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A BREAKTHROUGH IN MILKFISH PRODUCTION

by QUITERIO FAJARDO MIRAVITE

A research project can have a lasting impact as well as add to the world's store of knowledge, particularly if it is development-oriented, applied research. A case in point is a project carried out in the Philippines to solve basic problems of the milkfish industry. And as the results show, it can also contribute to strengthening national scientific and technological capabilities.

Along the shores of many of the islands dotting the Philippine Archipelago, one can often see men, women and children patiently pushing a triangular bamboo and net contraption in waist-deep water, as if winnowing the seas. Now and then they stop to scoop something out of the net with a small plate. To an untrained eye, the catch is all but invisible. A closer look reveals hundreds of tiny black dots darting in the water. The "dots" are actually the eyes of hundreds of tiny, as yet transparent, milkfish fry.

More than a billion fry with a value of at least US$8 million are now caught annually with at least 170,000 people directly or indirectly dependent on the industry. If as a result of some ecological catastrophe the milkfish fry should suddenly disappear, the Philippine aquaculture industry would simply collapse.

The milkfish, known as *banqus* in the Philippines and *chanos chanos* in science, is a remarkable species in many ways. The beautiful silvery fish can survive and grow in waters fresh enough to be drinkable as well as in waters with up to three times as much salt as regular seawater. They can, in fact, stay alive in ponds where the high salt content has killed most other fish, and withstand temperatures higher than those that could occur in their natural habitat.

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The dietary needs of the fast-growing milkfish are simple. They are primarily vegetarian and subsist on minute organisms as well as decayed plant materials submerged in water. Their wide distribution in the Pacific and Indian Oceans also makes milkfish an ideal cheap protein source for the masses. They have one major drawback, however: they do not spawn in captivity. Milkfish farmers have had to continually obtain wild fry as seed stock for their ponds.

At present there are only three places where milkfish are cultured on a large scale: the Philippines, Taiwan and Indonesia. Of these three, Taiwan has the smallest area devoted to milkfish, but the highest productivity at 2,000 kg per hectare. Indonesia, with the largest pond area, has the lowest productivity (358 kg per hectare) while the Philippines averages 580 kg per hectare. The combined annual yield of the three countries is some 200 million kgs.

This production is nowhere near the potential capability of the region. An additional 6 million hectares of mangrove swamps in Asia and the Pacific could be used for milkfish production. Even if only one quarter of this area was exploited at least an additional 750 million kilograms of valuable food could be produced.

Milkfish production is a labour-intensive operation. It is estimated that the manpower requirement for operating a milkfish pond is one person per hectare. Thus, opening 1.5 million new hectares within the region would employ 1.5 million people, not including those needed for constructing and developing the sites or for fry collection.

The relatively low productivity of ponds in the Philippines and Indonesia is not due to a lack of technology. The technology for intensive culture exists, and in the Philippines, a few pond operators routinely harvest 2000 kg per ha per year. Disseminating the technology and training pond operators and caretakers is, however, needed.

Despite the sophistication that exists in milkfish rearing ponds, one undeniable problem remains: the industry is totally dependent on the acquisition of fry from the wild. The natural supply of fry is highly unstable and subject to the vagaries of forces beyond man's control. As environmental degradation takes place, it is difficult to predict how much longer the present fry supply

can be sustained. Furthermore, as fish farmers improve their skills, enabling them to stock more fry per unit area, the total demand is expected to rise.

In answer to the need for a sustained and concerted effort in milkfish research, especially in seed production, the Aquaculture Department of the Southeast Asian Fisheries Development Centre (SEAFDEC) in Tigbauan, Iloilo Province on the island of Panay, with the financial assistance of Canada's International Development Research Centre, embarked on a research program on a scale never before attempted. The project aimed to ensure an adequate and reliable supply of milkfish fry and make them available throughout the year, and develop economical and nutritious feeds from local products for the fish while improving pond management and culture.

The project started virtually from scratch as little was known about milkfish. The scientists were faced with very basic questions: How do you catch adult milkfish and keep them alive? How do you distinguish between male and female fish? What kind of hormone, and how much, will induce spawning?

The site for the milkfish station in the province of Antique, like most rural areas in the Philippines, was languid and unhurried. But with the onset of the program it was to become the scene of the most frenetic efforts in the history of Philippine science. The site was selected primarily because of the existence there of a giant fixed net with which adult milkfish could be caught with the least injury. The province is also the Philippines' major milkfish collecting grounds.

During the 1976 spawning season, 16 adult fish were injected with purified salmon gonadotropin, a hormone extracted from fish pituitary glands. The females responded to the treatment and produced eggs, but the males did not, and the eggs could not be fertilized.

Finally on April 15, 1977, the first artificial fertilization of milkfish eggs -- a world breakthrough -- was achieved. The eggs were incubated and the resulting larvae grown to fingerling stage. The survival rate was low, but the experiment proved that milkfish could be bred in captivity. In 1978 38,000 fry were carried through the larval stage and the fingerlings are now being reared in ponds.

During the course of the studies, other successes were achieved. External differences between male and female milkfish have been discovered, making it possible to distinguish sex without injury to the fish. The infestation by a common parasite was found to be controllable by a chemical agent. Several spawning areas have been found around the island of Panay. The age of the breeders has also been determined using patterns of lines in the scales as indicators.

The scientific breakthrough will need further refinement. Nevertheless, it opens the way for producing a vast new source of animal protein for the world's hungry masses. Both the press and industry acclaimed the breakthrough because assurance of fry supply could eventually stabilize and expand the industry, and stimulate the establishment of canning and other processing plants to absorb excess production for export. Vast tracts of undeveloped marshland could be converted into productive ponds and generate employment while raising income levels in the rural countryside.

As a result of the success of the project, aquaculture in the Philippines has been seen in a new and more important light, with greater emphasis now being placed on its role in national development. The government has mounted a massive credit financing scheme for fisheries development, and plans have been made to establish a state university with a basic fisheries thrust.

As the milkfish breakthrough was achieved by local researchers and a Canadian scientist assigned to the project, it gave new and abounding confidence in the capability of the Filippino as scientist. It has also attracted a number of Filippino scientists from abroad to return to their country and participate in the research, thus reversing, even in a modest way, the brain-drain process. Finally, collaborative arrangements have been made with other research institutions in the United States, India, China, and France to exchange both information and expertise to hasten work on the milkfish, and facilitate cooperation among developed and developing countries.

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