Potential of marine fish farming in India

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Considering India's estimated population growth of more than one billion by the dawning of the Third Millennium, the total fish requirement will be more than seven million tonnes at the modest rate of 12.5 kg/capita/ annum consumption. This is due to increasing trend in the fish eating habits of Indians from 27.7% in 1987-'88 to 39.7% in 1996-'97. India is also one of the major exporter of fisheries products and it constitutes about 4% of India's total export earnings. India depends heavily on capture fisheries for fish production. The present fisheries production from both marine and inland resources is about 4.9 million tonnes which is not sufficient to meet the demand. Furthermore, owing to a substantial increase in the fishing effort, a stagnation stage has been reached due to the relentless unplanned exploitation of fisheries resource. This is also evident from the recent statistics of Marine Products Export Development Authority of India, that shows a decline in the export value of fisheries products worth 1.296 billion US$ during I 997-'98 period to 1.107 billion US$ during I 998-'99. Furthermore, export quantity of marine fish declined from 188029 mt during 1997-'98 period to 108556 mt during 1998-'99. The shortfall has to be realized through aquaculture.

India has a long coastline of 8,129 km extending over nine maritime states and the islands of Lakshadweep in the Arabian Sea and Andaman and Nicobar in the Bay of Bengal. It has an EEZ area of 2.02 million km^2 and a shelf of 0.512 million km^2 that makes it possible for one of the richest multispecies fisheries in the world. The multispecies and multigear nature of marine fisheries has led to the under exploitation of many cheaper fish species stocks and the overexploitation of certain high-value vulnerable stocks. Hence there is need for informed planning and management which are key issues in responsible fisheries. In addition to the vast coastline, it has 8.5 million ha of derelict inland saline area. But yet India's mariculture progress has been very slow. Of the 1.2 million ha of potential land identified for shrimp farming only about 100,000 ha is utilized. The slow progress is due to the collapse of the shrimp farming industry because of environmental concerns and disease problems. Although the present attention is towards diversification of fish species other than shrimp, the commercial ventures are constrained due to unreliable wild seeds and lack of technology for commercial marine finfish hatchery seed production.

Status of finfish culture

The culture of finfish, including milkfish, grey mullets, seabass and pearl spot, has been practiced in India since the I 960s. Most of the culture systems are on a smallscale basis or on an experimental level to evaluate the feasibility of the culture system. However, marine fisheries in India are accorded priority in the planned development process due to their significant contribution to the economy. Potential mariculture sites, especially for open sea-cage fish farming has been identified at Andaman Sea, northeastern arm of the Indian Ocean, bounded on the west by the Andaman and Nicobar Islands.

With its coral lagoons and protected deep-water bays, it provides optimum environmental conditions for finfish farming using sea-cages. A commercial marine fish hatchery has already been established near Port Blair at Andaman and is in the process of initiating finfish seed (seabass and grouper) production for its grow-out operation using sea-cages. When operational, this will be the first of its kind commercial marine fish-farming venture in India. Considering the potential use of marine finfish hatcheries for producing seeds for stocking in abandoned shrimp farms and in potential aquaculture sites, entrepreneurs are now interested in initiating marine fish hatchery projects in the main land. The species selection for the hatchery operation is based on the availability of broodstock from the local waters and market demand. The seabass *Lates calcarifer* and the grouper *E. fuscoguttatus, E. polyphekadion, E. coioides* etc., are considered potential candidates for commercial farming in India.

Seabass

The seabass *Lates calcarifer* is a potential candidate for farming in India, because of its fast growth rate, tolerance to wide environmental conditions and its demand in domestic and export markets. The domestic market price is up to US$ 2.5-3.0/kg. Many farmers consider it as an alternative species for farming in shrimp farms abandoned due to viral disease problems, using seawater or brackish water. Also it is considered for farming in freshwater. It is distributed along the East and South West Coast of India. In spite of lack of commercial hatchery technology for seed production, it is traditionally farmed in northeastern India using seeds collected from the wild. The limited seed availability restricts the culture to the months of May-August in West Bengal. Monoculture is very rare. Normally it is polycultured with other fish and shellfish species. Some farmers use the tilapia, *Oreochrornis mossambicus* as a supplementary feed during 7-12 months grow-out period. The harvesting size is 700g to 1kg. Most of the culture systems are extensive. The farmers achieve a production of about 2.2 tonnes/ha/year. Under the 'All India Coordinated Project on Brackishwater Fish Farming (1 973-1 985)', experimental culture of seabass was carried out in different centres. A production of up to 3.6 tonnes/ha/year has been reported under experimental culture conditions. Recently, one of the research centres (CIBA) has succeeded in the hatchery breeding and larval rearing of seabass. However, the hatchery technique is in the early stages of development and has not been demonstrated for commercial ventures.

Grouper

The high-valued food fish species serranid groupers are widely distributed in the coastal waters of India. More than 42 species have been recorded along the east and west coasts of India and in the islands of Lakshadweep in the Arabian Sea and in the waters of Andaman and Nicobar islands in the Bay of Bengal. Among these the most preferred species for farming, *Epinephelus coioides, E. fuscoguttatus, E. malabaricus, E. polyphekadion* and *E. tauvina* have abundant nursery grounds located along the Gulf of Mannar, coral lagoons of Lakshadweep and in the waters of Andaman and Nicobar islands. Since live groupers fetch a price of more than US$ 15/kg in the export market, many entrepreneurs in India are interested in farming groupers as an alternative species for shrimps.

Although grouper seeds of 60mm and above are available in the nursery grounds, seasonal constraints and lack of abundant supply of a particular species at a time from the wild restricts the commercial farming of groupers. Several research units are concentrating on developing hatchery and grow-out production technologies. The Central Marine Fisheries Research Institute has carried out experimental cage culture of *E. tauvina* using seeds collected from the wild. However, a reliable hatchery and grow-out production technology has not yet been developed in India. Therefore, entrepreneurs are considering the prospects of getting the expertise from other countries or from those who gained experience from other countries. An entrepreneur has initiated attempts to set up a commercial hatchery and grow-out production facilities for grouper at Andaman Islands. The anticipated production is about 200 tonnes/year. Another business venture has availed the wild groupers for fattening in sea-cages in Andaman Islands for marketing alive to neighboring countries.

Milk fish

The euryhaline milk fish *Chanos chanos* is either monocultured or polycultured with compatible species of fish and shrimps. Hatchery technology is not available. The wild fry of 10-15 mm size are nursery reared to 40-100 mm in two months before stocking in grow-out ponds. Several grow-out experiments have been carried out by research centres to farm milk fish in ponds, cages and pens. Under pond culture conditions, the farmers produce 2.5-3.0 tonnes/ha during a grow-out period of 8-10 months. The stocking density range from 3000-5000 ind./ha. Some shrimp farmers use milkfish seeds to stock in the effluent treatment ponds.

Grey mullet

The grey mullets *(Mu gil cephalus, Liza macrolepis, L. tade* and *L. parsia)* are polycultured with other compatible species of fish and shrimps. Under extensive brackishwater pond culture conditions

the production average 2.0-2.5 tonnes/ha/year during 8-9 months grow-out period. Mullets are also considered for stocking in the effluent treatment ponds during shrimp farming. Intensive farming is restricted due to non-availability of hatchery seed.

Pearl spot

The pearlspot, *Etroplus suratensis* an indigenous cichlid fish, is distributed along the east and west coasts of India. It is monocultured using wild seeds in traditional ponds in Kerala. The average production is about 1000 kg/ha/year over 8-10 month grow-out period. Experimental cultures of this species show its potential for polyculture and integrated farming with poultry. In addition to export, it has high demand in the local market and fetches a price of more than US$ 3/kg.

Constraints and Prospects

There is great deal of ambiguity regarding the policies and legislation for mariculture activities in India. The shrimp farming industry in India is in the doldrums as a result of the stay order by the Supreme Court of India. Although potential of coastal aquaculture in India is immense, stringent regulation to protect the environment and lack of balanced view and regulations on this important sector affect the progress of marine fish farming. Furthermore, ocean ranching is also an important measure from the viewpoint of conservation of the marine resources, which is not effectively practiced in India.

Sustainable marine fish farming could be achieved in India through integrated farming, sea-cage culture systems, polyculture, rotation of fish and shrimp crops and by establishing reliable hatchery technology. Industrial aquaculture in India will prosper if commercial marine fish hatcheries are established and the farmers are willing to abide by certain regulations to follow social commitments and avoid environmental pollution.