Knowing Asian aquaculture and fisheries

By **MB Surtida**

CAMBODIA

Cambodia has a land area of 181,035 km^2 of which 20% is used for agriculture. Cambodia is a geographically compact country administratively divided into 22 provinces, three of which have relatively short maritime boundaries. The country has a coastline of 435 km and extensive mangrove stands, some of which are relatively undisturbed. The country has widespread forest resources, some of which have important commercial potential.

The highest monthly rainfall in Phnom Penh occurs in October at the end of the monsoon season. January has the lowest monthly rainfall level. Temperature fluctuates between 21°C and 33°C.

Population of Cambodia is 10.5 million with population growth rate of 2.8% per annum. The national average population density is 53 persons per km^2.

Fisheries

Result of a study conducted in 1983-86 showed that there are 435 fish species from 97 families in the off-shores.

Purse seines (for mackerel and scad) are used mostly in Kohkong province since 1958. Around a few hundred units of fish trawl, long lines, and nylon gillnets are also used. The rest are small boats using traditional fishing techniques such as fishing weir, stake trap, crab trap beach seine, etc. The target species (for the Thai market) include shrimp, crab, squid, tuna, and Spanish mackerel. Surplus of scad, mackerel, and other low-value fish are also exported to Thailand.

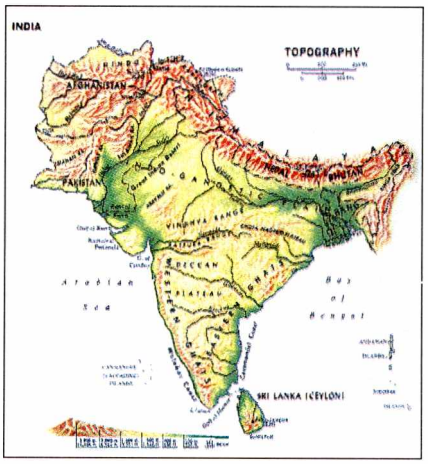
The shrimp trawler was introduced after 1970. Shrimp fishing in Kohkong province using modern gears (big trawler and monofilament gill net) rapidly developed in the 1980s. This led to the drastic decrease of almost all the purse seine operation and traditional fishing.

Aquaculture

Coastal aquaculture in Cambodia practiced mainly in Kohkong province is intensive shrimp culture (mainly *Penaeus monodon*). Other species being cultured such as oyster and green mussel are not significant in terms of production and area.

Kohkong is beginning to suffer the negative side effects common in intensive shrimp farming, i.e., economic loss due to shrimp disease and self-pollution caused by indiscriminate discharge of pond effluents and resource conflicts particularly in farms located near mangrove areas.

In 1996, the FAO Network of Aquaculture Centres in Asia conducted a survey in sustainable aquaculture. It showed that the intensive shrimp farms' production is 7,545 kg per ha per yr. Although intensive shrimp farms generated big sales, the farmers also faced environmental problems with an estimated loss due to disease at US$14.5 million per year and environmental related loss of US$28.6 million per year. These problems prompted the government to place a temporary moratorium of further licensing of shrimp farms.



INDIA

India has a land area of 3.3 million km^2 with a coastline of 8.041 km. Estimated fish potential production from the inland sector is 4.5 million tons while from the marine sector, 3.4 million tons. In 1995-1996, fish production from reservoirs, canals, brackishwater was 59.3 tons; from ponds and tanks 164.9 tons. The marine sector yielded 270.7 tons.

Aquaculture

Out of the more than 700 freshwater species, the following species are cultured throughout the Indian subcontinent: catla, rohu, mrigal and silver, grass, and common carp. Catfish, freshwater prawns, and freshwater pearls (through nuclear implantation) are also being cultured. Freshwater algae for use in agriculture has become an additional component of aquaculture produce in the light of diversification of aquaculture industry.

Freshwater aquaculture has become the most economic practice in the state of Andhra Pradesh where the farmers have converted about 60,000 ha of paddy fields into fish ponds. Other provinces like Punjab, Maharashtra, ad Gujarat have adopted fish culture with higher entrepreneurial in-

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vestment and getting fish production of 5-7 tons per ha per year.

In addition, the component of aquaculture worth mentioning is wastewater aquaculture. A production of 2-5 tons per ha per year in carp polyculture with domestic sewage input of 2.2 million liters per ha is projected. A package of practices for adoption by fishfarmers for sewage-fed fish culture is being prepared.

MYANMAR

Myanmar is land of valleys and mountains and covers 676,577 km^2. Its coastline is 2,831.34 km long. Myanmar has four major rivers as well as minor ones that form a network of tributaries, estuaries, and mangroves. These river systems are the natural habitats and nursery grounds for fishes and shellfishes of commercial importance in Myanmar fisheries.

Myanmar has a tropical monsoon climate with three seasons with temperature ranges from 32 to 21°C. Population is 46 million with an annual increase of 25%.

Status and practice of aquaculture

Fishfarming started in the late 1950s. In 1989, a Law Relating to Aquaculture was enacted. Consequently, the existing unauthorized fishponds became legalized under this law.

Freshwater aquaculture is relatively more advanced than brackishwater or marine aquaculture. Predominant species are Indian and Chinese carps. Total fishpond area is about 24,468 ha. At present, red tilapia, Thai catfish (*Pangasius sutchi*), and hybrid catfish (*Clarias gariepinus* x *Clarias macrocephalus*) are gaining popularity among the fishfarmers. To upgrade the farming of these species, the Department of Fisheries has successfully produced the seed and transferred the technical know-how of artificial propagation to private fishfarmers.

There are five species of commercially important shrimp. But only tiger shrimp *Penaeus monodon* has been attempted for

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SEEN AND NOTED

AQD's visiting scientists and guests share new ideas and new experiences in brief seminars at AQD's main station in Iloilo.

Dr. Focken of the University of Hohenheim

Dr. Kaneko of the University of Tokyo

Dr. Kawauchi of Katasato University

No difference between male and female tilapia?

Aquaculturists may have to rethink the current practice of stocking all-male tilapia in grow-out ponds. The underlying assumption of this practice is the faster growth rate of males compared to female tilapia which is said to be caused by sex-specific physiological growth capacity, female mouth-brooding (i.e., female tilapia spends more energy on reproduction, not growth), or the more aggressive feeding behavior of male tilapia.

But the physiological differences may not be true, says Dr. Ulfert Focken of the University of Hohenheim in Germany. Dr. Focken gave a seminar on "Growth and energy budgets of individually reared male and female tilapia, *Oreochromis niloticus*" on February 19 at AQD's Tigbauan Main Station in Iloilo.

Dr. Focken tested for differences in physiological growth capacity for both sexes by rearing 45 tilapia individually for 109 days in aquaria or respirometric boxes connected to recirculating systems. Body mass of males increased from 38.2±6.5 g to 130±39.5 g and females from 34.5±5.5 g to 163±29.8 g.

His results contrasted with reports in literature on tilapia reared in groups. He found that body mass gain, metabolic growth rate, feed conversion and productive protein value were significantly better for females than for males when individually reared. Energy retention, heat dissipation and non-utilized energy were also slightly more favorable for females than for males.

The superior female growth performance, Dr. Focken said, is due to lower metabolic costs, i.e., oxygen consumption is lower for females than for males. The growth superiority of males reported in other studies is probably caused by behavioral factors rather than physiological ones.

Tilapia is an ideal experimental fish

Tilapia can survive in both seawater and freshwater. This is what makes them ideal specimens for basic research in osmoregulation, says Dr. Toyoji Kaneko of the Ocean Research Institute, University of Tokyo. Dr. Kaneko shared with AQD researchers some interesting results of his recent study at a seminar titled, "Novel salinity tolerance of euryhaline tilapia, *Oreochromis mossambicus*" held on March 10 at AQD's main station in Tigbauan, Iloilo. Dr. Kaneko reported that the high salinity tolerance of tilapia is due to their excellent ability to develop chloride cells in response to increased environmental salinity.

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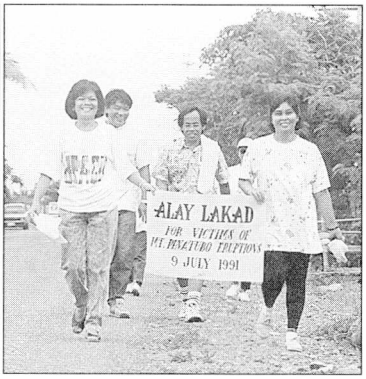
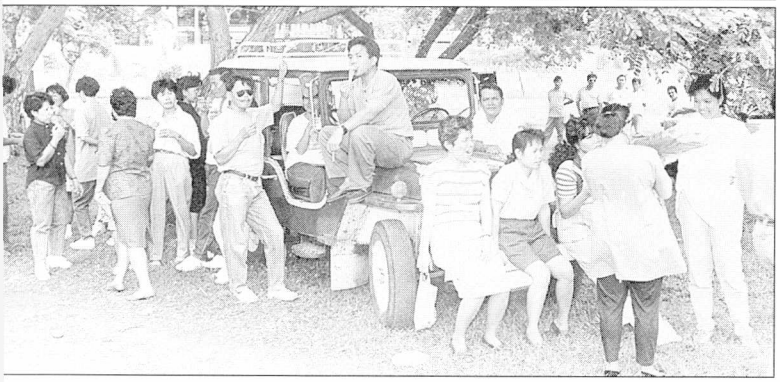
pers)]. Another researcher won a graduate student award in an abstract writing competition sponsored by the American Institute of Aquaculture (1989).

The Training and Extension Program was also reorganized. Training courses were prioritized to suit the manpower training needs of the region as identified during the "Seminar on Training Requirements in Fisheries and Aquaculture in Southeast Asia" held in Thailand on March 1988. Extension activities were intensified in collaboration with the Department of Agriculture and other government agencies to raise the income of small fish farmers. "Alay Palaisdaan" and the Aquaculture Technology Outreach Program (ATOP) were held in 1988 to bring new aquaculture technologies to farmers through on-the-spot consultations, seminars and informal discussions. Hand-outs and videos were also provided. AQD started to join in fairs and won the best booth award in the DA-PHILCITE sponsored Agri-Aqua Caravan Fair in Cagayan de Oro City (1988).

As AQD moved on into the '90s, the aquaculture industry of the region was confronted with environmental and socio-economic problems. R&D priorities were redirected towards seafarming and searanching. This was approved by the SEAFDEC Council in its 22nd meeting in Singapore in 1989 and was strengthened further by ADSEA II in 1991. Thus, AQD took firmer strides into the new decade with the launching of the Community Fishery Resources Management Project in Malalison Island in west central Philippines in 1991. - **RY Buendia**





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bar> (h. L :(D) over bar) photoperiod, 100 mu Em(-2)s(-1) photon flux density (PFD), 50 mu M NH4Cl: 5 mu M K2HPO4 and 25 parts per thousand salinity. For the first time in this species, tetraspore formation was induced in the laboratory. The tetrasporophyte produced many tetraspores in almost all branches of the thallus grown at 26 degrees C, 11 :<(13)over bar> (h. L :(D) over bar) photoperiod, 100 mu Em(-2)s(-1), 25 mu M NH4Cl: 2.5 mu M K2HPO4 and at 30 parts per thousand salinity while those grown at lower light, higher nutrient level and higher salinity had fewer tetraspores. No tetraspores were formed at a higher temperature (30 degrees C), longer photoperiod (13:<(11) over bar> h. L:(D) over bar), and at 25 parts per thousand salinity and the plants remained vegetative from 4 to 7 months. Logistic regression analysis showed that tetrasporangial induction was significantly affected by nutrients and salinity ($P < 0.05$).

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There are five species of commercially important shrimp. But only tiger shrimp *Penaeus monodon* has been attempted for culture. In 1982, the first shrimp pond was completed in Naukmee covering area 26.5 ha with nursery pond, transit, and grow-out ponds. Initially, due to predation and inability to obtain the right species of *P. monodon*, production was poor. Later, it was stocked with hatchery-reared fry, significantly increasing production.

Seaweed (*Gracilaria edulis*) culture started in 1978. Hanging net method was used. Seaweed is collected from nature but it is not sufficient. Seaweeds can be collected after four months with a net (1.0 x 4.0 m), with yield of about 10 kg of dried seaweed.

Edible oyster culture experiments were initially started in 1971 by People's Pearl and Fisheries Corporation at Rakhine state. However, it was only in 1978-79 that the project was pushed through. Spats attached on rafts were cultured. Experimental culture showed that oyster attain marketable size after 18 months with 15% reaching marketabke size.

List of references will be provided upon request.-Ed.

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Malaysia, Philippines, and Thailand