1988

Aqua Farm News Volume 06(05) September - October 1988

Aquaculture Department, Southeast Asian Fisheries Development Center

AQUA FARM NEWS

ISSN 0116-6573

Released by the SEAFDEC Aquaculture Department as a production aid for fishfarmers and extension workers

Vol. VI No. 5
September-October 1988

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SEAFDEC "Better life through aquaculture"

FISHERIES' ANSWER TO AGRICULTURE'S "LAND TO THE TILLER": GIVE SMALL-SCALE FISHERMEN TERRITORIAL RIGHTS OVER MUNICIPAL WATERS

Recent studies revealed that many of the Philippines traditionally rich fishing grounds have now reached the limits of sustainable yield. A reorientation of national objectives for fisheries is therefore strongly recommended. Attention is being called on the neglected artisanal fishermen who can be "developed" into a strong and more productive fishery sector. This implies giving the small-scale fishermen a fair share of distributive justice in allocation of fishery resources. To make it a lasting benefit, these fishermen should be helped to organize themselves as independent managers of coastal resources from which they derive sustainance and other amenities of life.

As resource managers, indigenous coastal dwellers are believed to be just as effective as resource conservators. Sense of ownership is a compelling motivation for resource conservation, as dramatically shown in some recent incidents where small fishermen passionately and even violently protested the intrusion and pollution by big industries of their fishing grounds and traditional domain. This, in essence, is the fundamental argument for the proposed grant to small-scale fishermen of territorial rights over municipal waters.

Background

Recent statistics show that there are in the Philippines about 700,000 small-scale fishermen and nearly 500,000 fishing boats. If each fisherman provides occupation to two or three shore-based workers, the total labor force directly engaged in small-scale fisheries therefore consists of some 1.8 million workers. Adding their families, at the average individual size of five members, the municipal fisheries support nearly nine million persons.

They live in the coastal areas that constitute two-thirds of the country's 1500 municipalities. They produced half (49 percent) of the total national fish production of 2.14 million tons in 1987 valued at P42 billion and 5.3 percent of GNP (gross national product). Yet paradoxically, the municipal fisherfolk has remained one of the poorest sectors of our population.

Problems and Causes

Two major problems in Philippine fisheries today are the obvious depletion of coastal fish resources and the rampant practice of illegal fishing.

The small fisherman is often blamed for the present sad state of coastal fisheries, mainly because he uses dynamite, poison, and destructive fishing gears. Granting these abusive methods contribute to destruction of coral reefs, the small fisherman believes that he is not a major factor in

the widespread depletion of wild fish stocks. Illegal fishing by small fishermen, at the scale it is conducted, is not the principal cause of depletion of nearshore fish. It is rather the result of such loss of coastal productivity that has driven them to unorthodox fishing methods to increase their catch. The practice is wrong, but to condemn them mercilessly is unfair because to them the plain issue is survival.

The real culprits pinpointed are the large-scale destroyers of the coastal ecosystems who demolish the coral reefs, mangroves, and estuarine areas.

Today, only five percent of the country's once extensive coral reefs (2.7 million hectares) are in good condition. Siltation from forest denudation is the major cause of coral reef deterioration. At their ideal condition, coral reefs have been known to support as much as two tons of fish per hectare.

Mangroves, on the other hand, not only provide nutrients to marine fish but are also their indispensable breeding and nursery grounds. Most of them are now gone, converted into commercial fishponds where fish production cannot match the quantity of fish lost from capture fisheries. The estuarine areas are in the same predicament, degraded and polluted as they are by industrial and agricultural wastes.

Recommendations

Experience has shown that fishery regulations, even with strict penal provisions, can be circumvented by influential people and vested interest groups. For instance, among the past violators of fishery laws in Laguna de Bay were high government officials and top military officers. Their victims were thousands of small fishermen whose traditional fishing ground and fish catch were drastically reduced with the large-scale construction of illegal fishpens.

Another recent case is the order from higher authorities rescinding a decision of an environmental board to close down a Marinduque mining firm because it was polluting the traditional fishing ground of Calancan Bay. There are two sides in this issue, but it appears that the short-term economic rather than the long-term ecological consideration has again won.

Existing laws and regulations are therefore saddled with certain inherent weaknesses, or admit too much government intervention that defeats the goal of resource management. Thus, alternative measures are necessary to reshape perception of the socio-economic and political dimensions of fishery activities. One of them, being strongly recommended for serious consideration by the Department of Agriculture and Philippine Congress, is the grant to small-scale fishermen of territorial rights over municipal waters.

The concept revolves around the organization of coastal folk into fishing associations that would then be given exclusive legal rights to manage the fishing grounds in their locality. In effect, fishing operations will be controlled on shared basis by the municipal fishermen themselves.

They can exclude outsiders or drive off intruders to protect their territorial rights.

The scheme, therefore, promotes the virtue of self-control, manifested by the adoption of community-imposed regulations such as gear restrictions, seasonal and area closures, and catch quotas. This idea is not alien to the cultural makeup of our fishing villages. The environment for social cooperation has always been present in these villages because of long familiarity among the residents, blood relationship, and other cultural ties. Acquisition of proprietary rights by fishermen over their traditional source of livelihood would further cement the community spirit that already exists.

There is a strong opinion that management and regulatory measures have a better chance of succeeding if these are adopted and implemented by the fishermen theselves, rather than being imposed upon them by the government. Moreover, by relinquishing its authority the government stands to gain in terms of lesser administrative and law-enforcement costs.

On humanitarian grounds, it is moral to give small fishermen exclusive control over fishery resources in their area. In most places, fishing is their only means of livelihood and survival. Unless given more attractive employment prospects, it will continue to be difficult for the government to address the plight of small fishermen under present conditions.

Artisanal fishermen are tied to their resource base by traditional and cultural attachments which are hard to break. On the other hand, the big fishing enterprises can easily abandon or sell out their interests and re-invest in other business with a minimum of personal sacrifice.

The grant of territorial rights to small-scale fishermen is not a new concept. It has been adopted and practised in Japan for 100 years. Prototypes can also be found in Brazil, Sri Lanka, the Ivory Coast, and Papua New Guinea. Some encounter problems and constraints, but we should study each model to gain useful lessons and insights. Out of it, we can devise and innovate methods suited under our particular soci economic, cultural, and political systems.

A thorough understanding of all aspects and implications of this proposed grant of territorial rights to artisanal fishermen is vital. One important consideration is the biological aspect. It may be necessary initially to limit coastal fishing until productivity of the natural stock is restored.

While the marine ecosystem is regenerating, the coastal fishermen can engage in alternative occupations, again, with initial help from local or national government. A promising solution to this employment problem is the implmentation of a nationwide seafarming program which would provide gainful employment to many people in coastal areas. A comprehensive plan for this government program has already been submitted to and is under consideration by the Department of Agriculture.

The Department of Agriculture has also recommended other alternative job opportunities which can be developed in the different provinces. For Iloilo alone, these include mango processing, wrapping paper production from rice straw, coffee processing, and cultivation of such crop as peanut, mungo bean, cotton, and watermelon.

Conclusion

The overall problem of the small-scale fishermen has now acquired serious proportions. Failure of the government to act decisively on the matter could result in their further disenchantment. This could make them prey to radical elements advocating violent actions to remedy the situation. Therefore, revision of fishery laws and new legislations designed to help small-scale fishermen are needed. Granting them territorial rights over municipal water is necessary for acquiring the right quality of life, self-respect, and ability to contribute to national goals.

Source : "Giving Small-scale Fishermen Territorial Rights Over their Waters" by Flor Lacanilao. **Diliman Review,** Vol 36, No. 2, 1988.

MILKFISH AND SHRIMP FRY GROUNDS AND SEASONS

MILKFISH FRY

Milkfish fry occur from India to Tahiti and from southern Japan to Malaysia. They have not been reported outside this range, probably due to non-use of the appropriate gear at the right place and time. At present, only the Philippines, Indonesia, and Taiwan collect milkfish fry for a commercial culture, while several countries collect fry and fingerlings for experimental culture (e.g., Sri Lanka, Kiribati, Fiji, India).

Milkfish fry grounds in the Philippines have been well surveyed. Fry grounds are located throughout the country although they are more prevalent on the western and southern coasts of islands than on eastern and northern shores. The milkfish fry grounds are usually flat sandy beaches, river mouths, and tidal creeks and mangrove swamps.

Milkfish fry are available throughout the year at one location or another, but individual fry grounds experience marked peaks and slack periods at certain times of the year. The season begins earliest in Mindanao (Cotabato-Zamboanga) where it peaks in May. After a decline in catch through August, a smaller peak occurs in September to November. In the Visayas (Cebu, Panay, Negros), the season begins in March-April, peaking in May, and lasts till November-December, with a second peak in October in some fry grounds and none in others. In northern Luzon (Ilocos, Cagayan, Pangasinan), the season starts in April and lasts till October with a peak in May-June.

The difference in the length of the milkfish fry season seems to be due to the latitudinal position of the fry grounds (Table 1).

The Philippines covers from 5 to 21°N latitudes. Fry appear early (January-February) in the south, and later (March-April) in the north. They disappear earlier in the north (August-October) than in the south (December-January). Moreover, in the south at latitudes about 5-11°N, there are two peaks, of which the former is higher; in the north 12-21°N, there is only one peak. In western Panay (Antique Province), the two towns of Pandan and Hamtik, 130 km apart on the same coast have different fry seasons. In Pandan, milkfish fry start to appear at the end of March and disappear early in December, with a peak in May. In Hamtik, fry appear in the middle of March and disappear in the middle of December with peaks in May and October.

Table 1. Milkfish fry collection season at various localities from north to south in the Philippines (After Kumagai 1984).

Latitude N	Localities	Collection season	Peak
	Santa Ana	April to October	June
	Badoc	April to October	(July) August
17.5°			
	San Fernando	April to July	May
	Lingayen	(March) April to July	June
15.0°			
	Batangas	(March) April to July	May
	Naujan	April to August	May
	Tabaco	April to November	May
12.5°			
	Culasi	April to November	June
	Hamtic	March to November	May & October
	Cadiz	March to November	May & October
10.0°			
	Narra	March to December	May & October
	Sipalay	March to December	May & October
	Naawan	(February) March to December	May & November
7.5°			
	Malita	February to December	April & October
	Zamboanga	(January) February to December	(March) April & October (November)
	Glan	Throughout the year	(March) April & November

SHRIMP FRY

Shrimp fry are often collected together with milkfish fry from shore waters as well as from inland waters where the latter can hardly be caught. Shrimp fry are present all year round with two peak seasons a year: June-July and October-November. However, there are differences among species:

Species

P. monodon	July-August; November-December
P. semisulcatus	February-March; November-December
P. merguiensis/P. indicus	June-July; October-November
P. japonicus	March-April; September-November

Seasonal occurrence seems to depend primarily on the prevailing monsoon and secondarily on the geographic location (Table 2). Shrimp fry seem to be carried by wind-generated currents. In addition, the collecting activity depends on the demand, e.g., shrimp culturists do not buy shrimp fry immediately prior to the dry season because growth of shrimps in ponds is slow at high salinities.

In the past 10 years, several shrimp hatcheries have sprung up in the Philippines to supply the great demand for **P. monodon** and **P. merguiensis-P. indicus** fry. The demand for wild fry nevertheless remains undiminished due to the expansion of shrimp culture operations supplying the export market.

Table 2. Local and seasonal occurrences of **P. monodon** fry, based on interviews with fry collectors in the Philippines (Motoh 1981).

Place	Collection period	Peak season
LUZON		
Dalahican	Southwest monsoon	August
Atimonan	Northwest monsoon	February
Calauag	Year round	Northeast monsoon (February to June except March and April)
VISAYAS		
Batan	Year round	November to February
Barotac Nuevo	June to October	August
Villa, Tigbauan	May to December	October to November
Bolanon, Danao	March to September	May to June
Tabao, Caingin	Northwest (December to February) & Southwest (June to November)	August-October
Aguisan	Year round	November
Bocana, Tabla	July to December	August to September November
Sipalay	March to June, October to December	June, November
Malabugas	April to December	May to June
Polo	March to June, October-December	June, November
MINDANAO		
Dapitan	Year round	September to October
Dipolog	Year round	September to November
Ozamis	Northeast & Southwest monsoon	July, November to December
Zamboanga	September-November	-
Tagum	Northeast & Southeast monsoon	April to May, October to November
Matina, Aplaya	Northeast monsoon	April to May

Source : Bagarinao TU, Solis NB, Villaver WR, Villaluz AC. 1986. Important Fish and Shrimp Fry in Philippine Coastal Waters: Identification, Collection, and Handling. Extension Manual No. 10, SEAFDEC Aquaculture Department, Tigbauan, Iloilo.

WHAT YOU NEED TO KNOW ABOUT SEA BASS AND SEA BASS FARMING

Sea bass (**Lates calcarifer**) locally called "apahap" is one of the economically important cultured fish species in Southeast Asia. Adult sea bass spends most of its life in lakes, rivers, estuaries, and lagoons. During the spawning season, fish with developing gonads migrate downstream and move to estuaries and adjacent coastal waters for gonadal maturation and subsequent spawning.

Sea bass spawns naturally or when induced by hormonal treatment. Earlier studies (1983-1985) on hormone-induced spawning used human chorionic gonadotropin (HCG), puberogen, carp pituitary, and other gonadotropic hormone preparations. Luteinizing hormone-releasing hormone analogue (LHRHa) induces single or sequential spawnings. This is administered either in saline injections, cholesterol pellet implants or loaded into osmotic pumps. Pellet implantation proved to be more reliable, cheaper and less stressful to fish. Under ambient conditions (28-30^{o}C, 30-35 ppt) in floating net cages, mature sea bass receiving a single injection or implantation of pelleted LHRHa spawn 30-36 hours after hormonal administration.

At 27-30^{o}C, sea bass eggs hatch in 13-18 hours. Newly hatched larvae are about 1.5-1.7 mm in total length. Larvae start to feed on rotifers at day 2, change their feeding habit at day 10, and prefer **Artemia** nauplii at day 15. Sea bass larvae may be weaned to artificial diet as early as day 10. Survival rates of up to 90% can be attained provided water management is good and food supply is unlimited. But, the best time and scheme is gradual weaning to artificial diets on the day of harvest (day 21).

In the Philippines, monoculture of sea bass in ponds, pens, and cages has been tried with fairly good results. At present, sea bass is fed trash fish although a food conversion ratio (FCR) of only 7:1 can be attained. The insufficient supply and the high cost of trash fish is a major constraint in sea bass monoculture. Because of these constraints, SEAFDEC AQD has recently addressed the need to develop an abundant, cheap, and economical food source for sea bass culture. In particular, basic studies on the nutritional requirements (e.g., fat and protein requirements) of sea bass are presently in progress. The use of cheap and nutritious substitutes (e.g., soy bean meal, meat and bone meal, shrimp head meal, and leaf meals) for costly and imported fish meal ingredients in commercial fish diets is also presently being evaluated.

An alternative to trash fish as food for sea bass is the culture of forage fish such as tilapia in polyculture system. A sea bass-tilapia (1:15) polyculture system appears to have some promise. Sea bass may also be grown together with milkfish and tilapia. In such a system, 5000 sea bass juveniles are stocked in a one hectare pond together with 1500 milkfish fingerlings and 4000 tilapia adults. Sea bass juveniles are stocked 90 days after tilapia and milkfish. A cost-and-return analysis of this polyculture system appears higher relative to a monoculture system. Also, it is economically competitive compared to other food production systems.

Sea bass is sold frozen or may be sold live in the local market. Live sea bass commands a much higher price of P100-P150 per kilo. However, frozen sea bass sells for only P50-P70 per kilo.

Source : A **Technology Dispatch** of the SEAFDEC Aquaculture Department, Tigbauan, Iloilo, Philippines, October 1988.

AFN-VI-5-3

THE VALUE OF SEA HORSE

The sea horse is more valuable than you think. It is very much in demand as curios and souvenirs and as medicine, too.

This small fish with a horse head shaped like that of a horse and bent at right angles to the body catches the interest of visitors in marine aquariums. It can be kept indefinitely because of its firm external skeleton and is not distorted when dried. It can be mounted on driftwood blocks or affixed to pedestals and used on a chessboard instead of the knight. The sea horse is also used for jewelry such as earrings and for medicinal purposes when pulverized or turned into powder.

There is a sea horse ranch in Marungas, Jolo, Sulu with an initial stock of 5,000 breeders for propagation. Dried sea horse is sold for P2,200.00 per kilo. It has market outlets in Borneo, Singapore, and Hongkong.

Sea horse ranching, anyone?

Source : AGCOM (Agricultural Communication) Services
Department of Agriculture
Region IX, Zamboanga City

AFN-VI-5-4

ARE YOU USING REGISTERED DRUGS FOR YOUR PRAWNS?

A number of drugs and chemicals that have been in aquaculture use for many years were never properly registered. The Food and Drug Administration (FDA) has begun to enforce regulations governing the use of drugs in aquaculture. Inspectors have visited hatcheries and grow-out farms to question the use of particular compounds. If the use is not consistent with an approved label or is not covered by another form of approval, the user maybe subjected to disciplinary action.

Presently, very few chemicals are registered for use on shrimps. Chlorine can be used as a disinfectant, and Aquatrine (a chelated copper compound similar to Cutrine) is registered for control of external parasites. However, no other drugs or chemicals are specifically approved for penaeid shrimps.

In the U.S., use of drugs is regulated by the FDA. Regulatory control covers all facets of development, distribution, and use. All producers, handlers, and applicators can be held legally accountable if they misuse a chemical. Only uses described on the label are permitted, and only at application rates listed. Applications at less than or more than the approved rate are equally illegal.

Several compounds are now in the registration process, and are expected to be cleared soon. These include (1) formalin for control of external parasites, (2) oxytetracycline (terramycin) for use as an anti-bacterial agent within feed, and (3) Treflan for control of larval mycosis.

Other potential candidates with no pending registration efforts include Chloramine-T, Romet-30, Streptomycin, Sulfamerazine. Neomycin, and Erythromycin. These therapeutants are already registered for other species, so it would be relatively inexpensive (less than $100,000) to extend that registration to penaeid shrimps.

Some chemicals which appear to be effective for bacterial control in larval shrimps such as furazolidone, nitrofurazone, and chloramphenicol are unlikely to be considered by the FDA because they are suspected as causing cancer.

Source : COASTAL AQUACULTURE, Texas Agricultural Extension Service. Texas A & M Sea Grant College Program. January 1988.

WHAT YOU SHOULD KNOW ABOUT THE RED TIDE

The **red tide** is a marine phenomenon described as a bloom of floating minute organisms known as dinoflagellates with characteristics orange-brown or red color.

Red tides usually occur in coastal areas after a prolonged dry spell. In the Philippines, the occurrence of red tide was first reported on July 23, 1983 in Maqueda and Villareal Bays in Western Samar. It was reported in Samar and Zambales in 1987 and this year in Bataan.

The red tide organism responsible for the toxicity of shellfishes such as mussels, oysters, and clams has been identified as the **Pyrodinium bahamense** var **compressa.**

As the organism is ingested by the shellfishes, it accumulates in their digestive systems. The organism produces a poisonous substance (neurotoxin) that causes paralytic shellfish poisoning (PSP) in humans but does not affect the shellfishes. When contaminated shellfishes are eaten by man, death may result if toxin levels are high and immediate medical attention is not given.

The toxicity of the red tide poison is not destroyed by cooking. It is even enhanced when the shellfishes are cooked in vinegar as in **paksiw** or **pinamalhan.** The symptoms of PSP are a tingling sensation and numbness of the lips.

While there is no known antidote to PSP, some palliative measures have been tried and found effective in the Philippines. Drinking coconut milk (**gata**) with brown sugar or coconut milk alone is said to make victims recover faster. Researchers have found that toxicity of the poison is highest at pH 3 and loses its effect at pH 7.

Experts recommend the following to prevent human deaths due to the red tide:

1. While red tides cannot be controlled or prevented as yet, they can be predicted by monitoring of the organism's cell and cyst counts in the water and substratum, respectively.

2. With the occurrence of red tide in an area, proper warning should be given to fishermen, shellfish farmers, and coastal communities to avoid human consumption of contaminated shellfish. This can be done through the radio and other public information systems.

3. People affected by PSP should be given medical attention immediately. In the absence of a physician, the palliative remedy described above may be resorted to as a first aid measure.

4. Consumption of shellfishes in contaminated areas should be avoided until such time as their safety is given clearance by authorities. This may take weeks or months depending on environment conditions.

Source : Reprinted from **The Journal** of September 18, 1988. this is a public service feature of the Philippine Council for Aquatic and Marine Research and Development of the Department of Science and Technology, Los Baños, Laguna.

PHRDC-SRDC TO CONDUCT OYSTER CULTIVATION TRAINING

The Philippine Human Resources Development Center (PHRDC)-Seafarming Research and Development Center (SRDC) will conduct a three-day training course on oyster cultivation techniques in Dagupan City, Pangasinan in October. This is the first of such specialized courses to be held this year as part of PHRDC-SRDC's technology transfer program.

About 15 government staff will participate in the training. Included in this batch are key personnel from the Department of Agriculture of Region XI and XII and the Southern Philippines Development Authority (SPDA) which shall assist SRDC in implementing its Mindanao project.

The training course seeks to upgrade the technical know-how of extension workers involved in oyster industry development through the dissemination of validated technologies such as spatfall forecasting, seed collection, and growth monitoring.

Other specialized training courses slated for this year include environmental survey techniques, oyster sanitation, and product formulation.

Source : Resource Update, Philippine Human Resources Development Center, Vol. 2 No. 9. Anniversary Issue, Aug. 1- Sept. 9, 1988.

AFN-VI-5-7

TIPS ON BUYING OYSTERS

1. In general, live oysters in the shell are more sanitary than raw shucked oysters packed in plastic bags.

2. Although oysters may remain live up to several days after harvest, storage increases bacterial concentration. Therefore, freshly harvested oysters are always preferable.

3. Storage and transportation of oysters are improved by low temperatures and shaded conditions.

4. Oysters whose shells are gaping or broken are not fresh and should be avoided.

5. Live, fresh oysters are characterized by closed shells which, upon opening, should reveal milky white, plump, oyster meat bathed in its own liquid.

6. When in doubt, never eat oysters raw or only slightly cooked.

Source : Philippine Oysters . . . Enjoy them safely (Brochure), Philippine Human Resources Development Center-Seafarming Research Development Center (PHRDC-SRDC), University of Life Complex, Meralco Avenue, Pasig, Metro Manila.

AFN-VI-5-8

RECENT TRENDS IN SHRIMP AND PRAWN IMPORTATION IN JAPAN

In 1987, total importation of fisheries products by Japan was 2,075,000 tons (product weight) amounting to 1,233.5 billion yen (or 5.8% of Japan's total importation). Importation of shrimps and prawns for the period January-June 1987 and 1988 is shown in the table below.

The amount of importation varies among the species, but there was a general increase of about 20% compared to the same period in 1987. Thus, if this trend continues, the estimate at the end of the year may reach 2,500,000 tons. Last year's results showed a final gain of about 11% despite the more than 20% gain at the same period of that year. This suggests that the final volume of imports by year-end may be more or less the same as that of 1987.

Shrimp and prawn imports show steady growth in general but with some changes in the exporting countries. This year, the import from Taiwan is likely to decrease due to the occurrence of some diseases. Some sources said Taiwan's total production may even decrease by 50%. Decline in importation from Taiwan, however, maybe temporary.

Even though there are remarkable increase in importation from the Philippines, Thailand, and Indonesia, total gain may not reach as high as that of last year.

Indications show that the productivity of Taiwan is nearing its limit, and it is likely that the bulk of shrimp and prawn culture will move to other Asian countries. For instance, growth of **Penaeus chinensis** in China is remarkable and its productivity may increase from now on. Also remarkable is the increase in production of **Penaeus merguiensis** in Thailand.

Shrimp and prawn importation in Japan (January-June 1987 and 1988)

	1987		1988			
	Volume (ton)	Amount (million Yen)	Volume (ton)	Gain (%)	Amount (million Yen)	Gain (%)
Taiwan	11,991	15,895	10,424	86.9	13,414	84.4
India	17,569	18,940	14,358	81.7	13,597	71.8
Indonesia	14,298	20,977	16,967	118.7	21,737	103.7
China	12,293	18,835	17,970	131.3	17,043	90.5
Greenland	6,257	7,870	6,752	107.9	8,665	110.1
Philippines	5,191	8,307	8,959	172.7	13,352	160.7
Vietnam	3,146	4,574	4,429	135.9	4,540	99.9
Thailand	1,901	4,211	3,513	173.7	14,015	188.8
Australia	2,767	4,856	3,795	137.4	6,503	129.5
Bangladesh	2,179	2,597	2,228	102.1	2,534	97.6
Total	100,791	131,109	116,507	115.6	139,660	103.4

Gain: $\frac{1988}{1987} \times 100$ %

Source : "Present status of importation of fisheries products in Japan" by Ryuichi Tanabe. Japan Fisheries Products Importation Association. **Yoshoku**, Vol. 25, No. 9, September 1988. (This portion was translated from the original by Mr. Yoshibumi Yashiro, JICA Coordinator, SEAFDEC AQD, Tigbauan, Iloilo.)

A SECOND LOOK AT ASIAN AND WORLD AQUACULTURE PRODUCTION

Dr. Chua Thia-Eng of the International Center for Living Aquatic Resources Management (ICLARM) said aquaculture production in Asia accounts for about three-quarters of world aquaculture production. China, Japan, India, the Republic of Korea, and the Philippines are among the top aquaculture countries, according to the Food and Agriculture Organization (FAO).

In Southeast Asia, the Philippines registered a growth rate of 14.83% and Malaysia 16.26% while in Thailand the rate was 7.5% and in Indonesia 5.63%. Singapore's aquaculture production since 1971 has been fluctuating between 500 and 917 tons but increased to over 2,000 tons in 1983 largely due to increased production of green mussels, groupers, and sea bass.

Chua said it was evident that world aquaculture production more than doubled over the last ten years from 3.3×10^6 tons in 1973 to 7.3×10^6 tons in 1983 or with a growth rate of 10.5%. Many scientists believe that the prospect of doubling aquaculture production every ten years for the next three decades may not be impossible.

Source : **ASIAN Food Handling Newsletter,** #23, January 1987.

AFN-VI-5-10

AQUA FARM NEWS is published **bi-monthly** by the Information Division of the Aquaculture Department, Southeast Asian Fisheries Development Center, P.O. Box 256, Iloilo City.

Subscription rates: Local – P40.00 per year; Foreign – $26.00 per year includes airmail postage. Please send orders and remittances in Postal Money Order or bank draft.

SEAFDEC

In citing information from AFN, please cite the institutional source which, in some articles, is not necessarily SEAFDEC Aquaculture Department. Mention of trade names in this publication is not necessarily an endorsement. Entered as second class mail matter at the Iloilo City Post Office on August 3, 1984.