SEAFDEC Asian Aquaculture

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At the SEAFDEC Council Meeting

Freshwater Aquaculture Training Course to be Revived

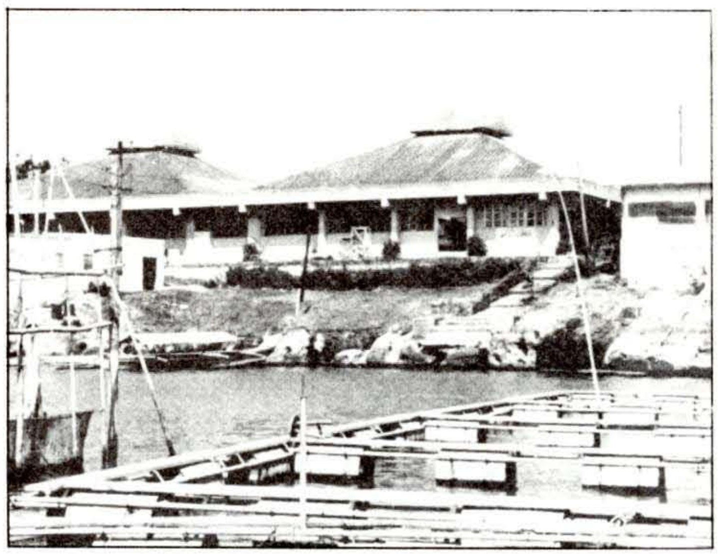
In 1995, the Freshwater Aquaculture Training Course, last conducted in 1988, will be revived to respond to the needs of SEAFDEC Member Countries identified at the ADSEA '95. The course will be offered every year.

This development was discussed and approved during the SEAFDEC Council Meeting on 29 November - 2 December 1994 in Singapore. The Council Meeting is a year-end activity of the SEAFDEC official family that approves the plans and programs of the four Departments.

The revival of the Freshwater Aquaculture training course was lauded by the delegates from Member Countries, specially Malaysia, who announced that their government will embark on a program related to the development of fisheries in freshwater lakes and reservoirs. The course will be conducted at AQD's Binangonan Freshwater Station in Binangonan, Rizal.

Other concerns discussed at the meeting are the strengthening of the Secretariat, possibly by the secondment of officers (task- and time-specific) from Member Countries, collaboration with non-member governments and international organizations, graduate thesis grant and external researchers programs, and the establishment of an ASEAN network of fishery post-harvest technology centers.

The amendment of the *Agreement Establishing the Center* was also discussed at the meeting. It was finalized on 18 November 1994 and allowed the official entry of two new members to SEAFDEC - Brunei Darussalam and Viet Nam. The amendment opened membership to SEAFDEC by other countries in the region like Myanmar, Cambodia, Laos, and Indonesia.



The revived training course on freshwater aquaculture will be conducted at AQD's Freshwater Station in Binangonan, Rizal.

Inside

Research Update

Geographic distribution and genetic variation in milkfish

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Most of the information on milkfish biology is related to aquaculture, for a long time within the pond context, and recently in the hatchery context. The book "Biology of Milkfish" published by the SEAFDEC Aquaculture Department in 1991 and the review paper "Systematics, distribution, genetics, and natural life history of milkfish" in *Environmental Biology of Fishes* 39: 23-41 (1994) attempted to advance the level of current understanding of the biology of milkfish by covering fundamental aspects not usually considered in aquaculture papers. The present account is taken from those two main sources, which contain all the literature citations here omitted for brevity.

Geographic distribution

Milkfish inhabit continental shelves and oceanic islands throughout most of the tropical Indo-Pacific. In 1913, Weber and de Beaufort gave the range of milkfish as Indonesia, Malaysia and New Guinea 'eastward to the Paumoto Islands, north to southern Japan, southward to New South Wales, and westward to the Red Sea and the east coast of Africa and Madagascar,' to which Sunier added '40°E to 140°W and 30-40°N to 30-40°S.' Based on these bearings, Schuster in a 1960 FAO Fisheries Biology Synopsis illustrated a blanket map of milkfish distribution, which has since been cited or reproduced by several authors.

To define the geographic distribution of milkfish more precisely, specific occurrence records in the literature, particularly those at the extremes, were plotted (Figure 1). The map that emerges shows a more restricted distribution than suggested by Schuster. Milkfish are rare in tropical waters affected by cold ocean currents, as in Ecuador and Peru, but occur in temperate waters affected by warm oceanic currents, as in South Africa and southern Japan. Milkfish apparently stay relatively close to the coasts of continents and islands, and have not been reported in catches of oceanic fishing fleets. The geographic range of milkfish seems to coincide with those of reef corals which are also restricted to clear, shallow, saline, and warm (>20°C) waters.

Southeast Asia, particularly the Philippines, Indonesia and Taiwan, is the center of the present-day geographic distribution and aquaculture of milkfish. Milkfish occur around Penang off the west coast of peninsular Malaysia and along the coasts of Thailand and Vietnam. However, milkfish have not been recorded in the Ponggol estuary in Singapore, in the Kretam estuary in north Borneo, nor in Sarawak, despite extensive collections. Milkfish was collected in Hongkong before 1930, but was not included in a 1979 account of Hongkong seafoods. Milkfish occur in the Taiwan Strait and in Xiamen, China.

The occurrence of milkfish in Japan is well documented, starting with the collections of David Starr Jordan and his colleagues in the very early 1900s, and then the first record of a postlarva in Amami-Oshima. Milkfish larvae occur in the surf zones along sandy beaches in southern Japan, from Okinawa to Tanegashima and Yakushima, the Goto Islands, Tosa Bay, and Ugui, Wakayama. Juveniles 5-56 cm in fork length were found in tide pools, river mouths, and incidentally in eel and shrimp ponds from Okinawa to Kagoshima, Miyazaki, Kumamoto, Wakayama and Shizuoka prefectures, and Lake Hamana. A dead juvenile milkfish was found stranded on the beach in Miho, Shimizu near 35°N one December, but none has been found in the Ogasawara Islands located in the same latitude as the Ryukyus but farther to the east. Milkfish in

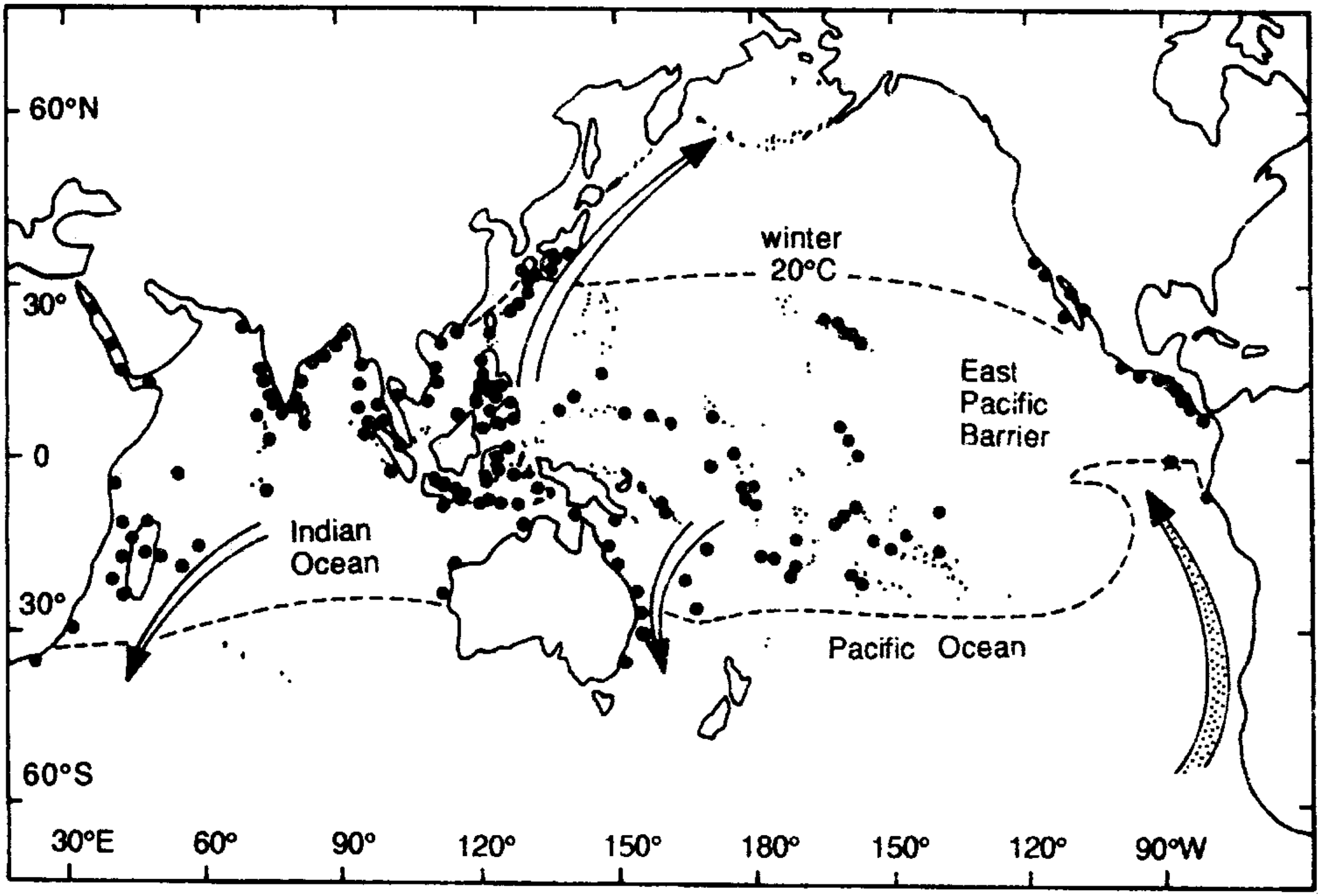


Figure 1. Present-day geographic distribution of milkfish based on documented occurrence (see text). Plain arrow = warm current, dotted arrow = cold current, broken lines = 20°C surface isotherm in winter.

spawning condition have been reported from Okinawa.

As in 1775 when Forsskal described the type specimen of *Chanos chanos* from Jeddah, adult milkfish still occur in schools in the Red Sea. In the Indian Ocean, milkfish are abundant in Burma, India, Sri Lanka and around the Andaman, Nicobar, Laccadives, Maldives, Chagos, Seychelles, Mauritius and Reunion Islands. Milkfish are found in Zanzibar, Mozambique and South Africa and around Madagascar and the Comoros. A 50-cm milkfish was recorded in Lake St. Lucia, and another 4.5-kg adult in the Swartkops Estuary in Port Elizabeth (latitude near 34°S) in South Africa.

Milkfish are common in the lagoons and atolls among the Pacific Islands, from Palau to Kiribati to Hawaii, and from New Caledonia to the Tuamoto Archipelago and the Marquesas Islands. Milkfish figure prominently in the mythology and traditions of the native Pohnpeians, Hawaiians, Tongans, and Nauruans. In the December 1921 issue of National Geographic is a picture of a Nauruan dancer with milkfish as ceremonial ornament.

Milkfish are found in Papua New Guinea, the Solomon Islands, and in Australia from Shark Bay and Dampier, around the north coast, and down Queensland. Milkfish larvae have been collected near Lizard Island, Carter Reef and Yonge Reef in the Great Barrier Reef lagoon near 15°S. Milkfish have also been recorded in New South Wales and Victoria (to about 38°S), and in Norfolk Island and New Zealand about 50-150 years ago.

Milkfish is one of the few Indo-West Pacific fishes that occur on the eastern side of the East Pacific Barrier. Milkfish have been reported from Magdalena Bay in Baja California in 1929 and from San Pedro and San Diego Bays (latitude near 33°N) in 1979 and 1982-1983, probably strays from the Mexican population. The 100 milkfish introduced from Hawaii in 1877 into a small stream at Bridgeport, Solano County, California did not persist. Milkfish are common in the Gulf of California and in the bays and lagoons of southern Mexico. They also occur in central America from Guatemala to Panama, and very rarely in Peru. Four specimens of juvenile milkfish were recorded from Tower Island in the Galapagos in 1938.

The milkfish's closest relative, *Gonorynchus gonorynchus*, is marine and essentially antitropical in distribution. It occurs widely throughout the cooler Pacific — Japan, Taiwan, Hawaii, Australia south of 18°S off the Great Barrier Reef, and on the San Felix ridge off Chile — and around South Africa including the western coast. Nowhere abundant, *G. gonorynchus*, has not been well studied. The other families in the Order Gonorynchiformes are Phractolaemidae (1 species, freshwater, tropical Africa) and Kneriidae (24 species, freshwater, tropical Africa and the Nile). The Gonorynchiformes is most closely related to the freshwater Ostariophysi (carps, loaches, catfishes). The earliest gonorynchiforms occurred in the Cretaceous of Brazil and west Africa. Fossil of *Chanos* occurred in the freshwater Eocene deposits of Europe and North America.

Genetic Variation

Variant forms of milkfish have occasionally been found. A specimen from the Philippines with distinctly elongated dorsal, pelvic and anal fins, and a caudal fin as long as the body is shown in Figure 2. This 'goldfish-type' milkfish is probably similar to one from Indonesia mentioned by Schuster. Dwarf or hunchback 'shad-type' specimens have also been recorded in Hawaii, Indonesia, and Australia. A milkfish of unusual coloration — red head, red fins, and brilliant-blue dorsal surface — was reported from Darwin Harbor in northern Australia. Nothing is known about these variant forms of milkfish since they rarely occur. Short specimens, however, may be produced through stunting under conditions of limited space or very high salinity.

Milkfish is a primitive ostariophysan, but it may be considered a much differentiated species based on its karyotype. It has a diploid chromosome number of $2n = 32$, consisting of 7 pairs of metacentric, 2 pairs of submetacentric, and 7 pairs of acrocentric chromosomes. This diploid number is low compared to the $n=50$ of other primitive teleosts. The original chromosome number of milkfish may have been 50 because all the two-arm chromosomes are approximately two times larger than any one-arm chromosome and appear to have been formed by centric fusion.

The wide Indo-Pacific distribution of milkfish may be expected to have given rise to genetic variation among populations in widely separated locations. Early taxonomists indeed saw morphological variation among milkfish from different localities that led them to apply different species names to milkfish. Recent studies using morphological data and protein electrophoretic data indicate the existence of at least nine major populations of milkfish across the Indo-Pacific. Through a statistical study of the variation in vertebral number of milkfish larvae, four populations were identified: Indian, Thai, Philippine-Taiwan-Indonesian, and Tahitian. Samples of larvae from

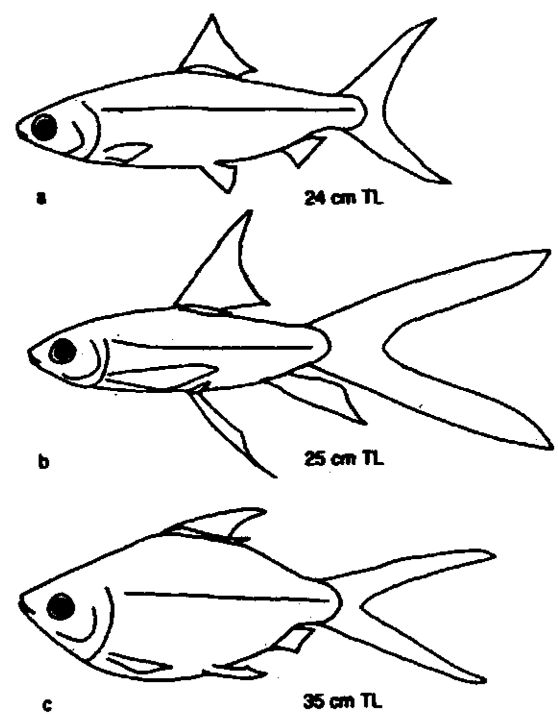
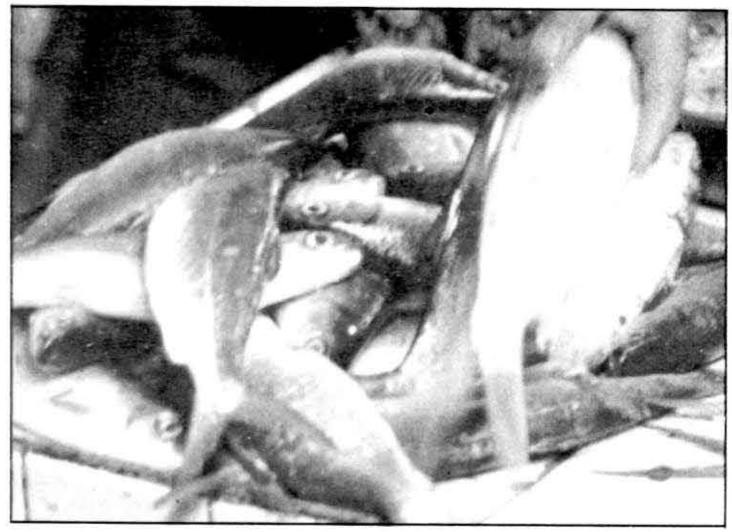


Figure 2. Outlines of the morphology of milkfish: a - typical juvenile (similar to adult); b - 'goldfish' type from Iloilo, Philippines; c - 'shad' type from Indonesia.

Kiribati, Tonga, and Hawaii, and a small sample of juveniles from Panama indicate four other populations. No sample has been obtained from the African coast, but it is highly likely that there is at least one other population there.

In two papers in 1980 and 1985, Gary Winans analyzed electrophoretic variation at 38 gene *loci* and morphological variation in six meristic and 19 morphometric characters in milkfish from 15 locations in the Pacific. He found both similarities and differences between the patterns of morphological variation and electrophoretic variation, a not unusual finding that shows the two may be independent. On the basis of electrophoretic data, the genetic population structure of milkfish in the Pacific includes three distinct groups: Philippine, Hawaiian, and equatorial Pacific (Palau, Kiribati, Fanning, Christmas) including Tahiti. The morphometric data actually separate Tahiti from the equatorial Pacific group, although the electrophoretic data do not. Winans did not include vertebrae among the meristic characters he studied on juveniles 9-37 cm FL. No significant meristic differences were found among samples, but multivariate analysis of morphometric characters showed Philippine milkfish to have smaller head features and larger tails than equatorial Pacific and Hawaiian specimens.

Winans' findings from protein electrophoresis are very interesting. First, milkfish has relatively high genetic variation, higher than the mean variation in 106 species of marine teleosts. Second, genetic variation in milkfish shows no latitudinal change but decreases with increasing distance from the Philippines, the region of greatest effective population size. Third, milkfish populations in the Pacific Ocean show very low divergence given the great distances (1,700 km to 10,000 km) separating the locations included in the study. Such high genetic similarity, i.e., high level of gene flow, is a phenomenon common among populations of oceanic marine animals. Fourth, the milkfish population around the island of Oahu differs from that around Hawaii, only 320 miles away. This last finding reflects the high level of endemism that has occurred in the Hawaiian fish fauna, and may be due to the existence of a strong gyre in the lee of Hawaii Island. Oceanographic conditions affect the gene flow among localities and determine in large part the magnitude of population differentiation in milkfish.



In milkfish, oceanographic conditions affect the gene flow among localities and determine in large part the magnitude of population differentiation.

In having high genetic variability within areas and low genetic differentiation between areas, milkfish is similar to many other commercially important teleosts. In more than 20 of these marine species, recognized stocks (natural breeding units or populations) separated by wide sea areas show little genetic divergence in terms of electrophoretic characteristics. Rather than being a homogeneous group of fish, a stock is a heterogeneous group of individuals of numerous genetic combinations, and a dynamic unit in which electromorph frequencies are not always stable.

It is interesting that the milkfish has not speciated, given its early origin (40-50 million years ago) and wide geographic distribution. Genetic divergence of milkfish populations is low and strictly quantitative, i.e, no alternative alleles are fixed. The high gene flow and stabilizing selection that have maintained all milkfish populations just one species may be due to many factors, among them: (1) the near-coastal pelagic and migratory habit of adults and larvae, (2) high fecundity and large population size, (3) low trophic level and wide-spectrum feeding habits, and (4) high tolerance to environmental changes.

Spawning response of mangrove red snapper *Lutjanus argentimaculatus* (Forsskal), to a single injection of human chorionic gonadotropin and luteinizing hormone-releasing hormone analogue

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The mangrove red snapper, *Lutjanus argentimaculatus* (Forsskal), is a member of the family Lutjanidae and is widely distributed throughout the Indo-Pacific region. Due to its high commercial value, the fish is considered a desirable species for aquaculture, especially in Southeast Asia. At present, the juveniles for culture are collected from coastal and estuarine waters only thus limiting the growth of the mangrove red snapper industry. As part of a project to develop reliable breeding and seed production techniques, induced spawning of the mangrove red snapper was conducted at SEAFDEC Aquaculture Department.

Initially, breeding trials concentrated on the spawning response of mangrove red snapper broodstock to human chorionic gonadotropin (hCG) and des Gly (D-

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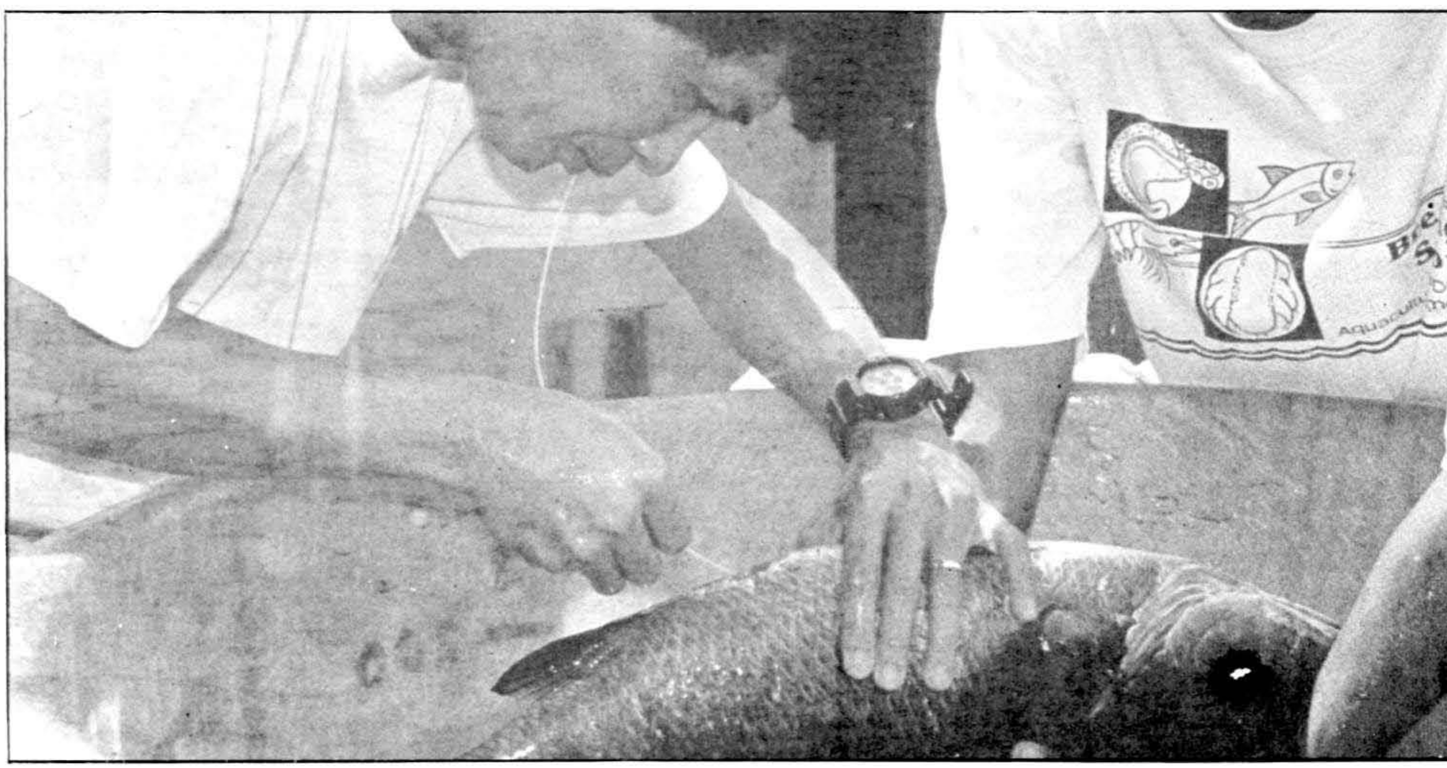

Dr. A.C. Emata doing gonadal biopsy on the mangrove red snapper. The work provides a reliable breeding program that is easily adaptable with the use of hCG and LHRHa.

Ala6)luteinizing hormone-releasing hormone ethylamide (LHRHa). Broodstock collected by fish traps along the coastal waters of Guimaras Island were bought from fishfarmers in 1992. These were kept in 5 x 5 x 3m deep floating net cage. In March 1994, the broodstck were transferred to two 5 x 5 x 3m deep floating net cages. Fish were fed trash fish every other day at 5% of their total body weight. In 1993 and 1994, fish were sampled monthly to assess their gonadal development. Gonadal biopsy for females was conducted by inserting a polyethylene tubing into the genital pore followed by gentle aspiration of ovarian oocytes. Oocytes were fixed in 5% buffered formalin and were measured to the nearest 0.05mm using an ocular micrometer. Females with mean oocyte diameter of 0.32mm and above were selected for the spawning trials. Mature males were identified by the presence of milt following gentle massage of the abdomen. Fish without oocytes or milt were considered immature and were not used for induced spawning.

Mature females and males were given a single intramuscular injection of 1000 IU hCG per kg BW (for 1993 trials) or 100 mg LHRHa per kg BW (for 1994 trials.) Injected fish were then placed in 2 x 2 x 2m deep fine mesh (0.6 - 0.8mm) net (hapa) cage at 1:1 to 1:3 female to male ratio and allowed to spawn spontaneously. Spawning was monitored by checking the presence of eggs in the water column beginning at nighttime on the day of injection until 3 days after injection.

Cage-reared mangrove red snapper responded successfully to a single injection of 1000 IU hCG per kg BW or 100 mg LHRHa. To induce spawning following an hCG injection, the minimum oocyte diameter was 0.35mm. Spawning responses to LHRHa appeared to be at higher minimum oocyte diameter of 0.47mm. The difference could be related to the mechanism of action of the hormone although presently this still remains unknown. The spawning latencies were similar between hCG or LHRHa which ranged from 32-36 h post-injection. However, in one instance where the female had a mean egg diameter of 0.57mm, spawning occurred 12h after injection. This female was probably very mature so the response to LHRHa was quicker than the others.

Seed production of the mangrove red snapper entails a reliable breeding program that is easily adaptable. The availability of mature male and female cage-reared mangrove red snapper for up to 5-6 consecutive months (May to October) is a big advantage for induced spawning program. Furthermore, the use of hCG and the less expensive LHRHa provides a reliable and easy- to-adapt protocol for production of eggs. However, additional studies are urgently needed such as determination of minimum effective dose of hCG and LHRHa, relationship of egg production to the initial oocyte diameter, serial (batch) spawning, natural spawning, and induction of off-season maturation and spawning. To date, natural spawning was only observed twice (September 1993; August 1994) in cage-reared broodstock, while serial spawning was never observed in the present study. In some Southeast Asian countries such as Thailand, Malaysia, and Singapore, researchers have observed these phenomena in the mangrove red snapper. Thus, optimum conditions for serial and natural spawning will have to be determined to maximize egg production of the broodstock. Recently, mortalities among breeders were observed. Small breeders (2-3 kg BW) kept with bigger-sized fish (4-5 kg BW) became physically injured leading to mortalities. Appropriate management techniques to address this problem are needed.

These results suggest that wild-caught mangrove red snapper can be reared in floating net cages to provide good quality eggs for mass production of fry as required by the industry.

The use of hCG and the less expensive LHRHa provides a reliable and easy-to-adapt protocol for production of eggs.

Credit Practices of Small-scale Fishermen in Panay, Philippines

The cooperative is seen as a viable credit structure for small-scale fishermen

The Philippines has an estimated 34,000 km total coastline with about 700,000 small-scale fishermen or 68% of the total population involved in fisheries and aquaculture who are dependent on the fishery resource for their livelihood. The Philippine Fisheries code defines small-scale fishermen as those who use the waters within 7 km from the shoreline and use fishing boats of 3 t or less, or do not use any fishing vessel at all. Total fish production for 1990 was 2.5 million tons, largely contributed by small-scale capture fisheries (45%), followed by commercial fisheries (28%) and the rest (27%) by the aquaculture sector.

This study is part of a three-year community fishery resource management project conducted by the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC/AQD). It was funded by the International Development Research Centre (IDRC) of Canada and conducted by AQD researchers Giselle PB. Samonte and Rolando S. Ortega published in *Philippine Quarterly of Culture and Society* 20(1992) 300-316.

An assessment of credit needs and its availability in five coastal communities were used as the socio-economic criteria for selecting the project site. This paper describes the existing credit practices of small-scale fishermen in five coastal communities in the Philippines. The factors which affect credit source and amount of credit are determined. Three hundred fifty (350) small-scale fishermen representing 16% of the total fishermen population in 5 coastal communities were interviewed from February to August 1990 using a pre-tested questionnaire. The 5 coastal communities were Culasi and San Jose in Antique province, Concepcion and San Dionisio in Iloilo, and Nueva Valencia, Guimaras province.

Socio-demographic Characteristics

Majority (98%) of the fishermen surveyed were male with age ranging from 37 to 44 years. All fishermen surveyed had some formal education but only 33% finished elementary or 6 years of schooling while 40% were not able to complete their elementary education. The average small-scale fisherman supported a family of 6.

Sixty-eight percent of of the total population involved in fisheries and aquaculture are dependent on the fishery resource for their livelihood.

Ninety-six percent of the fishermen considered fishing as their major source of income. Forty-three percent of the fishermen surveyed had land-based alternative sources of income such as farming, tuba (coconut wine) gathering, carpentry, backyard animal raising, firewood cutting, net mending, rice milling, fish vending, fishpond labor.

Total income of the small-scale fishermen averaged ₱2,097/month (25 Philippine Pesos = U.S. $1). Income from fishing consisted of 92.34% or ₱1,920/month while the remaining 7.66% was from alternative sources previously mentioned.

Fishing Gear

All of the fishermen surveyed owned at least one piece of fishing gear. Hook and line, gill net, jigger, spear, seine net, fish trap, and trawl net were the common fishing gears used by the fishermen.

Hook and line. This gear generally consists of a monofilament of one or more branch lines to which a hook and a sinker are attached. With a bait, the gear is dropped in the water to a depth measured according to the full arm-length of the monofilament. The main line is jerked up in a repetitive manner. Common baits used vary from squid, shrimp, fish, to silk thread and chicken feathers. This gear is used for catching both pelagic and demersal fishes such as tuna, mackerel, snapper, grouper, nemiptenid, shark, and squid. Common variations of the hook and line are the handline, bottom longline, and trolling line.

Gill net. Gill nets are operated both in shallow and deep coastal waters.This gear is classified into four types: surface gill net, bottom gill net, drift gill net, and encircling gill net. The net is made of nylon monofilament or multi-filament with mesh sizes ranging from 2 to 15 cm. Height of the net varies from 1 to about 15 m. Floats and sinkers are attached to the net. The gill net is spread or suspended on the surface, which is manually beaten to drive the fish into the net, where they get entangled. Catch includes mullet, pomfret, Spanish mackerel, blue swimming crab, herring, trevally, goatfish, flying fish, garfish, fusilier, and other pelagic and dermersal fishes.

The Philippine Fisheries Code defines small-scale fishermen as those who use the waters within seven kilometers from the shoreline and use fishing boats of 3 tons or less, or do not use any fishing vessel at all.

Spear. This gear is made of galvanized iron or stainless rod and is shot from a gun or bow-like gadget by diving fishermen wearing goggles and wooden flippers. Fishes caught are snapper, surgeonfish, parrot fish, siganid, Spanish mackerel, and barracuda. This spear is generally used with lanterns when fishing at night. Variations come in the form of non-detachable wooden, galvanized iron pipe, or bamboo handle with various lengths.

Seine net. This gear consists of a bag, flask, and wings. It is operated by 2 to 30 persons by surrounding a school or area where fish are spotted. Hauling is done either on boat or on the shore. The catch varies from milkfish fry to goat fish, emperor, mullet, pomfret, silver biddy, and anchovy. A variation is the seine net for milkfish fry. This variation is a rectangular net made of sinamay or white cloth or nylon screen mounted on 2 bamboo or wooden poles and operated along the beach by two persons. Dimensions are 1 to 1.5 m wide and 5 m long. Another variation is the beach seine, which consists of a bag, flanked on both sides by two long wings. The net has a head rope to which floats are attached and a ground rope which holds sinkers. A pair of towing ropes are pulled by fishermen (from 16 to 30 persons) towards the shoreline. This gear is operated during daytime in shallow water, bays, and coastal areas, especially when water is turbid. Catch consists of demersal fishes.

Fish trap. This gear is either temporarily or permanently fixed at the bottom, where fish are caught after having been led, attracted or trapped into it. Fish traps are made of fine screen or bamboo slat netting. It is operated along the shore at 1 to 6 m depth. Catch includes squid, anchovy, trevally, mullet, pomfret, and other trash fishes. Sometimes lanterns are used to attract shrimps and squids.

Danish (trawl) seine. This gear consists of a body, long wings, and bag with long ropes that also serve as scarelines. A ring (30 kg) is dropped through the scareline towards the net at the bottom to close the mouth of the net and allow hauling up to the boat. Fish caught by this gear include threadfin-bream, trevally, mackerel, whiting, goatfish, and slipmouth.

Credit Practices

Of the fishermen surveyed, 291 or 83% obtained credit from both formal and informal sources. Majority (97%) of those who sought credit borrowed from informal or non-institutional sources such as relatives, friends, store

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owners, traders, employers, private lenders, and town funds. The remaining 3% borrowed from formal or institutional credit sources such as credit unions, rural banks, government banks (Development Bank of the Philippines), cooperative, and commercial banks.

The amount of credit availed per fisherman varied with respect to credit sources. Informal credit sources extended loans from as low as ₱20 to as high as ₱20,000 compared to formal credit sources, with ₱500 to ₱6,000 credit lines.

Credit was used for food/household expenses (65%), fishing operations (28%), social occasions (17%), hospital/ medical expenses (14%), and education of children (5%). The use of credit for fishing operations included payment of wages for hired labor, fuel, maintenance and repair of fishing boat and gears, purchase of fishing boat and engine, and purchase of fishing gear.

Informal credit sources were preferred over formal credit sources for the following reasons: accessibility (51%), fast credit extension (31%), liberal terms (25%), only source known by the fisherman (18%), buyer of fish (6%), source of household goods (2%). Liberal terms included no collateral requirement and longer and more flexible repayment schemes, which usually coincided with fishing operations.

Eighteen per cent of the fishermen surveyed did not encounter repayment problems. However, of the 19% who had difficulty in repaying their debts, lack of funds (57%) and low catch (43%) were cited as the primary reasons for their inability to repay their loans.

Existing Credit Delivery System

The existing credit delivery system is inadequate for lending to small fishermen due to high costs and risks. In the Philippines, small-scale fishermen have traditionally relied on informal lenders in view of the limitations of self-finance and the lack of access to bank credit, according to Llanto in 1989. Results of one study showed that implementation of credit programs in the Philippines enabled fishermen to purchase modern fishing equipment through loan acquisition, and an increase in their volume of catch was observed after loans were obtained. However, this did not significantly increase their income, and some fishermen attributed their added income to earnings from other occupations. Statistical analysis showed that borrowers' income and welfare were favored by low rate of interest, staggered mode of loan disbursement, individualized borrowing , and a loan size of ₱11,000 to ₱14,000/borrower.

In another similar study, loans had an impact on investment and technology by allowing an increase in boat ownership and motorization and an increase in the number and gear type owned. However, loans had no effect on catch or the income of fishermen. The coastal resources management component of the Fishery Sector Program for the Philippines has a credit program not for the improvement in fishing gears, but for stimulating the participation of fisherfolk in alternative livelihood activities, thus reducing their dependence on fishing, as found by White and Lopez in 1991.

Income from fishing has become less and less for the small-scale fisherman to meet the basic necessities for his household. In addition, fishermen in the rural communities have no access to institutional credit sources. Institutional credit has often failed because it has not been able to cover all the services offered to fishermen by the trader-financier, as shown by one study.

Results of this study are parallel to the fishery credit in Indonesia whereby the reasons why moneylenders, mostly fish traders, are popular among fishermen are: (1) flexibility in lending procedures and absence of complicated procedures to be followed; (2) source of loan is near at hand and the use of money is not supervised, that is, money is available not only for production purposes, but also for purchasing daily necessities, health, education, and housing; and (3) the moneylenders know the borrower personally and do not ask for a formal pledge of collateral. The moneylender is prepared to give the loan when the borrower needs it. This has the effect that the moneylender controls the economic life of the fishermen as the lenders are in a position to determine selling prices.

The informal credit market plays a significant role in the fishery sector, specifically for the small-scale fishermen. The small-scale fisherman is dependent on informal credit for household consumption needs as a result of the meager income derived from fishing operations. Informal rural credit markets (IRCM) co-exist with the formal credit system since lenders in the former serve those who do not have access to the latter market. This being so, the IRCM facilitates the continuous flow of financial resources.

There are several credit delivery structures that may be used to channel credit, one study said. But the cooperative seems to be the most viable. Cooperatives function socially as a source of help for fishermen while fishermen view cooperatives as credit sources. Individually, fishermen find it impossible to acquire bank loans due to their financial standing and the stiff collateral requirement.

MFRDMD has new Chief

Mr. Ismail Taufid bin Md. Yusoff has been appointed as new Chief of Marine Fishery Resources Development and Management Department MFRDMD), SEAFDEC's newest department in Malaysia. He succeeds Mr. Lui Yean Pong.

Mr. Yusoff holds a Bachelor in Fisheries Science degree from the Tokyo University of Fisheries (1975).

Prior to his appointment as Chief of MFRDMD (15 December 1994), he was Head of Resource Management and Conservation Section of the Department of Fisheries Malaysia, Selangor State Director of Fisheries, Terengganu State Director of Fisheries, Perak State Director of Fisheries, Fisheries Officer and Instructor at the Fisheries Training Institute in Penang, and Research Officer at the Fisheries Research Institute also at Penang.

Typhoon Katring batters Binangonan Freshwater Station

Typhoon Katring hit Rizal and neighboring provinces on 21 October 1994 causing severe damage to Binangonan Freshwater Station (BFS) in Tapao Point. The floating and fixed cages containing experimental animals did not withstand the battering by the strong wind and waves. The cages were either completely swept away by the strong current or torn by bamboo poles and other debris carried by the waves. All fish stocks of the Binangonan Freshwater Station in the lake were lost. The fish were part of several ongoing studies.

The entire roof of the carp hatchery was blown off and was deposited on top of the floating cages. Flying debris punctured the roof of the main hatchery building causing leaks to several newly repaired laboratories. The duplex housing was also damaged. The Engineering unit reported the damage as approximately 2.7 million pesos.

Shrimphatch closes training season

The last training course for 1994 - Shrimp Hatchery Operation closed 1994's training season on 16 November 1994 at the Training and Information Division Conference Room. Participants came from Thailand, Malaysia, Viet Nam, India, Indonesia, Nigeria, and the Philippines.

Deputy Chief Soichiro Shirahata graced the occasion and gave the opening speech.

Training activities would resume in January for the *Third Country Training in Coastal Aquaculture*. It is a newly instituted training course that addresses the need for a more equitable, rational, and sustainable methods to husband the coastal waters of Asia and the Pacific. It is a joint project of the Philippine government through the Department of Agriculture and the Government of Japan under the JICA Third Country Training Programme.

The training courses conducted in 1994 were *Shrimp Culture for Bangladesh Nationals* (29 March-18 April), *Fish Health Management* (20 April-30 May), *Marine Finfish Hatchery* (31 May- 20 July), *Aquaculture Management* (7 September-8 October), and *Shrimp Hatchery Operation* (28 September-16 November). That brought together sixty trainees from both SEAFDEC Member and Non-Member Countries.

Trainees of the Shrimp Hatchery Operation training course try eyestalk ablation.

Sustainable Aquaculture '95
Public Policy, Financing, and Technology for economically and environmentally sustainable aquaculture

11-14 June 1995
Honolulu, Hawaii

Emphasis for the *Sustainable Aquaculture '95* meeting being organized by PACON International in cooperation with PACON Hawaii Chapter, will be on the environmental, socioeconomic, and managerial aspects of aquaculture. To make aquaculture environmentally and socioeconomically sound requires cooperation by many disciplines. A major goal is to foster the interdisciplinary team research objectives that contribute a clearer meaning to the concept of sustainability.

This sysmposium will examine the key ingredients, constraints, and opportunities to foster sustainable aquaculture in both developing and developed countries. Policy makers will be brought together with technologists, economists, social scientists, and resource managers. Discussions will identify the information and expertise needed to plan, and pursue the economic, social, and environmental opportunities offered by long-term sustainable aquaculture development. Send abstracts, registration, and correspondence questions to: *Sustainable Aquaculture '95*, PACON International, P.O. Box 11568, Honolulu, Hawaii, 96828, USA. Phone: (808) 956-6163, Fax: (808) 956-2580 MCI/TELEX: 6503161203, Internet: saxena@wiliki.eng.hawaii.edu.

FishAsia '95
2nd Asian Aquaculture and Fisheries Exhibition and Conference

19-21 September 1995
Singapore

The Singapore Organizing Committee of *FishAsia '95 Conference* invites interested persons to this event to be held in Singapore International Convention and Exhibition Centre (Suntec City). The two-day technology-transfer sessions will bring together policymakers, businessmen, researchers, and practitioners from all over the world to present and review findings on development and demonstration projects and farm management issues.

The aim of the conference is to bring together international and regional aquaculturists, engineers, administrators, government officers, researchers, and businesses to discuss and deliberate on current and future issues of the aquaculture industry. The topics to be discussed in the conference are: site selection, engineering systems, management issues, fish and prawn aquaculture, and water treatment systems.

For submissions and other information, write or call *FishAsia '95 Conference*, RAI Exhibitions Singapore Pte Ltd, 1 Maritime Square #09-49, World Trade Centre, Singapore 0409. Tel: (65) 272 2250 Fax: (65) 272 6744.

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