the basic need is for modernization and diversification to keep up with modern technology. Malaysia needs a manpower requirements survey, textbooks in Bahasa Malaysia, screening of students, and a review of tertiary programs. The Philippines has already made a plan to streamline the whole fisheries education sector, pruning the number of institutions and revising curricula. Taiwan sees the need to provide more practical training and to improve both curricula and textbooks; another laudable goal is to encourage professional pride! Malaysia echoes the sentiment. In Thailand, there may be a need for more vocational training as well as providing more access to the international fisheries "scene" through visiting scientists, overseas travel and international literature.

Those countries not presently following the American system will probably all move towards that system at the postgraduate level, requiring students to undertake specific courses in addition to the research component which is the only requirement, e.g., the British system for the doctorate degree. The American system also allows much more flexibility in career path.

In India, manpower needs will depend on whether a fisheries degree is made mandatory for various posts in government positions. This could also be the situation in future in other countries. Upgrading the necessary qualifications for key positions would stabilize the demand for graduates.

Sources: (1) Maclean, J.L. 1988. An overview of fisheries education and training in Asia, p. 12-16; and (2) Juliano, R.O. and E.E.C. Flores. 1988. *Fisheries education and training in the Philippines*, p. 86-113. *In* Fisheries Education and Training in Asia: Workshop Proceedings. Asian Fish. Soc. Spec. Publ. 2, 162 p. Asian Fisheries Society, Manila, Philippines.



Courses of Action

The root problem of establishing or strengthening fisheries education systems must be addressed. There must also be political will to improve the industry; improvement of fisheries education systems should be seen as part of overall national efforts to promote the industry.

The following are recommended:

1) Development of a policy which incorporates fisheries education and training into fisheries manpower development strategies.

This can be achieved by:

- determining the quantity, type, and level of manpower required for fisheries development over a fixed period in accordance with national economic development plans;
- incorporating the different levels of fisheries education into the mainstream of education in order to provide a broader and more balanced education.

2) A comprehensive and regular review of fisheries education programs in line with development trends of the fisheries industries.

This could be achieved by:

- strengthening vocational level training at the postprimary/elementary level to provide appropriate training with hands-on experience for skilled labor needed in the industries;
- strengthening technical education at the postsecondary level to provide appropriate training for professional skilled fishermen, fish farmers, and fish processors, and instructors for vocational institutions. This should include a balanced instruction of theory and practice;
- strengthening fisheries education and training programs at university level to provide appropriate education and training for extension workers, research scientists, technicians, instructors, and administrators . This should include a review and restructuring of:
  - undergraduate fisheries programs with specialization in fisheries management, aquaculture, fish processing, fisheries economics, and fisheries extension;
  - fisheries science programs at the postgraduate level to improve the capability of fisheries science graduates in helping the industries to resolve technical problems;
- organizing subregional workshops to discuss complementarity in curriculum development and educational mate-rials.

3) Upgrading existing fisheries training capability in Asia.

- sufficient financial support is essential to improve national training capability in terms of facilities, operation and staff salary scales;
- education and training institutions should have adequate training facilities and staff and should endeavor to attract better quality students; for example, by offering more scholarships;
- the region needs relevant fisheries textbooks and references appropriate for Asia; the writing and translation of fisheries textbooks and other training materials is urged.

4) Promotion or strengthening of a network of fisheries educational institutions with areas of excellence in fisheries science.

This could be attained by establishing a consortium of fisheries institutions to provide opportunities for exchange of professional staff, graduate program complementarity, and collaboration on research and training activities.

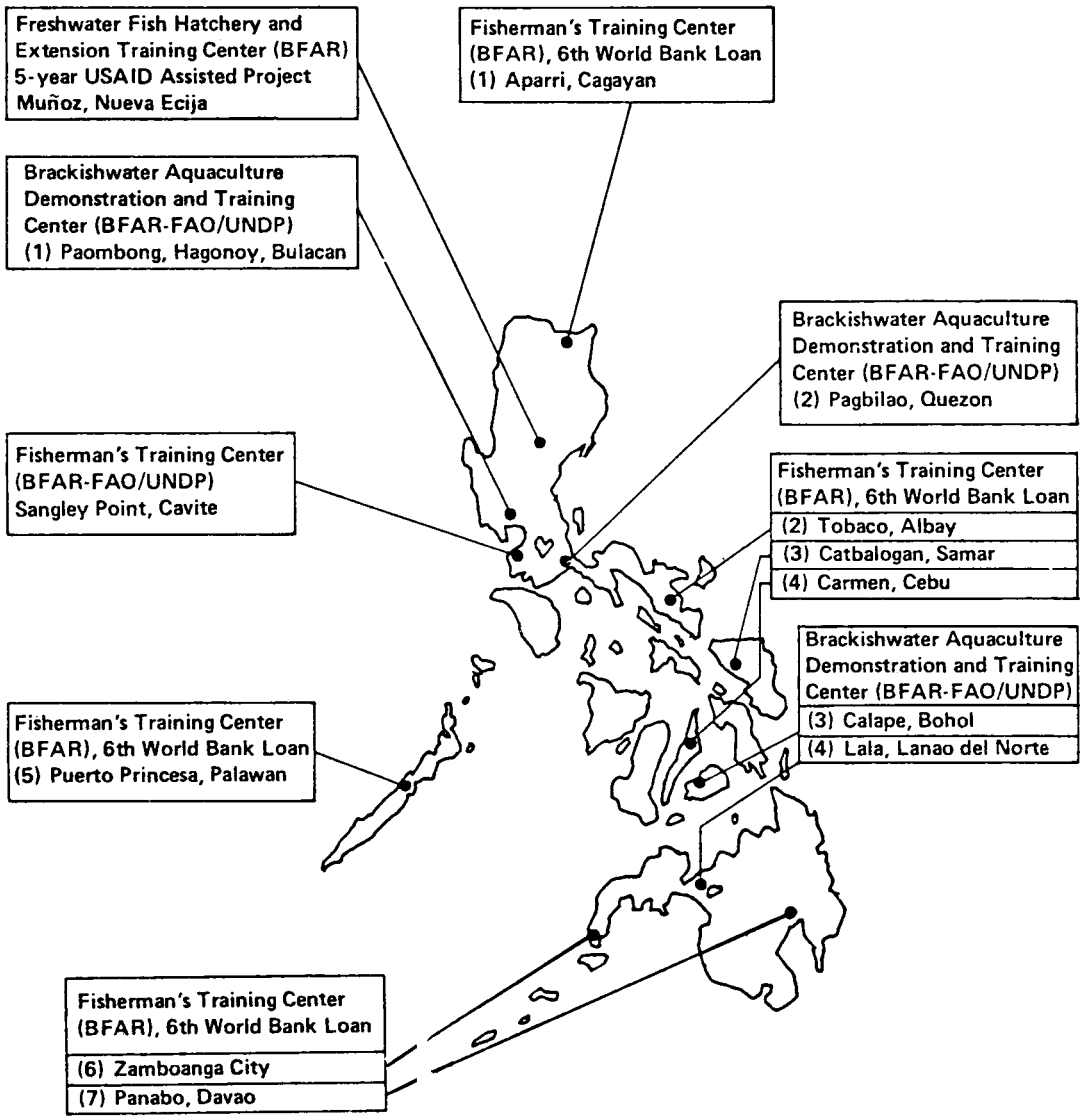
5) Stronger linkage and cooperation among fisheries professionals in government, universities, and private institutions involved in training, research, and development.

6) Taking steps to improve the image of the fisheries profession and the professional status of fisheries personnel.

Source: Asian Fisheries Society. 1988. Workshop statement of fisheries education and training in Asia. p. 1-6. *In* Fisheries Education and Training in Asia: Workshop Proceedings. Asian Fish. Soc. Spec. Publ. 2, 162 p. Asian Fisheries Society, Manila, Philippines.

Training opportunities in the Philippines

Department of Agriculture
Bureau of Fisheries and Aquatic Resources (BFAR): 860 Quezon Ave., Quezon City. Academic program: aquaculture (vocational), fisheries (vocational). Fields of interest: fishpond engineering management, economics, extension methods, and postharvest technology. Short courses for skippers, fishermen, boat engineers; aquaculture training for extension workers. Also conducts individual training. Other DA-BFAR stations are detailed in the map below.



Aquatic Biosystems
National Highway, Bay, Laguna; or write to 164 Aurora Blvd, San Juan, Metro Manila. Fields of interest: development of aquaculture production systems. Short courses: tilapia hatchery/nursery

management; tilapia pond and cage culture; vermiculture. Also conducts individual training.

Bicol University - College of Fisheries
Albay, Philippines. Academic program: BS fisheries/aquaculture. Field of interest: aquaculture. Also conducts individual training.

Central Luzon State University - College of Inland Fisheries
Muñoz, Nueva Ecija 2320. Academic program: MS aquaculture; BS fisheries. Fields of interest: inland fisheries (aquaculture and fisheries management). Short courses for fish farmers, managers, and extension workers. Also conducts individual training.

Central Luzon State University - Freshwater Aquaculture Center
Muñoz, Nueva Ecija 2320. Field of interest: freshwater pond aquaculture especially integrated farming and tilapias; rice-fish culture. Short courses: freshwater aquaculture production and marketing, hatchery and culture techniques for tilapia, others. Also conducts individual training.

FAO/UNDP South China Sea Fisheries Development and Coordinating Program
P.O. Box 1184, MCC, Metro Manila. Short courses: small-scale pen and cage culture for finfish, sea bass spawning and larval rearing, others.

Mariano Marcos State University - School of Fisheries
Currimao, Ilocos Norte 0307. Academic program: Diploma (aquaculture, fisheries), vocational high school (fisheries), BS fisheries. Short courses: seaweeds processing, finfish culture, mollusc culture. Also conducts individual training.

Mindanao State University - Institute of Fisheries Research and Development
Naawan, Misamis Oriental, 8418. Academic program: high school, BS, Diploma in fisheries/aquaculture. Fields of interest: fish capture, mariculture, fisheries extension, marine biology, fish processing, others. Short courses: shrimp hatchery. Also conducts individual training.

Mindanao State University - School of Marine Fisheries and Technology
Naawan, Misamis Oriental. Academic program: high school and BS in fisheries/aquaculture. Fields of interest: mariculture and fish capture, fish extension, marine biology, fish culture, others. Short courses: shrimp hatchery. Also conducts individual training.

SEAFDEC Aquaculture Department
Tigbauan, Iloilo 5021. Fields of interest: freshwater, brackishwater, and marine aquaculture especially milkfish, penaeid shrimps, others. For a list of courses and individual training for 1993, see p. 19.

Silliman University - Marine Laboratory
Dumaguete City 6501. Academic program: BS/MS. Field of interest: marine biology.

University of the Philippines - Visayas College of Fisheries
Miag-ao, Iloilo. Academic program: BS, MS fisheries/aquaculture. Field of interest: brackishwater finfish and crustacean culture, advance aquaculture, nutrition, others. Short courses: aquaculture course for extension workers and fish farmers. Also conducts individual training.

University of the Philippines - Diliman Marine Science Institute
Diliman, Quezon City. Academic program: MS. Field of interest: marine biology and oceanography.

Xavier University - Institute of Marine Science
Cagayan de Oro City, 8401. Academic program: MS. Field of interest: marine biology.

Sources: (1) Juliano, R.O. and E.E.C. Flores. 1988. *Fisheries education and training in the Philippines*, p. 86-113; and (2) *A list of 203 institutions offering fisheries education and training opportunities in Asia*, p. 154-161. In **Fisheries Education and Training in Asia: Workshop Proceedings.** Asian Fish. Soc. Spec. Publ. 2, 162 p. Asian Fisheries Society, Manila, Philippines.

Fisheries Information Services in South and Southeast Asia

Here is a listing of relevant South and Southeast Asian information sources:

Title	Products/services	Status	Address for inquiries
AIBA or Agricultural Information Bank for Asia	Coordinates Agricultural Information Network for Southeast Asia (AGINFONET-SEA); produces bibliographies; answers inquiries. Also maintains CARIS database.	Began 1974; produced fisheries bibliography from 1976. There are 5,500 entries to date.	c/o SEARCA, Los Baños Laguna, Philippines
BRAIS or Brackishwater Aquaculture Information System	A specialized information analysis center for brackishwater aquaculture. Produced bibliographies on shrimp, mud crab, mussels, rabbitfish, sea bass, milkfish, and grouper; state-of-the-art review on shrimp; and registries of institutions and scientists. Provides query-answering services.	Began April 1984. Over 7,000 entries on subject databases. Ended 1990. Products available c/o SEAFDEC/AQD.	c/o Library, SEAFDEC/AQD P.O. Box 256, Iloilo City Philippines
INFIS or Indonesian Fisheries Information System	A network of fisheries libraries and documentation centers coordinated by the Directorate General of Fisheries Library. Produces, translates extension materials.	Began October 1984. About 1,500 database entries.	P.O. Box 3071, Jakarta 10002, Indonesia
INFOFISH	FAO. Marketing information and advisory services for fish products in the Asia/Pacific region; bimonthly marketing digest and trade news on subscription.	Began 1981. Fully developed with computerized services.	P.O. Box 10899, Kuala Lumpur 50728 Malaysia
MALFIS or Malaysian Fisheries Information Systems	Information on all aspects of the industry in Malaysia, including catch, economics.	Began 1988. Produced several bibliographies; about 1,000 entries to date.	Fisheries Mgt. and Info. Unit Dep't of Fisheries, Ministry of Agriculture, Kuala Lumpur
NACA or Network of Aquaculture Centers in Asia	Info. for aquaculture farm management based on numerical database AQUIS. Priorities: shrimp, carp, pen/cage culture, integrated farming, mollusc, and seaweeds.	At planning stage; existing AQUIS database of production data available.	c/o NIFI, Kasetsart Univ. Bangkhen, Bangkok 10900 Thailand
PASFIS or Philippine Aquatic Services and Fisheries Info. System	Proposed network of 12 institutions with the UPV as lead center, to produce national bibliographies, abstracts, journals, reviews, digests, extension materials.	Organizational seminar held 1982. Little funding to date; some bibliographies produced. About 1,000 database entries.	c/o Library, University of the Philippines - Visayas Iloilo City, Philippines

(please turn to p. 16)

SEAFDEC/AQD and its training alumni: a partnership in technology transfer

In the last 17 years, AQD has followed the classic research-extension-farmer approach in technology transfer. Its extensionists are mainly the training alumni, although AQD conducts some outreach programs and disseminates information through its publications, video programs, and library/documentation services. Indeed, AQD has trained over 7,000 fishery technicians and aquaculturists from all over the world. This partnership with the training alumni was strengthened through the recently concluded *Aquaculture Workshop for SEAFDEC/AQD Training Alumni* held September 8-11, 1992 at the Tigbauan Main Station. The workshop aimed to (1) establish linkage between the Department and its training alumni and among trainees; (2) assess and evaluate the effectiveness of the various training courses conducted by AQD; (3) update alumni on the recent technologies developed by AQD; and (4) recommend strategies to make the training programs more responsive to the needs of the fishfarmers and the aquaculture industry.

As a result, two new training courses were recommended: *Mollusc Culture* and *Brackishwater Pond Culture*. These are additions to the courses offered every year like *Fish Nutrition, Hatchery/Nursery of Marine Finfishes, Fish Health Management,* and *Aquaculture Management* and the courses offered every two years like *Culture of Natural Food Organisms* and *Shrimp Hatchery and Nursery Operations*. The workshop also pressed for continuous internship for training alumni, incorporation of the environmental aspects of culture systems to the course content, and extension of some courses to include more practical work.

The proceedings of the workshop will be available from AQD in the first quarter of 1993.

Assessment of aquaculture training needs

AQD is planning to conduct an assessment survey of the aquaculture training requirements in the region to improve its training programs. The survey will cover actual needs and available aquaculture manpower. The survey will also include a tracer study of former AQD trainees. In addition, the survey will attempt to evaluate the extent of utilization of technologies developed by AQD. As a feedback mechanism, results of the survey will be used in the planning of research studies to be undertaken by AQD.

The target clientele for the assessment survey are the aquaculture agencies, aquaculture institutions, former AQD trainees, and fish farmers' associations in the Philippines, Malaysia, Thailand, Singapore, Brunei Darussalam, and Indonesia. AQD also hopes to promote cooperation among aquaculture institutions in the ASEAN countries. The ultimate goal of the survey is to transfer AQD technology to the fish farmers and to involve them in the research plans of the Department.

AQD's newest training graduates

The *3rd Training Course on Aquaculture Management*, conducted by AQD Sept. 30 to Oct. 29, graduated fifteen participants: Rene Calumpang, Marie June Esprela, Tomas Mercado, Herminia Javier, Emilio Gulle, Marlou Fernandez, Justerie Granali, Merlina Andalecio, Edgar Estanislao, Antonio Abogado, Gerarde Malate, Sonyos Sidtichokpan, Prapun Leepayakoon, Prem George Philip, and Haydar H. Alsahtout.

The four-week course was aimed at developing the skills of project managers in aquaculture planning and implementation, monitoring, and evaluation. Participants were also expected to use the different managerial tools whenever applicable and likewise be updated on new developments in aquaculture.

The *Training Course on Fish Nutrition* on the other hand is attended by participants from five countries: Edgar Balambao, Zenaida Fontanila, Guia Teresita Taleon, Dionisio Calantro, Olivia Payba, and Dennis Flores - Philippines; Hamdan Alawi - Indonesia; Pravit

(please turn to p. 12)

A total of 81 training alumni from Malaysia, Thailand, and the Philippines; observers/ guests; and AQD staff attended the 4-day workshop. AQD's efforts to help develop the aquaculture industry through technology transfer was lauded; and, without exception, all the training alumni present expressed their appreciation for AQD's highly relevant and effective courses.

In the workshop, AQD learned the status of seed production, nursery and grow-out, fish nutrition, and fish health in SEAFDEC Member Countries from its training alumni who presented country reports. In turn, the training alumni were updated by AQD on its research technologies developed in the last three years (1988-1991). AQD also discussed its research plans and activities for the next three years (1992-1994). Training and information activities were also discussed.

Issues discussed ranged from shrimp fry quality, the practicality of formulated feeds, marketing value-added products, to pollution, mortalities, and role of governments.


CLOSING CEREMONIES
AQUACULTURE WORKSHOP FOR
SEAFDEC/AQD TRAINING ALUMNI

AQD AND ITS ALUMNI ... con't from p. 9

Laoobuth, and Pranee Sraboul - Thailand; Alex Kwok Chi-Keung - Hongkong; and Omar Jaafar, Rostan Tili, and Mohd. Zadodin Ismael - Malaysia.

The six-week course - from Oct. 22 to Dec. 2 - covers important topics in fish nutrition such as nutrient and nutritional requirements of cultivated species; sources of nutrients; physiology of feeding, feed formulation, preparation and storage; feeding procedures; feed analysis and evaluation; and economic aspects of different types of artificial feeds and feeding.

New training courses at AQD

AQD is planning to offer two new courses - *Seaweed Culture (Kappaphycus)* and *Aquaculture Training Program Development and Management.* (See also p. 19.)

Seaweed Culture (Kappaphycus). This three-week training course is intended for fishery extension workers, farm managers, and future seaweed farmers. It aims to give basic preparation on the identification of local seaweed species, biology and ecology of *Kappaphycus* and other economically important local seaweeds, and their uses; provide practical skills on seaweed (*Kappaphycus*) farming techniques, management, post-harvest handling, and quality control; and compare the cost and returns of seaweed farming using fixed bottom line, raft culture, and hanging long line.

Aquaculture Training Program Development and Management. This four-week training aims to provide project managers, planners, and trainors with training on how to plan, design, and conduct training programs, replicating the regular training courses offered by AQD at the national level. It will orient participants on the various aspects of aquaculture operations, focusing on training methodologies and preparation of audiovisual materials.

Participants should be able to organize and conduct national aquaculture training courses upon their return to their respective countries.

The schedule of the course will be determined later.

Technical Assistance from AQD

Small-scale fishfarmers can access the latest AQD technology through various means:

1) Fishfarmers can write the Research Division Head (or the Training and Information Division Head) for technical assistance. These technical queries are referred to researchers expert in a particular field. (Some of these queries are featured in this newsletter.)

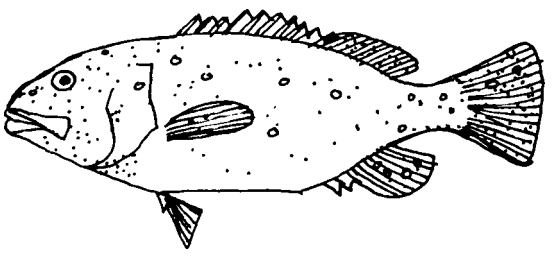
2) Fishfarmers can visit the AQD booth in science and technology fairs and exhibits. AQD usually fields a researcher to act as aquaculture consultant.

3) Fishfarmers can write the Library and Documentation Services for references or materials. Or, the Sales/Circulation Unit for AQD-published or produced books and video programs.

4) Fishfarmers may also subscribe to the quarterly newsletter *SEAFDEC Asian Aquaculture* and/or to the bimonthly *Aqua Farm News.* The former features research published in scientific journals, the latter the latest technology for cultured species and other noteworthy information excerpted from various sources. The two newsletters carry updates of AQD research, training, and information activities. Charge is minimal, ₱50 and ₱40 per year, respectively.

5) A visit to AQD can also be accommodated. During the visit, the fishfarmer or a group of fishfarmers may talk with researchers and inspect AQD facilities. Write to the Visitors' Service to arrange itinerary and lodging in advance.

6) It is also possible to invite AQD researchers to talk on a specific topic. However, the cost of the seminar, travel of researchers, and incidental costs must be shouldered by the inviting group.



The fisherfolk

Profile of a target clientele

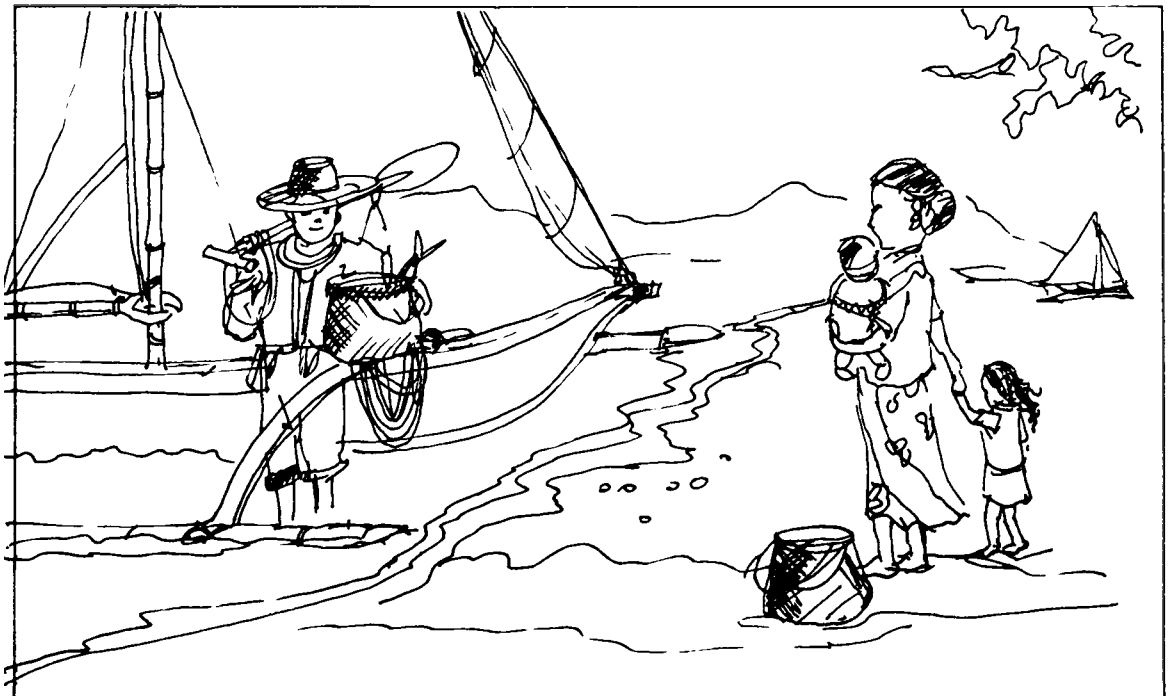
Development cannot and will not take place unless it takes into account the people who are supposed to be the recipients of such a developmental movement. The people should be the agents of their own development, the actors and not simply the spectators. Development should take place through them and with them and not imposed on them. The good news of development cannot be forced down the people's throats for then all efforts would go like water on a duck's back. The process then of development starts with the individual, and thereby, a knowledge, an understanding and a sensitivity to what the individual is like, is imperative. The Messiah for development must understand the people's fears, their basic views of life, their joys, their frustrations, their ways of coping, their reactions to situations, their nature, their aspirations and work through them, for it is here where the seeds of development will be sown and if accepted, flourish.

"Rural development," according to noted anthropologist Landa Jocano, "can be accelerated if the people who are ironically never consulted about plans to change their lifestyles are better understood on their own terms. The rural folk have their own conceptual models for action, thought, belief, and aspiration - an intelligible world view which makes life real and meaningful to them. Many have failed to realize this in dealing with the barrio people. This in turn explains our failure to grasp why they insist on their traditional and accustomed ways of doing things instead of taking advantage of scientifically tested methods that modern technology offers."

A survey was then conducted by the University of the Philippines - Visayas to determine the psychological characteristics of fishermen in selected municipalities in Iloilo (Philippines). There were 346 respondents, or 20% of the total population of husbands and wives in Concepcion, San Joaquin, and Nueva Valencia.

The fisherfolk: who can they be?

Fisherfolk have great trust in their capacity to support themselves and their family. They are proud of themselves and their family, though they worry about their children and their poverty. They are patient and would pray when afraid. Feelings of shame grow out of their wrong doings and of their poverty. When oppressed, their most frequent reactions are anger followed by patience. They feel sad when alone, and when they have no money. When others are oppressed, they feel bad and would help. When others have more, they do not feel envious but would strive to be like those who have more. Their biggest source of happiness is the family. When others don't like them, they are patient and stay away. They have great trust in God and in themselves. They would refrain from doing something that others don't approve of. They are interested in new ideas and are willing to learn but do not welcome the idea of transferring to another place. They love and respect their parents, perceive their family as happy, but poor. Money is for them the most important in life and they dream of a better life where they will have enough to eat, a comfortable home, and time to rest.

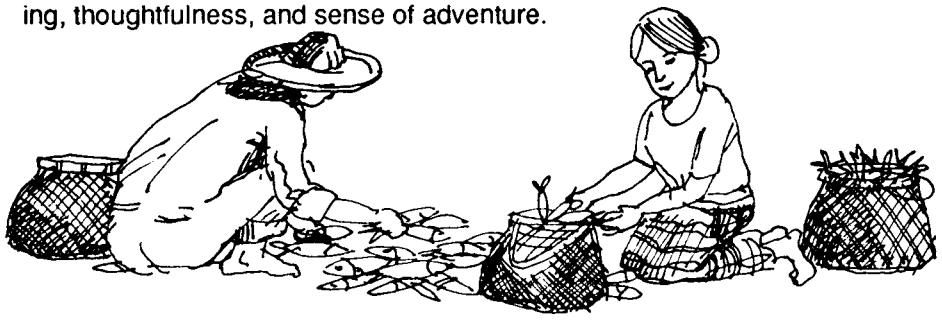


The fisherfolk also dream of being able to send their children to school. Good fortune is attributed to God's help. In time of crisis, they call on God and their spouse for help. Children are welcome because they assure parents of support in the latter's old age. The fisherfolk are happy to have money so they can send their children to school, a task they consider an obligation. They believe that education means a better life for the children. When deceived by a friend, they are patient as they believe that there is a God in the heavens that will demand retribution from their enemies. They are also wary of strangers.

The wives are more sensitive and more orderly than husbands, but husbands are calmer, gaier, and more adventurous.

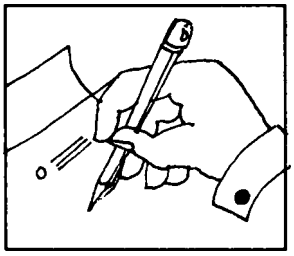
The higher the educational attainment, the greater the respectfulness, intelligence, humility, honesty, sense of responsibility, understanding, thoughtfulness, neatness, and sense of adventure. This relationship between educational achievement and the possession of positive personality traits indicates a need for education.

The younger the respondents, the greater their perseverance, understanding, thoughtfulness, and sense of adventure.



Source: Castells, Ma. NB and Ticao, CJ. 1985. Psychological characteristics of fishermen in selected fishing municipalities in Iloilo. UPV-AFSSRN Research Rep. No. 6. ICLARM, Metro Manila. 394 p.

When a handshake won't do



How many times have you hired someone to do construction work that ended with something different than planned or had a price considerably greater than originally projected? Unfortunately, such situations happen far too frequently and often are the result of a failure to communicate. Aquaculture facilities are generally very expensive and construction delays or misunderstandings can be financially disastrous.

Verbal construction contracts and brief written contracts are, for the most part, legally binding. What these agreements say is that you will pay someone a sum of money and they will build something for you. Perhaps such agreements were sufficient in the past but with increased costs and structural complexity comes the need for increased clarity of the contract. A well written contract with specifications protects both you and the contractor. It is a notice which says, "Yes, we both understand each other."

A contract should define the project: its dimensions, location, quality of materials and workmanship, construction procedure, site preparation and cleanup, who is to provide the materials, ownership of surplus materials, responsibility for any on-site damage to materials or incomplete structure, procurement of permits, and other items specific to the construction.

The contract also describes such items as contractor bonding, liability insurance, performance dates and penalties, payment schedules and amounts, inspection, use of subcontractors, and other legal items pertaining to the cost of construction.

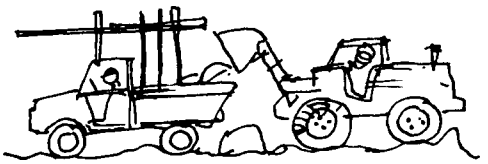
A properly written contract contains contingency clauses which allow extra time for adverse weather conditions or material availability delays not caused by the contractor. Allowances are also made for construction changes once the project has been started. Changes may develop because of unforeseen site problems or because you might want to change or modify the design. In any case, a change in the construction should be preceded by a short form written agreement describing the change and the added or reduced cost and time resulting from the change. The agreement should be signed by both parties and kept with the original contract.

This sounds like excessive paper work. However, with this written document, you now have a means to hold the contractor to what was agreed. If there is a disagreement and there are no contract specifications, you have no legal proof that the contractor did not provide all services.

Your caution should not end with your signature. You should frequently inspect construction progress. Do this in a friendly manner and take note of things you think are incorrect. Discuss these items with the foreman before work progresses so far that correction is impossible or costly. Do not be afraid to question any aspect of the quality of materials or workmanship by the contractor or any subcontractors. Compare the work with that specified in your contract. If you think you really have extensive problems that are not being corrected, get advice from your lawyer and a consulting engineer.

By now you might be thinking the writer is biased against contractors. On the contrary, as a group, farm construction companies do their best to satisfy their customers. But, there are many, many examples of poor communication that result in dissatisfied customers and disgruntled contractors. A very small percentage of farm construction problems occur through overt deception.

Make sure that you have communicated through a proper contract reviewed by a lawyer. Observe and demonstrate your interest in the construction progress. Above all, check with past customers and visit examples of past work before signing any sales or construction agreement.



Source: H.L. Brodie, University of Maryland - Comparative Extension Service, Vol. 4, No. 3. Fall 1989.

newsclip

Bangus mariculture

It is now possible to culture *bangus* (the milkfish, *Chanos chanos*) in marine waters using the fishpen method. This was successfully shown by fishery experts of the Department of Agriculture - Region I based on results of a 500-m² fishpen project in Alaminos, Pangasinan.

Initiated by DA Region I Assistant Director Candido Ramos, the project is also replicated in Sto. Tomas, La Union. Harvest of *bangus* at this site is scheduled within the month.

While *bangus* culture in marine waters could be done only during the non-typhoon months, it is still profitable. Ramos said that given a 500-m² fishpen, a net income of ₱3,250 every three months can be realized. With two croppings a year, fishermen could get ₱6,500.

(to p. 17, col. 2)

FISHERIES INFORMATION SERVICES ... con't from p. 8

Title	Products/services	Status	Address for inquiries
MAARIS or Marine Affairs and Aquatic Resources Info. System	Sri Lanka's national system. Answers inquiries; search and document delivery service; extension material.	Began 1988. Database small to date.	Information Director National Aquatic Resources Agency Colombo, Sri Lanka
PCAMRD or Phil. Council for Aquatic & Marine Research & Dev'l	With an Aquatic Resources Management Unit. To produce bibliographies, directories, production data; includes network of cooperating institutions.	Began 1988. Database w/ 3,000 entries.	c/o PCAMRD Los Baños Laguna, Phil.
REMIC or Regional Mangrove Info. Center	Operates a regional mangrove information center for Asia and the Pacific and a regional network. Provides information and reference services; prepares state-of-the-art reports; quarterly newsletter (*Bakawan*), bibliography.	Began May 1985. Databank under development.	c/o Natural Resources Mgt. Cent. Triumph Bldg. 1610 Quezon Ave. Quezon City, Phil.
SEAFIS or Southeast Asian Fish. Info. Sys.	Regional info. center; ASFIS inputting center; produced 1985 regional bibliography; assists development of national centers.	1984-1989. May become a coordinating secretariat for SEA info. centers.	c/o SEAFDEC Olympia Bldg. 956 Rama IV Road Bangkok 10500 Thailand
SFIS or Selective Fisheries Info. Service	Specialized information service in finfish aquaculture, resource management and small-scale fisheries. Answers inquiries; produces bibliographies; current awareness service via quarterly newsletter; translations; minireviews of literature.	Began April 1984. About 16,000 database entries.	c/o ICLARM MC P.O. Box 2631 Makati, M.M. 0718 Philippines
SICEN or Seaweed Info. Center	To handle inquiries on seaweeds in the Phil. initially, later regionally; ongoing bibliographies	Began 1987. 7,600 records.	c/o MSI, UP-Dil Diliman, Quezon City, Philippines
THAIFIS or Thai Fisheries Info. System	Network of fisheries libraries and information centers with the National Inland Fisheries Institute as a national focal point. Produces national fisheries bibliography, will produce directories on trade and production.	Began 1984. About 2,000 database entries.	c/o NIFI, Kasetsart Univ., Bangkhen Bangkok 10900 Thailand

Source: **Naga, The ICLARM Quarterly**, Apr.1986 and Apr.1989, with updates from **SICEN Newsletter**, Feb. 1990, and the SEAFDEC/AQD Library and Documentation Services.

Aquaculture clinic

Technical queries of this column are referred to SEAFDEC/AQD scientists expert on topic(s) raised by reader(s). Below is a discussion of aflatoxins with Associate Scientist Myrna N. Bautista who has worked on feeds and feeding of shrimps. The topic is of concern to both fishfarmers and fish consumers because the former shoulder the heavy cost of spoiled feeds and fish mortality and the latter the health risks. - Ed.

What are aflatoxins?

Aflatoxins are toxins produced by the fungi *Aspergillus flavus* and *A. parasiticus.* They can cause chronic and acute poisoning, or even cancer.

Where and how do aflatoxins accumulate?

Spores of the fungi are common in our environment. They can be transported via insects, especially flies, wasps, and bees. Given favorable environmental conditions, e.g., warm and humid conditions, these spores germinate and give rise to fungal colonies (molds) which excrete aflatoxin as a by-product. They are also most commonly found in feeds and feed ingredients such as peanuts, corn, coconut, etc.

Aflatoxins are taken in through contaminated feed and absorbed by animals including human beings. Laboratory studies with rats and monkeys show that most aflatoxins injected into their bodies are either excreted or retained in the liver.

What are the effects of aflatoxins on fish and humans?

Aflatoxins cause various types of cancer of the liver of many animals including trout, salmon, duck, rat, mouse, and monkey. One symptom prior to death is weight loss.

Acute poisoning also causes death of affected animals. In chronic poisoning, symptoms vary depending on the nature and concentration of toxins.

How is accumulation of aflatoxin prevented?

Production of aflatoxin can be prevented by reducing fungal growth in crops, by rapid drying and proper storage, or by using antimold preservatives. If aflatoxin contamination has already set in, contaminated materials may be treated. Alkali treatment with sodium hydroxide can destroy aflatoxin in peanut meal. Ammoniation of aflatoxin-contaminated peanut meal and corn result in reduction in toxicity to chicken, trout, and ducklings.

How are aflatoxin levels measured?

Aflatoxin levels can only be accurately measured by column, thin layer, or high performance thin layer chromatography. The Department of Food Science of the University of the Philippines - Los Baños and the Bureau of Animal Industry of the Department of Agriculture have the facilities to measure aflatoxin.

Are commercial feeds in the Philippines loaded with aflatoxin?

A survey was conducted by SEAFDEC/AQD and funded by the International Foundation of Science to determine aflatoxin levels in shrimp feeds manufactured in the country. Results showed an acceptable though narrow margin of safety based on toxic levels determined for juvenile and pre-adult shrimp.

NEWSCLIP FROM PAGE 16 ...

On commercial scale, this could reach ₱260,000 per hectare.

Ramos recommends that the fishpens be established in coves or bays, where waves are slight and average depth ranges 1-1.5 m. The recommended stocking rate per hectare is 20,000-30,000 fingerlings, which should measure 5-8 cm long. Supplemental feeds should be given during the culture period. An average 250-g bangus can be harvested after three months.

Source: *Bangus culture in marine waters*, **Philippine Daily Inquirer,** 2 July 1992; *How to culture bangus in marine waters using fishpen method*, **Daily Globe**, 22 June 1992.

Update of the Seafarming and Searanching Project

Researchers link up with fisherfolk

Researchers of the Aquaculture Department are joining forces with the fisherfolk of Malalison Island in central Philippines, to pursue a community-based fishery resource management. The fisherfolk are participating in four of the five subprojects of the Pilot Seafarming and Searanching Project.

Thirty-three participating households are monitoring their daily fish catch. They record the fishing gear they use, the period of operation, area of the coral reef where fish is caught, species of fish caught, total daily catch, price at which fish is sold, and expenses incurred in the operation. The households also record their non-fishing activities like net mending, carpentry, and fish retailing. The researchers will knit these data into a picture of the economic utilization of resources in Malalison Island.

The fisherfolk also share their views regarding their right to fish in the area around the island, the benefits and disadvantages of artificial reefs, the sources of conflict among fishers, and the mechanisms for the resolution of these conflicts. They recommend some sites where artificial reefs may be deployed. Again, the researchers will use these data in recommending the specific area and the fisherfolk association(s) to be covered by the territorial use rights in fisheries, a management tool practiced in Japan that will be introduced in the community.

The fisherfolk also participate in a series of training activities to strengthen their association which will eventually manage the coastal resources of the island. The training sessions so far conducted include (1) *Membership orientation seminar,* (2) *Organizational management and development,* and (3) *Project management and development.* The Fishermen Association of Malalison Island has also established a Consumers' Store to ensure enough food supply especially during the monsoon season. The community organizing and institution building component of the Project is being undertaken in cooperation with a non-government organization, PROCESS.

A verification run of seaweeds cultivation in hanging long line (monoculture) and inside a floating cage (polyculture with grouper) has been completed as part of the component on additional livelihood. The fisherfolk will participate in the next run, December 1992 to June 1993.

Assessment of marine resources around Malalison identified 210 species of fish and noted their abundance, determined the frequency and cover of five species of seagrasses, and noted 64 species of macrobenthic algae. Assessment of marine invertebrates started in October.

The Pilot Seafarming and Searanching Project is funded by the International Research Development Centre (IDRC) of Canada and the SEAFDEC Aquaculture Department. SEAFDEC and IDRC recently signed the Memorandum of Grant Conditions which, among others, defined the project's general objectives: (1) to support and learn from the collaboration of community organizations, biologists and social scientists in adapting aquaculture and resource management techniques to the circumstances of one selected community; and (2) to assess the potential replicability of the experience in other communities where it may help sustain and enhance the livelihood of the people.

Specific objectives are (1) to develop model marine hatchery-nursery systems of selected species for culture and release of juveniles; (2) to provide additional livelihood through cultivation of appropriate fishes, seaweeds, molluscs, and crustaceans; (3) to regenerate fish habitats such as coral reefs, seagrass beds, and mangrove swamps; (4) to increase fish stocks by releasing juveniles of suitable species; (5) to develop the community into a strong and organized association granted territorial use rights; and (6) to extend seafarming and searanching activities to other fishing communities.

SEAFDEC Aquaculture Department announces its 1993 Training Program -

Regular Short-Term Courses [a]

	Dates[b]	*Training Fees*[c]
Culture of Natural Food (Natural Food)	03 Mar - 01 Apr	US$ 1,650
Fish Health Management (Fishhealth)	21 Apr - 31 May	US$ 1,650
Marine Finfish Hatchery (Marfishhatch)	01 Jun - 21 Jul	US$ 2,250
Aquaculture Management (Aquamanagement)	21 Sep - 20 Oct	US$ 1,650
Fish Nutrition (Nutrition)	21 Oct - 01 Dec	US$ 1,850

[a] For telegram and telex comm inications, use abbreviated course titles (Fishhealth, etc.).

[b] Allow another 5 days for post-training tour (optional).

[c] Basic training fee covers lodging, cost of registration, training materials, field trips, honoraria for resource persons, accident and medical insurance. Other fees include a refundable breakage fee of ₱500 (for training courses with laboratory practicum) and US$ 100 for post-training tour (does not include board and lodging at US$ 30/day). Average cafeteria meals cost ₱35. All fees must be paid in full on or before the start of the training course otherwise admission will be cancelled. Payment should be made in demand draft, manager's check, or telegraphic transfer payable to SEAFDEC Aquaculture Department, or in cash.

Internship/Practicum Training

Upon request, internship training may be arranged for individuals and small groups in areas of nutrition and feed formulation, chemical/proximate analyses, plankton culture, instrumentation and other laboratory work. Training in fish/shrimp hatchery and disease diagnosis is covered exclusively by the regular short-term training courses. The Department also accepts a number of undergraduate fisheries students for practical work (maximum of 400 hours) as a requirement for graduation. Applicants will be screened on the basis of application forms and endorsement of the college dean. Acceptance will depend on the availability of a research project in any of the Department's stations to accommodate the practicum trainee(s).

For application forms and further information, please contact: TRAINING AND INFORMATION DIVISION, SEAFDEC AQUACULTURE DEPARTMENT, P.O. Box 256, 5000 Iloilo City, Philippines. Tel. No. 7-45-35, 7-05-05, 8-12-61; Cable: SEAFDEC Iloilo; FAX: 63-33-8-13-40.

Or MANILA OFFICE, SEAFDEC AQUACULTURE DEPARTMENT, #17 Times Street, West Triangle, Quezon City, Metro Manila; Tel. No. 924-55-11 to 13; Cable: SEAFDEC Manila; Telex No. : 29750 SEAFDC PH; FAX: 63-2-924-55-11 loc. 23.

IN THIS ISSUE

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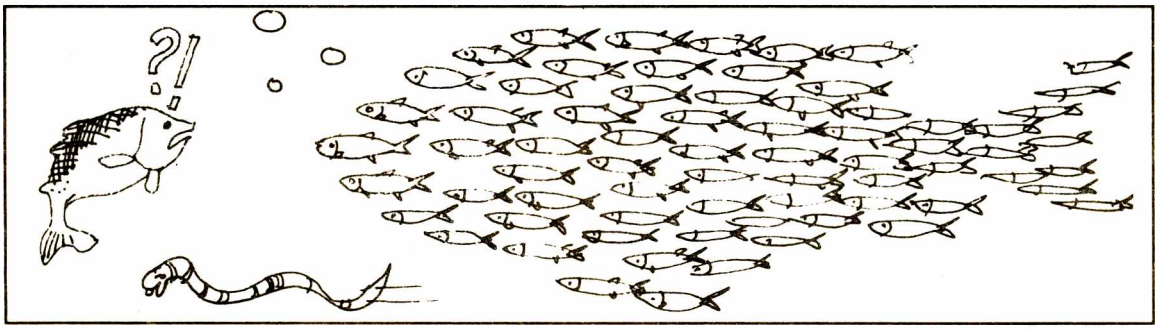
School of Fish



by I. Tendencia