VII CENTRAL MARINE FISHERIES RESEARCH INSTITUTE, COCHIN, KERALA

A) OVERVIEW AND MAJOR OBJECTIVES

The Aquaculture Review Team visited the main campus of the Central Marine Fisheries Research Institute (CMFRI) and its prawn culture laboratory at Narakkal. Meetings were held with the Director, Dr. P.S.B.R. James, and the leaders of the nine scientific disciplines to discuss research over the past five years, ongoing studies, and the direction of research planned for the future. The team toured the facility to observe laboratories and equipment and to meet the staff scientists. The CMFRI has about 200 active research projects -- most of which are related to captive fisheries in marine environments. These projects were augmented with culture-research centers on prawns, lobsters, crabs, oysters, clams and mussels. Some research related to the culture of finfish is conducted, but it is not a major area of emphasis. A division related to nutrition, physiology and pathology of cultured species has recently been established. Although the station was originally funded by the FAO - UN, it is now supported solely by the Indian Government.

The CMFRI offers advanced degrees at the M.Sc. and Ph.D. levels, has active programs for training and information transfer and provides courses in stock assessment of marine resources.

To date, findings include techniques for the spawning and rearing of prawns including culture of live foods needed at the early life stages and supplemental feeds for growing juvenile prawns to market size. Demonstrations were provided at the CMFRI prawn hatchery. Although the team did not observe the work, the staff indicated that similar progress was being made on the culture of lobsters and crabs.

The Director informed the team that techniques have been developed for spawning oysters, clams, and mussels and for their culture in the open sea or in estuaries. The artificial culture of valuable species of seaweed has been achieved through the placement of plant fragments in strands of rope mesh submerged in the sea. Training in all the aforementioned culture areas is provided at a Training Center and at the Krishi Vigyan Kendra.

B) GENERAL COMMENTS REGARDING THE EXISTING PROGRAM

The CMFRI has ample facilities for conducting research in marine and brackish water aquaculture. It has a large staff of researchers, many of whom hold the Ph.D. degree. Laboratory space is available, but it appeared that the on-campus capability for holding live animals was limited. The Narakkal station has adequate wet laboratory space and suitable culture ponds that can be used for pond experiments. However, the number may not be adequate for multiple, replicated studies.

Future research plans include studies in fish pathology with emphasis on viral diseases. An electron microscope has been acquired but it is not yet in service. Neuro-endocrine studies on the control of reproduction in prawns and lobsters are planned in order to enhance the spawning of these species. Further work is scheduled on improved techniques for the use of hormones in the artificial culture of commercially important finfish species. Genetic improvements of cultured oyster stocks will be attempted. Information on the nutritional requirements of the various economically important species will be obtained, and efforts will be made to develop practical feed formulations from locally available plant and animal by-products. As the need arises, pharmaceutical drugs needed to control infectious diseases and to enhance growth and maturation will be developed.

C) POTENTIAL AREAS OF MUTUAL INTEREST TO INDIA AND THE U.S.

Many of the research areas proposed for future research have potential applications in both India and the U.S. If the work is successful, it should provide a significant impetus to aquaculture in India.

D) SPECIFIC AREAS OF MUTUAL INTEREST

a) Production of Prawn and Lobster Seed:

Although the team was provided demonstrations to document that CMFRI scientists have successfully spawned prawn and lobsters under laboratory conditions, the team learned from others that

farmers are likely to lack the electricity, air pumps, algae-rearing tanks, etc., used in the present technology. Efforts should be made to further explore artificial spawning methods to refine, simplify or eliminate as many of the steps as possible, especially those requiring major power and equipment inputs. To refine the practicability of the proposed techniques, demonstrations should be held every year on a prawn farm using the farmer's available equipment. If large numbers of viable prawn and shrimp larvae can be produced, farmers should have no problem producing the needed seed to support the potential industry.

b) Improve Survival of Crustacean, Molluskan, and Fish Seed:

The team was informed that there is commonly an 80% loss between the number of eggs spawned and the number of seed produced. Such a loss represents a high cost to the farmers: even a 20% increase in survival would double the production. The causes of the observed mortalities have not been researched but possible factors could be external parasites, malnutrition, predation, poor water quality, and disease. It will be necessary to develop accurate techniques for estimating the numbers at each life stage and to sample the population frequently over the 30 day culture period in order to determine when (and possibly why) the mortalities occur.

c) Economics of Harvesting Culture Ponds at Various Sizes of the Organisms:

Researchers at the CMFRI reported that farmers normally harvest cultured shrimps when they are about 13 - 14 cm in length (15gms). Shrimps of this size have a significantly lower market price than larger sizes. The growth rate over time should be plotted using at least 125 animals on each sampling date. Such data would indicate the period of logarithmic growth and could also (along with population data) be used to estimate the value of the crop at any given size. Farmers could then be advised as to the most profitable harvest time.

d) Diseases of Aquatic Culture Organisms:

The literature contains reports of numerous

pathogens and parasites found in culture systems. The possible role of disease in mortalities of very young animals has been noted. Although some bacterial tests have been carried out, a complete inventory throughout the culture period has not been made. Viruses known to infect important fin-fish and mollusks should be first identified.

e) Development of Practical Methods to Produce Needed Natural Foods for Young Animals in Aquaculture:

Studies on feeding several species of young animals have shown that their larval stages will accept phytoplankton, copepods, cladocera, and brine shrimp. It would seem that farmers should be advised on practical methods for measuring the amount of available food, how to enhance its production, and how to produce the proper sizes and species of feedstuffs when they are needed at the various life stages of cultured fishes and crustaceans.

f) Techniques for Assessment of Sizes and Availability of Populations of Marine Species of Economic Importance:

The Marine Products Export Development Authority reported that the CIFT and the Integrated Fisheries Project had both developed acceptable products using most of the captive species. Unfortunately, there are no data on the magnitude of the populations so private industry is reluctant to invest large sums of money in developing this unused fisheries resource.