1991

Aqua Farm News Volume 09(04) July - August 1991

Aquaculture Department, Southeast Asian Fisheries Development Center

ISSN 0116-6573

AQUA FARM NEWS

Produced by Audiovisual-Print Section
Training & Information Division
SEAFDEC Aquaculture Department

Vol. IX No. 4
July-August 1991

IN THIS ISSUE:

SEAFDEC "Better life through aquaculture"

Aqua Farm News is published bimonthly by
AV-Print Section, Training and Information Division
Aquaculture Department
Southeast Asian Fisheries Development Center
P.O. Box 256, Iloilo City, Philippines

ISSN 0116-6573

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 an endorsement.

Subscription rates:

Local - P40.00 per year
Foreign - US$26.00 per year (including air mail postage)

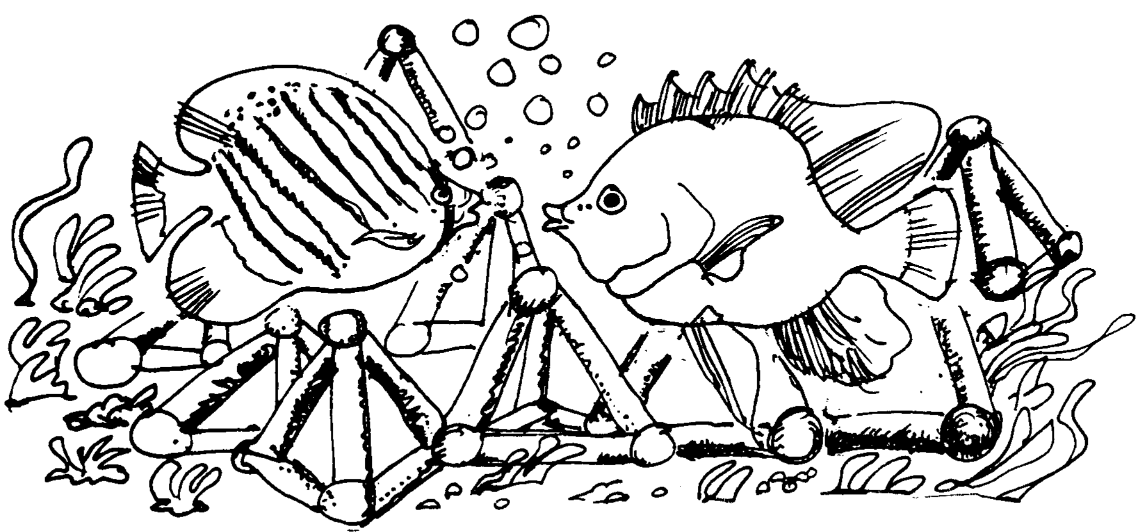
Please make remittances in Postal Money Order/Bank Draft/Demand Draft payable to **SEAFDEC Aquaculture Department**.

WHY ARTIFICIAL REEFS?

Artificial reefs or man-made reefs are concrete, tire, wood or bamboo modules (or which may consist of other scrap materials) submerged in selected areas to lighten the fishing pressure on natural reefs and to concentrate fish for easier fishing.

In his paper presented at the *Regional Symposium on Coastal Waters Rehabilitation and Development* (in Iloilo City, 9 March 1989), Dr. F.J. Lacanilao, SEAFDEC/AQD Chief, noted the three recognized functions of artificial reefs: (1) as a fish-aggregating device that concentrates fish for easier fishing, (2) as protection or shelter for fish juveniles preventing their early harvest, and (3) as a means to increase coastal productivity in the long run by providing substrates for growth of sessile organisms and establishment of new food chains.

Artificial reefs have yet to be proved as a cure for the country's degraded and overfished coastal environment, and experts have cautioned on the possibility of their misuse. Thus, investigations on the biological and ecological functions of artificial reefs are continuing. Some findings and recommendations are reported below.



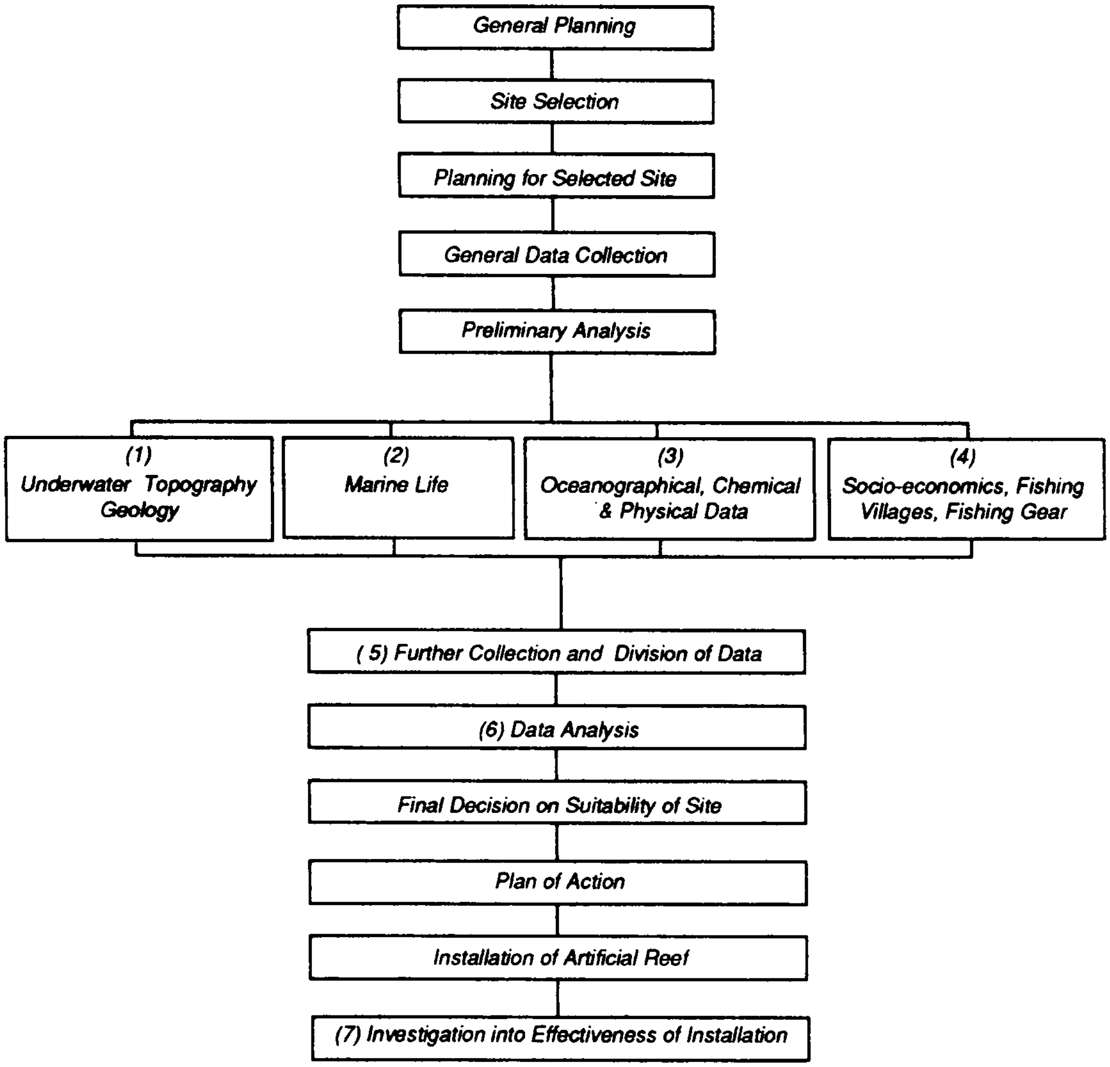
Is this your new dig? Coziest condo in town! Wait till our friends hear this! *Yeah! Part of the Urban Renewal Program!*

Item One: Flow Chart for the Installation of an Artificial Reef

Details of planning, site selection, data collection, and analysis in the flowchart (see p. 2) are as follows:

(1) *Underwater Topography and Geography*

The site should be selected depending on the features of the underwater topography, which are shown by the contour lines as in the figure on p. 3. More specifically, the suitability of each site should depend on the seabed gradient, i.e., an artificial reef can be installed where the seabed flattens out. This information may be obtained from local fishermen, or through a natural reef survey.

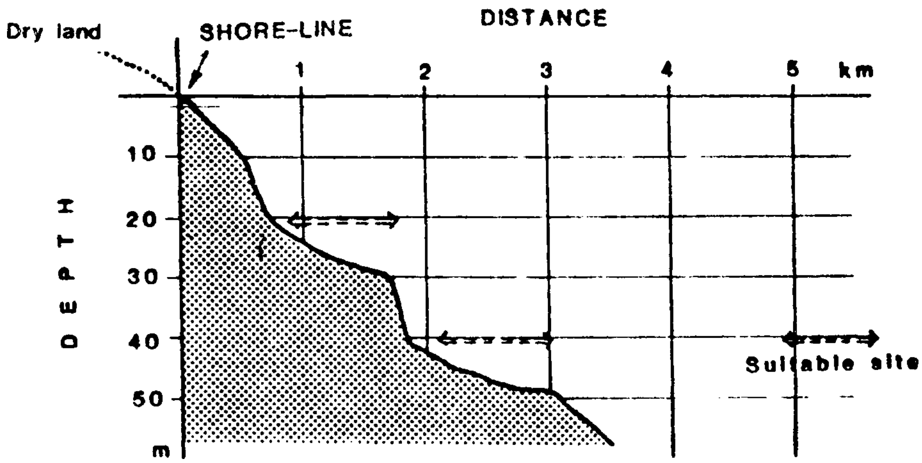


Planning, site selection, data collection, and analysis.

(2) *Marine Life*

The target species should be chosen from those species which are commercially more highly priced. The target species should be observed throughout the various phases of development. Their feeding habits and predator-prey interaction should be observed and their ecological characteristics should also be studied. The possible size of catch should also be evaluated.

I thought it would be a cinch for predators like us.
How come I don't see any food?



A suitable site is where the seabed flattens out.

(3) *Oceanography*

Oceanographical data, especially relating to currents and waves, should be collected for two reasons, namely, to calculate the external pressure exerted on modules and to assess the environmental conditions at the site.

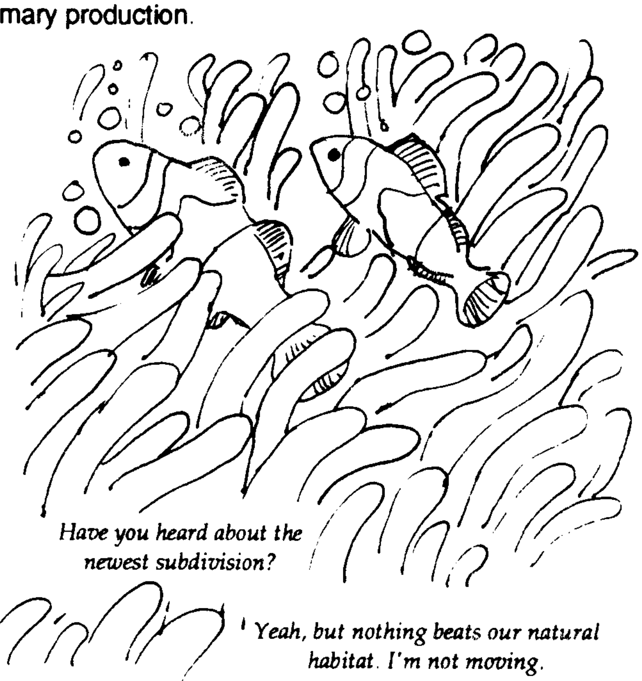
Current velocity and direction should be measured throughout the year, and the period of each measurement should last for at least fifteen days, which should be the fixed period for an oceanographical measurement. Data on waves, on the other hand, should be collected over a longer period, and this can also be predicted from data gathered on wind. Temperature and salinity levels should be measured at the same time as the current measurements are being made With regard to the chemical data required, nutrient salts (e.g., phosphate-P, ammonium-N, nitrate-N, and nitrite-N) in seawater and the chlorophyll-a contents of suspended particles should also be analyzed. In addition, nutrient salts are an important chemical factor for maintaining primary production at the site. The contents of chlorophyll-a are also an indicator of phytoplankton biomass and of potential primary production.

(4) *Socioeconomics*

In order to clarify the situation at the site, data should be collected on the following:

- the number of fishermen using the site
- the cost of the fishing operation
- the kinds of fishing gear used
- the quantity and value of the fish which is processed
- the different types of fishing gear used at the fishing ground
- the number of fishing villages near the site and of fishing cooperatives
- illegal fishing that is carried out.

To ensure the success of each operation, fishing ground management should be considered at the planning stage.



(5) *Further collection and division of data*

If any of the above-mentioned data proves impossible to collect or is insufficient, further survey should be carried out. Fishermen using the site should be interviewed and the information collated so as to understand better the effectiveness and validity of the methodology.

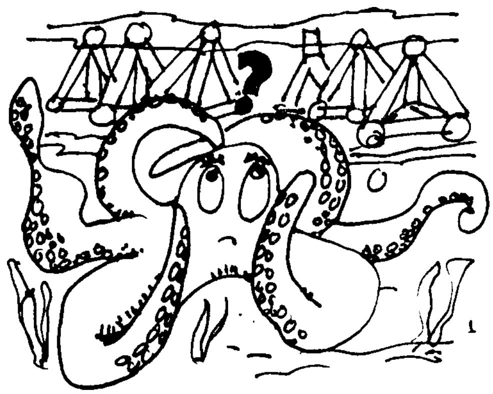
(6) *Data analysis*

All the data collected relating to items (1) to (5) should be analyzed section by section as bases for deciding whether to proceed with the project or not. The level of investment required can be projected based on the data collected.

(7) *Follow-up*

At least one year after the installation of the artificial reef, the surveys should be repeated for items (1) to (4). Then a re-evaluation should be made to see whether the operation can be improved; if so, where and how.

From the planning stage onwards, the local fishermen should be consulted since their experience and knowledge of the proposed site are a valuable contribution to the development of the project. Most fishermen in the surrounding area are aware of the topography and marine life at the proposed site. In addition, the effectiveness of the project should be cross-checked with similar sites in the region.



I'm lost! This must be a new neighborhood.

Item Two: Site Selection

Site selection criteria for the installation of an artificial reef are as follows:

(1) There should be a satisfactory concentration of fish at the site, and the fishermen living near the site should be able to use the reef effectively.

(2) From the point of view of the marine life, the area should be a suitable breeding ground and habitat for the target species and, furthermore, the area should be on the route along which the species migrate.

Fish change their environment according to the various stages of their development. For instance, at the fry stage, especially immediately after hatching, they float on the surface of the sea. At the juvenile stage, when their mouths remain open and until they start feeding, they are mostly concentrated along shallow, coastal nursery areas which are sometimes areas of marine forest. From the beginning of the juvenile stage until they become adults, fish continue to migrate until they return to their original starting point. This migration is controlled by the environment, the most important factors being temperature, salinity, and depth.

Based on the relationship between the environment and stages of development, the target species may be chosen and their life history analyzed.

(3) From an environmental point of view, the physical and chemical conditions around the site have to be suitable.

The physical conditions that should be considered are temperature, salinity, current direction, current velocity, underwater topography, and the type and quality of the seabed.

Current direction and velocity should be worked out by mapping counter-currents, eddies, and upwellings. The type and quality of the seabed depend on the current velocity. If a current exists, the seabed will consist of sand and/or gravel. The underwater topography needs to be worked out by mapping variations in the seabed such as banks, caldrons and depressions. Where there are extensive sandy areas, the flat area between a steep slope and the continental shelf should be selected.

To select a suitable site, data of all kinds should be collected and a site chosen after close analysis. Data gathering is very time-consuming and requires considerable financial investment. Interviews with local fishermen will be beneficial and will save time and money.

Source of Items One and Two: Wajiro Fujisawa, **Technical Manual for Resource Enhancement.** February 1990. Training Department, Southeast Asian Fisheries Development Center Bangkok, Thailand.

Item Three: Characteristics of Coral and Artificial Reefs

Coral reefs	Artificial reefs
Natural living structures depend on specific environmental factors such as light, salinity, temperature, and suitable substrate for basic framework development.	Artificial structures are independent of environmental conditions for basic framework development.
Shape, size, location, and orientation depend on environment and age.	Shape, size, location, and orientation do not depend on environment and age.
Basic framework of calcium carbonate. Development is slow as coral growth is 15-20 cm/yr at best. No cost involved.	Basic framework of metal, concrete, tires, wood, etc. Rate of framework development could be fast but cost-related except as natural growth occurs.
Longevity of basic framework is indefinite.	Longevity depends on materials.
Recruitment of marine life is dependent on environmental conditions, shape, size, and biological health of the coral reef.	Recruitment of marine life is dependent on environmental conditions and the nature of framework.
High primary production from algae, corals, etc.	Primary production is dependent on area available for photosynthetic marine organisms to grow on basic framework.
Recesses and crevices naturally present in the framework provide shelter and hiding spaces for a large variety of marine organisms.	Hiding space provision is limited by the basic framework. The size and species which will attach depend largely on the size and the nature of hiding spaces provided which depend on cost.
Establishment of new coral reefs through transplantation and other techniques is slow, time-consuming, and of limited application.	Establishment of artificial reefs is relatively fast and has proven to be cost-effective in specific instances.
Fish production figures of 9.7-32 $t/km^2/yr$ of coral have been recorded.	Very little actual detailed work carried out on fish yield, etc. However, definite enhancement in fish aggregation has been recorded. In the Philippines, 312 m^2 of bottom area of artificial reef has produced yields of 2 kg/week.

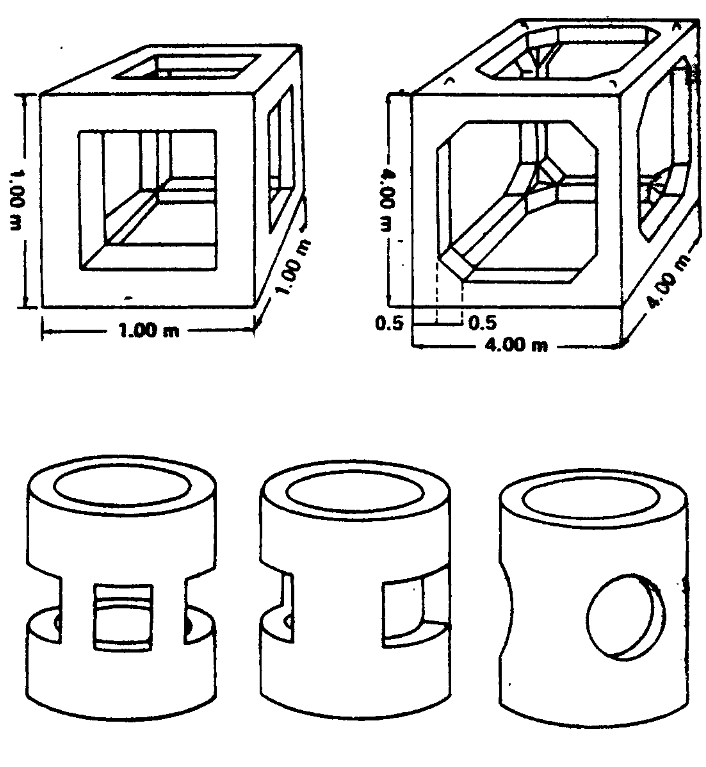
Item Four: The Hawaiian Experience

Average number of species and standing crop of fish at various artificial reef sites in Hawaii prior and subsequent to the deployment of artificial reef materials are shown below:

	Prereef inventories		Postreef inventories	
	No. of species	Standing crop (kg/ha)	No. of species	Standing crop (kg/ha)
Maunalua Bay, Oahu	20	7	43	154
Waianae, Oahu	32	19	41	137
Kualoa, Oahu	24	17	No subsequent surveys	
Kaewakapu, Maui	6	0.6	25	41

Source of Items Three and Four: Alan T. White, Chou Loke Ming, M.W.R.N. de Silva, Flordeliz Y. Guarin, **Artificial Reefs for Marine Habitat Enhancement in Southeast Asia.** 1990. ICLARM. MC. P.O. Box 1501, Makati, Metro Manila.

Item Five: Concrete - Best Material for Artificial Reefs



Concrete dice (1st row) and tube (2nd row) blocks (*SEAFDEC Newsletter*, Vol. 10, No. 3. 1987).

To find out what surfaces best attract and maintain the presence and growth of corals, University of Hawaii zoology professor Dr. Julie Bailey-Brock and her assistant, doctoral candidate Rachel Fitzhardinge, have been measuring the recruitment of corals on materials commonly used to construct artificial reefs. Recruitment refers to the number of organisms that initially settle minus the number that die before a count is made.

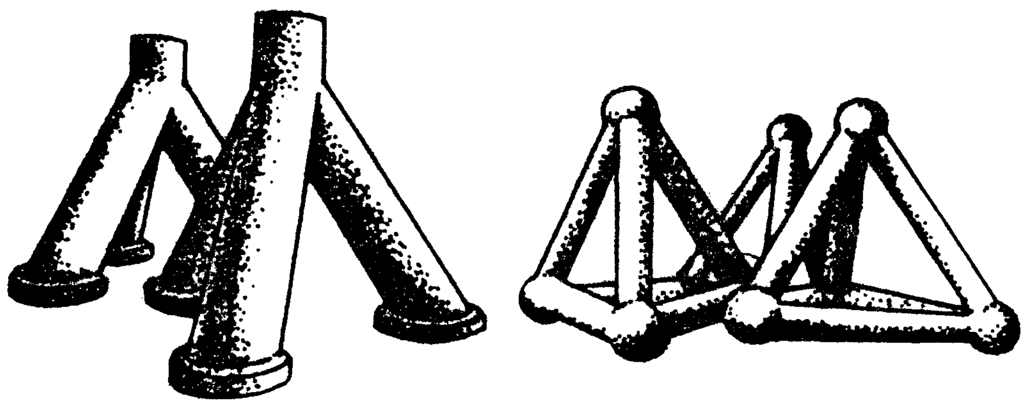
Four materials were tested at various locations in Kaneone Bay, in the Sea Grant-funded project. The materials - rubber tires, metal (a car hood), concrete, and dead coral - were fashioned into sets of flat plates, about 38.7 cm^2. These plates were then placed in the bay at a depth of about 4.6 m. Sets of plates were removed after 2 weeks to 1 year and coral settlement and survival were estimated for the different test materials.

After several months in the bay, the metal plates had the highest recruitment of corals, dead coral and concrete followed, while the rubber tire plates had the lowest. According to Bailey-Brock, this may possibly be due to chemicals leached from the rubber tires. Four species were recruited to the plates, including three species of hermatypic (reef-building) corals.

Although the metal plates had the highest rate of recruitment, recruitment of organisms on the concrete more closely resembled that on natural surfaces (like dead coral). This, and the fact that thin sheet-metal structures, such as car bodies tend to deteriorate rapidly in seawater, led researchers to conclude that **concrete was the best material for constructing artificial reefs.**

Source: Daniel Bauer, "Artificial Reef Materials Make a Difference to Corals," **Makai,** University of Hawaii Sea Grant College Program, Vol. 9, No. 2, February 1987.

Item Six: The Japanese Experience



Triangular and ball-joint modules (*SEAFDEC Newsletter*, Vol. 12, No. 4. 1989).

As early as 1952, the Japanese Government began a subsidy program to support the construction of artificial reefs. At first, drawing on historical experience, small-scale artificial reefs were sunk in local waters. Now, large-scale devices, comparable in size to natural reefs, are being installed offshore. Artificial reefs from small to extra large scale (400 m^3 bulk volume to 150,000 m^3 and over) are being subsidized by both national and local governments.

The first industrial fishing reefs were constructed in Japan in 1954. These consisted of concrete blocks. By 1977, other materials, such as steel, were being used.

Mr. Wajiro Fujisawa, a Japanese expert on artificial reefs, cautioned that the construction of artificial reefs on sea bottom requires serious study since all areas are not necessarily suited for them. Some of the factors to be considered include:

- biological data on more than one of the major fish species in the area;
- data on the life history of these species;
- oceanographic surveys of the topography and geology of the sea bottom;
- an analysis of the water, covering particularly temperature, salinity, DO, pH, current direction and speed, wave patterns, etc.;
- information on the fishing gear used; and
- economic estimates of the income expected to be derived by fishermen from the fishing reefs.

These data will help establish suitable construction sites and determine the scale of the reefs needed. Just as important, once the reef has been constructed, is the follow-up phase to evaluate the economic benefits accrued and, eventually, improve the engineering and standardize the technology.

According to Mr. Fujisawa, even in Japan, some unresolved questions remain, one of which concerns the effect of artificial reefs on catch increases. The Japanese experience has not yet established whether the devices actually increase production rather than aggregate fishes. So far, there is no concrete data addressing this question.

On the other hand, part of the popularity of artificial reefs in Japan stems from the fact that they favor small vessels using traditional gear while large trawl nets run the risk of being damaged by them. As a result, the construction of artificial reefs has boosted employment and increased productivity for small fishing communities and fishermen's cooperatives along the country's coastal waters.

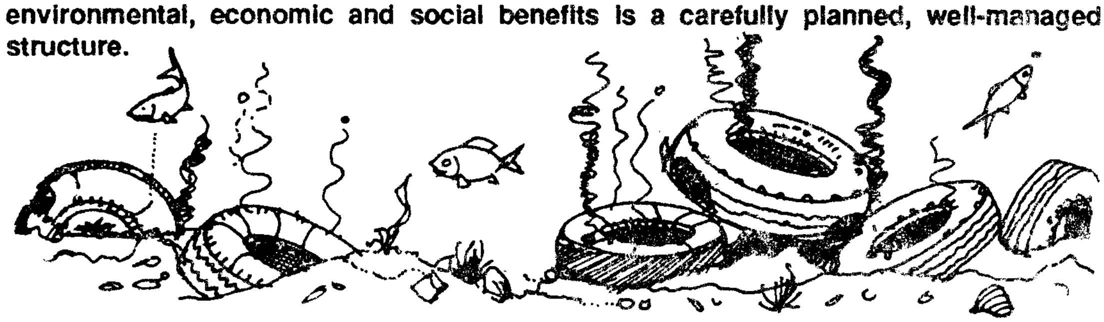
Source: **SEAFDEC Newsletter,** Vol. 10, No. 3, 1987, Bangkok, Thailand.

A Footnote to the Artificial Reef Issue

Scientists led by Alan T. White (White A.T., C.L. Ming, M.W.R.N. de Silva, F.Y. Guarin. 1990. *Artificial Reefs for Marine Habitat Enhancement in Southeast Asia.* ICLARM. MC. P.O. Box 1501, Makati, Metro Manila) suggested that although "the use of scrap materials in generating artificial reefs may be an economic way to solve solid waste disposal problems on land ... it may damage marine habitats. Scrap materials can release toxic pollutants to marine food chains. Some may even add to the already increasing debris in coastal waters. Research on the viability of artificial reefs should be improved before moving into large-scale programs. In 1969, a scientist warned that if we don't base 'a reef's construction upon proper scientific principles, it becomes at best a temporary high relief area of questionable value, or at worst an ocean junk pile whose major value has been as a promotional gimmick publicizing a special interest group.' "

Other scientists also said that "perhaps too much effort has been expended in building artificial reefs and not enough in research.. not all artificial reefs have increased fish harvest or productivity. In many areas, managers have the mistaken belief that they can proceed with large-scale programs without research. Decisions are often made based on political expediency, absolute cost, readily available materials, navigational considerations or solid waste disposal problems, without considering biological, economic, or social effects. The potential exists for major mistakes which could be difficult, costly, or impossible to correct."

Many artificial reef programs have failed because waste materials have been dumped in the cheapest way possible and haphazardly. The environmental and other costs have shown that this shortsighted approach is undesirable. The best alternative in terms of environmental, economic and social benefits is a carefully planned, well-managed structure.



FACTS ON PHILIPPINE CORAL REEFS

Did you know -

1. **THAT** THE PHILIPPINES RANKS SECOND IN AREAL EXTENT OF CORAL REEFS?
The Philippines ranks second to Indonesia on areal extent of coral reefs in the Asian region, a fact which should give us a sense of pride.

2. **THAT** THE COUNTRY'S CORAL REEFS OCCUPY ABOUT TWO-THIRDS THE AREA OF ARABLE LAND?
The Philippine coral reefs occupy an area of 44,000 square kilometers, about two-thirds the area of arable land.
The most productive part of the coral reefs is shallower than 20 fathoms or 37 meters and covers 33,000 square kilometers.

3. **THAT** CORAL REEFS ARE HIGHLY PRODUCTIVE COMPLEX COMMUNITIES?
The coral reefs are highly productive complex communities with primary production roughly 20 times greater than the open ocean, 10 times greater than coastal waters, and 3 times greater than in upwelling zones. Coral reefs in the Philippines produce about four times as many fish per unit area as typical coastal trawl fisheries.

4. **THAT** PHILIPPINE CORAL REEFS PRODUCE SEVERAL METRIC TONS OF FISH PER SQUARE KILOMETER EACH YEAR?
The coral reefs produce 3 to 37 metric tons of fish per square kilometer each year, depending upon how badly damaged they are.

5. **THAT** THE MOST PRODUCTIVE PART OF THE PHILIPPINE CORAL REEFS CAN ONLY BE FOUND IN TWO ISLANDS?
The most productive part of the Philippine coral reefs can be found in the Island of Pamilacan with a moderate yield of 17.9 metric tons/year and Apo Island Reef with a high value of 31.8 metric tons/year.

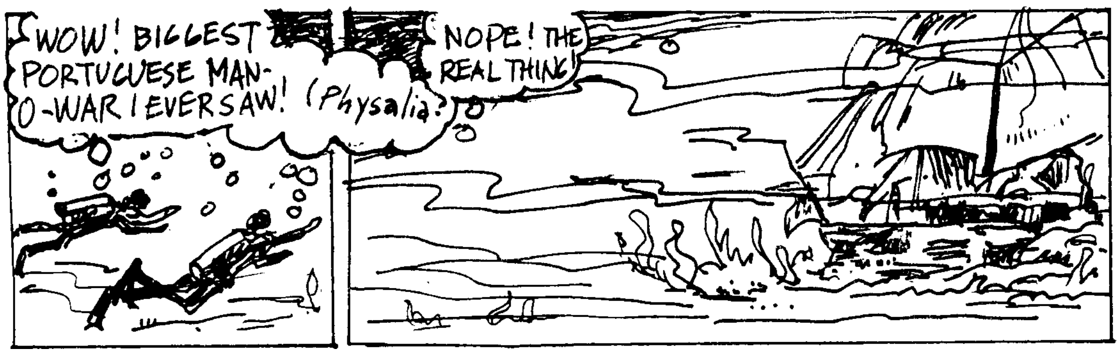
Source: **Haribon Update,** Vol. V, No. 10, July-August 1990.

More on Philippine corals

Of the 500 coral species known in the world, 400 are found in the country. This collection is even greater than that of the renowned Great Barrier Reef in Australia.

Source: **Haribon Update,** Vol. V, No. 6, November-December 1990.

The most productive reefs in the Philippines are Apo Reef near Mindoro (indicated by arrow on left) and in Pamilacan Island in Bohol (arrow on lower right).



TRADE OF CORALS

Illegal Coral Trade

The consumer demand for "exotic" decorative items for the home (for aquarium use for instance) has given illegal traders the market they need for smuggling corals out of the country.

The value of raw corals traded in 1988 was placed at about $500,000 which are distributed to various buyers, the U.S. being the major importer. And the Philippines has continued to be the major supplier of raw corals to the US market wherein 413 tons of raw corals were exported.

Last year, Traffic-USA, the wild-life trade monitoring arm of World Wildlife Fund-USA had uncovered illegal trade involving $125 million worth of corals entering the United States from the Philippines despite the complete ban on exportation of raw corals since 1977.

An examination of US import documents show that corals sometimes leave the Philippines disguised as "shellcraft" and some of the permits that accompanied recent shipments may have been forged.

The Coral Market

Of the country's rich coral collection, there is a great demand for the following:

i) Porous or stony corals (e.g., mushrooms, brownstems, brain, antler, and finger corals) are the common rocklike ornaments found in aquaria. In ground form, they may also be used for building purposes and as mixture for fish meals due to their calcium content. Harvest of this type of corals is totally banned.

ii) Precious or hard corals are mainly black, pink, and red corals. These are the types which are processed into chokers, pendants, belts, and inlays in shellcraft. These and item iii are allowed for trade only in the processed form under a special permit system.

iii) Princess corals are also used in shellcraft; e.g., in the stems of floral designs for tables, trays, wall frames, and dividers. Related to these are the "sea fans" which are small treelike ornaments put in aquaria.

At present, the precious corals in the local market are presumably imported. No firm has been issued the special permit for harvest of precious and semi-precious corals by the Management Authority for Marine - Bureau of Fisheries and Aquatic Resources (BFAR).

The biggest market of semi-precious and non-precious corals is the Zamboanga-based trade. It caters to two major consumers: the local or domestic consumers (10%) and the foreign importers (90%). Of the foreign market, the United States is the biggest customer (56% of coral imports), followed by Europe (33%), Japan (8%), and the rest of Asia (3%).

Ecological and Economic significance of Coral Reefs

Besides trade value, corals, particularly reef builders, have immeasurable economic and ecological importance for people. The immense coral structure protects the coastal areas from the effects of waves and storms. Coral grazing by fish likewise contributes to sand formation and deposition by creating a natural dynamic balance on many beaches and by lessening the occurrence of massive erosion. Various non-food items such as building materials, industrial, and pharmaceutical products may also be derived from the reefs. The natural habitats are also magnificent tourist drawers, and therefore help boost the country's tourism industry.

But the importance of reefs lies in what they contribute to man in terms of basic food items like fish, crabs, molluscs, and seaweeds. Since the coral reefs serve as spawning, feeding, and nursery grounds for fishes, crustaceans, echinoderms, and other smaller marine creatures, it is estimated that a good reef may produce up to 30 tons of fish per square kilometer per year. There are studies indicating that reefs produce greater volumes of food than an agricultural land of equal area. Sadly, though, a 1981 survey showed that only 5% of the country's reefs remain in excellent condition and capable of producing such volume of fish.

Laws, Rules, and Regulations on the Trade of Corals

The overharvesting of corals, particularly reef building corals (ordinary or stony corals) has affected the coastal fishing industry of the country and in an attempt to minimize the destruction and further depletion of coral resources, the Philippine government, specifically BFAR, banned the collection and export of both raw and processed "ordinary" or stony coral and all raw precious and semi-precious corals.

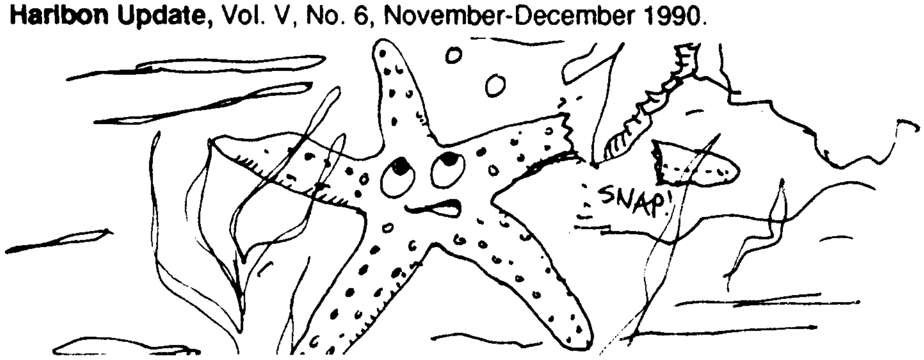
The illegal coral trade, along with destructive dynamite fishing, pollution, siltation, and other factors, has contributed to the degradation of close to 75% of Philippine coral reefs.

What You Can Do

The coral is most beautiful in its natural habitat and the underwater marine environment, specially a reef, is the best aquarium an individual can see. Let us contribute to its conservation by following these measures:

i) restrain from buying any reef-building or stony corals;
ii) avoid the gathering of any live corals for "pasalubong";
iii) make sure that the coral jewelry or item you buy was not derived from stony corals;
iv) buy only jewelry or products made of precious and semi-precious corals; and if you're not sure that what you're buying is made of precious and semi-precious corals, DON'T BUY.

Source: **Haribon Update,** Vol. V, No. 6, November-December 1990.



Oops! No problem, but unlike me, corals can't regenerate. I hope humans realize that. Once destroyed, they can kiss it goodbye!

FISHERIES TIPS

Fish Protein Concentrate

Mexican researchers have developed a process for producing a fish protein concentrate using industrial proteolytic enzymes.

Developed by the Department of Biotechnology of the Institute of Biomedical Research at the Universidad Nacional Autonoma De Mexico (UNAM), the process utilizes by-products of fish canning or waste of large catches.

It involves the following steps: grinding of fish, enzymatic hydrolysis, enzyme inactivation, filtering, centrifuging, and spray-drying. The product thus obtained is a beige-colored, water-soluble powder with a protein content of 85%.

The concentrate can be used in milk substitute formulations for calves, as well as for replacing peptones in fermentation processes.

For further information, contact:

MARIO DIAZ CASTANEDA
Departamento De Biotecnologia
Instituto De Investigaciones Biomedicas, UNAM
Ciudad Universitaria, Coyocan, 04510 Mexico D.F., Mexico

Rice-Fish Farming

The introduction of "high-yielding" rice varieties and the consequent emphasis of governments and researchers on monocultures have generally been accompanied by heavy use of pesticides and herbicides that has all but destroyed centuries of traditional integrated rice-fish farming systems.

Fish production in flooded rice fields is gaining popularity among Indonesian farmers. Simultaneous culture techniques as well as rotational and sequential systems have been developed.

According to researchers, the synergistic effects of rice and fish in the same field exemplify the advantages of an integrated approach to farming. The recycle of nutrients leads to improved phosphorus and nitogen uptake by the rice plants. Furthermore, the fish eat insect pests and larvae, thus potentially reducing the use of insecticides.

The recommended method involves digging a deeper water "refuge" in a low-lying area of the rice field into which fingerlings, usually carp (*Cyprinus carpio*) or tilapia, are introduced. The water from the field is drained, and the fish are collected in the lower "refuge" before toxic chemicals are applied to the rice.

It has been shown that where excessive use of pesticides, herbicides, and chemical fertilizers has not yet poisoned the waters, farmers get better rice yields plus additional food and cash income in the form of fish by adopting these methods.

For more information, contact:

SUKAMANDI RESEARCH INSTITUTE FOR FOOD CROPS
Ji Kaya 9, Sukamandi, Subang
West Java, Indonesia

SEAFDEC/AQD NEWS

SEAFDEC/AQD RESEARCH PRIORITIES, 1992-94

ADSEA II or ADSEA '91 came up with reseach priorities by species to be pursued by the SEAFDEC Aquaculture Department (AQD) in the next three years. 1992-94 As prioritized by the representatives of SEAFDEC Member Countries Japan, Philippines, Singapore, and Thailand these are

Marine finfish: (1) grouper, (2) milkfish (3) bighead carp, (4) sea bass, (5) rabbitfish (6) mullet

Freshwater finfish: (1) other tilapias (2) catfish, (3) bighead carp, (4) red tilapia

Ornamental fish (1) marine ornamental fish, (2) freshwater ornamental fish

Crustaceans (1) *Scylla serrata*, (2) *Penaeus monodon*. (3) *P merguiensis*, (4) *P indicus*

Bivalves and gastropod; (1) *Crassostrea* sp., (2) *Perna viridis*, (3) *Pinctada* sp (4) *abalone*, (5) *Placuna placenta*, (6) *P sella*, (7) *Tridacna* sp. (8) *Anadara* sp (9) *Pholas orientalis*, (10) scallop

Seaweeds: (1) *Eucheuma*, (2) *Gracilaria*, (3) *Gelidiela*, (4) *Porphyra*. (5) *Sargassum*.

Accomplishment of these research priorities by AQD will depend on available financial and manpower resources.

The representatives of the four countries (Malaysia's representative was not able to make it to ADSEA II) also prioritized the training courses to be offered by AQD in the next three years. (1) *Fish Nutrition*, (2) *Marine Finfish Hatchery*, (3) *Fish Health Management*, (4) *Aquaculture Management*. (5) *Culture of Natural Food Organisms*, and (6) *Shrimp Hatchery*

Marine Finfish Hatchery shall concentrate on milkfish, sea bass and rabbitfish For 1992, the training course shall include grouper depending on availability of the species

ADSEA II is the acronym for the second seminar workshop on **Aquaculture Development in Southeast Asia** which along with prospects for seafarming and searanching, was discussed on 19-23 August at the Amigo Terrace Hotel, Iloilo City Philippines Jointly sponsored by the International Development Research Centre of Canada (IDRC) and SEAFDEC ADSEA II followed a previous seminar-workshop (ADSEA I) also held in the same place in 1987 Aside from the representatives of SEAFDEC Member Countries participants and observers also came from national and international cooperating agencies

SEAFDEC/AQD WINS BEST PAPER AWARDS

In the National Research Symposium last 1 August 1991 sponsored by the Bureau of Agricultural Research Department of Agriculture two AQD papers won first place while two others won second place

The winning papers as categorized are as follows

<u>Agricultural Engineering</u>

Oseni M Millamena, Eva Aujero and Ilda Borlongan 1990 Techniques on Algae Harvesting and Preservation for Use in Culture and as Larval Food *Aquacultural Engineering* 9 295-304 **1st Place**

<u>Fisheries</u>

A.Q Hurtado-Ponce 1990 Vertical Rope Cultivation of *Gracilaria* (*Rhodophyta*) using Vegetative Fragments *Botanica Marina* 33 477-481 **1st Place.**

Corazon B Santiago Mercedes B Aldaba Manuel A Laron and Ofelia S Reyes 1988 Reproductive Performance and Growth of Nile Tilapia (*Oreochromis niloticus*) Broodstock Fed Diets Containing *Leucaena Leucocephala*

Leaf Meal. *Aquaculture* 70:53-61. **2nd Place**

Socioeconomics

Renato F. Agbayani, Dan D. Baliao, Giselle P.B. Samonte, Reuel F. Tumaliuan, and Romeo D. Caturao. 1990. Economic Feasibility Analysis of the Monoculture of Mudcrab (*Scylla serrata*) Forsskal. *Aquaculture* 91:223-231. **2nd Place.**

MARFISHHATCH GRADUATES 16

The 7th session of the training course in *Hatchery/Nursery of Marine Finfishes* (MARFISHHATCH for short) graduated 16 trainees in closing ceremonies held 24 July 1991.

The graduates were: Lorna J. Cardanao, Elsa C. Segovia, Evelyn S. Escala, Susan B. Gaffud, Raul C. Millana, Gildo B. Bayogos, Hanani T. Torrila, Kenneth S. Kennedy, Mark Anthony Clemente, El Cid R. Caballes, Arsenio S. Santos III - Philippines; Porntip Wisutiwong, Suchat Suwangarreruks Thailand; and Ismael Bin Yasin, Ab Halim Bin Ab. Kadir, Philip Pak Hong Wong - Malaysia. The SEAFDEC Fellowship Fund, a contribution from the Government of Japan, sponsored the participation of the two Thais, two Malaysians, and five Filipinos.

AQD Deputy Chief Soichiro Shirahata distributed the Certificate of Graduation assisted by Dr. Cesar T. Villegas, head of the Training and Information Division.

Dr. Arnil Emata, one of the lecturers, delivered a message. Excerpts:

"The shortage of natural fry supply has definitely led to studies on spawning and larval rearing where the ultimate goal is the mass production of fry. As we live in this world where man studies and controls biological activities, finfish is definitely not an exception. From broodstock to spawning to larval rearing, we look for means to manipulate these activities in order to increase our hatchery production and help alleviate this natural fry shortage. As you leave our premises, we are confident that with the knowledge and experience you have gained, you can also contribute in increasing our fry production. A collaboration of institutions, such as SEAFDEC/AQD with the private sector and government agencies, is definitely a major asset that could meet the increasing demand for finfish fry.

"When you look at wild-caught fry, think of the many obstacles it has gone through to survive. It surely must be the fittest, as Darwin would remark. But even if it is fit enough, if the environment has been changed so that the fry can no longer adapt to it, then obviously, as Porntip, would say, "Problem." Thus, I would hope that you, too, can advocate against the destruction of natural fry grounds."

AQUA FARM NEWS is produced bimonthly by the Audiovisual-Print Section, Training & Information Division of the **Aquaculture Department, Southeast Asian Fisheries Development Center,** P.O. Box 256, Iloilo City, Philippines.

SEAFDEC

Entered as second class mail matter at the Iloilo City Post Office on August 3, 1984.