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Present Status of Mariculture in India

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Aquaculture, the farming of aquatic animals and plants has been the world's fastest food production system for the past decade with an average compound growth rate of 9.6% per year since 1984. On the basis of the rapid growth of the aquaculture sector and recent stagnation of landings from capture fisheries, aquaculture is seen by many as a potental source of hope to meet the current and future needs of a growing population in search of food. The marine ecosystem with its rich resource of fauna and flora has sustained both capture fisheries and mariculture activities. India ranks second in aquaculture production next to China. However 90% of the production is from freshwater ecosystem with very little contribution from marine sector. Though there is increased demand for seafood both in the domestic and export market the present marine fisheries scenario is characterised by declining yields from inshore waters and increased conflict between different resource users. However, the vast coastal zone indicates the prospects for augmenting the production through large scale seafarming.

The marine ecosystem of the Indian subcontinent is the niche of several marine resources of which the major resources on which the mariculture industry is built are the shrimps, lobsters, crabs, mussels, oystes, finfishes, seaweeds and pearl oysters. Due to the developmental activities of various governmental organisations vast areas in several maritime states were developed. However, out of the potential 11.9 lakh ha available for farming activities only 12.4% is currently utilised. One significan .ge witnessed by the Indian mariculture industry in the past few years is diversification of aquaculture activities wherein several other marine resources like the bivalves, ornamental fishes and other finfishes have also become significant candidate species for aquaculture.

Crustacean culture

One of the principal and highly valued aquaculture resource is the marine shrimp. In 1998 - 99 the production of farmed shrimp in India was estimated as 82,634 tonnes from 1.35 lakh ha. of which 86% of the production was from the farms along the East coast. Among the maritime states, Andhra Pradesh was the leading producer contributing 54.3% of the total production, followed by West Bengal and Kerala. While 81.7% and 92.4% of the shrimp production in West Bengal and Kerala was from the traditional farms, the production from such farms in Andhra Pradesh was negiligible. The dominant species was ***P. monodon*** followed by ***P.indicus***. However the scope for farming ***P. semisulcatus*** and non-penaeid species like ***Metapenaeus dobsoni, M. monocerus*** and ***M. brevicornis*** is also bright through rotation of crops.

Along with the increased production of farmed shrimp, the nation witnessed growth of aquaculture related industries like shrimp feed production units, hatcheries and processing plants. It has been estimated that to meet the growing requirements of this industry, about 70 shrimp hatcheries with a total capacity of 39,000

million seed and 30 shrimp feed mills (capacity 60.000 ton) were established along the south west and south east region of the country.

Lobsters are one of the highly priced seafoods whose trade increased in volume and value within the last decade. In India, lobsters like ***Panuilirus homarus, P.ornatus*** and ***P. polyphagus*** are farmed in the coastal ecosystem. However due to the extremely long duration of larval development and due to the cannibalistic behaviour of this group, a viable hatchery technology has not been developed. Instead, juvenile lobsters are collected from coatal waters and grown to marketable size. It has been observed that juvenile lobsters (40gm) can attain 100 to 125 gm when fed with trash fish, worms, crabs, echinoderms etc. The yield from a 70 sq.m. pond with a stocking density of 10-15nos/sq.m was 300 kg resulting in a net profit of Rs.50,000 for three crops a year. Supported by the encouraging results obtained in lobster fattening 'and the global demand for live and frozen lobsters, it can be predicted that scope for developing lobster farming in India is bright.

World trade for crabs witnessed a phenomenonal increase during the last two decades. Concurrent with the development of global market, crab culture/ crab fattening becomes popular in South East Asian countries India has several species of crabs suitable for farming viz., ***Scylla serrata, S. tranquebarica*** and ***Portunus pelagicus***. The present farming technique involves collection of juveniles (seed crabs) from wild, stocking in cages/tanks or earthen ponds followed by feeding with trashfish, clam, etc. for a period of 8 to 11 months. At present crab fattening is done in mangrove and coastal areas by small-scale farmers. The demand for live crab in the world market predicts a profitable investment opportunity.

Bivalve Mariculture

Characters like high tolerance to environmental variation and rapid growth of edible bivalves and the relatively simple farming methods have encouraged farmers to opt for commercial farming of oysters and mussels. Mussels which rank first in world aquaculture are grown on ropes suspended from rafts, longlines or racks. In India, two species of mussels, ***Perna viridis*** and ***P. indica*** have shown good culture potential. During the last five years, more than 2000 t of mussels were produced through mariculture activities along the southeast and southwest coast. Similarly oyster culture demonstration with the candidate species ***Crassostrea madrasensis*** has indicated high returns in 5 to 6 months. Moreover the technology for seed production of bivalves has been perfected and it is possible to meet the demand of a bivalve culture industry if required.

India successfully produced the first cultured pearl from ***Pinctada fucata*** in 1973. Since then due to relentless effort of the research team at the Central Marine Fisheries Research Institute a complete technology for pearl culture and hatchery production of spat were developed. India also won international recognition when a training programme funded by FAO/NACA/UNDP was held at Tuticorin RC of CMFRI for 26 delegates from 10 Southeast Asian countries. The Tamil Nadu Government and Southern Petrochemical Industrial Corporation Ltd., (SPIC) made pioneering attempts for commercial production of pearls in the past two decades. In the recent years, several industrial houses in the southeastern states have initiated projects on pearl farming with scientific support from CMFRI. According to industry sources, demand for pearls is on the rise and pearls with good lusture and colour can easily access the world market. This indicates that in the subsequent years pearl culture can emerge as a viable and sustainable form of economic activity which will further be catalysed by use of biotechnological approaches.

Finfish mariculture

It has been estimated that one in four food fish consumed by humans now is supplied by aquaculture. Finfish culture in the freshwater and brackish water systems is widely popular contributing to 98.8% and 33% of the global production from these two aquaculture niches, while in the marine environment their contribution is only 8.3%. Marine fishes are mostly carnivorous and are reared in cages or other intensive culture systems like raceways. In the temperate countries mariculture of finfishes is well established. In most Asian countries cage culture of groupers such as ***Epinephelus tauvina*** and ***E. malabaricus*** using seed collected from wild has given yields of 20 tons/ha/yr. Similar grouper species are abundant in Kerala and Tamil Nadu coasts of India. Other potential species available for aquaculture are seabass ***(Lates calcarifer)***, milkfish ***(Chanos chanos)*** and mullets ***(Mugil cephalus).*** Yet another group under finfishes are ornamental fishes, many of which can be reared in aquarium tanks, ponds and cages. The coral reefs around Andaman and Nicobar and Lakshadweep Islands are blessed with wide variety of ornamental fishes. This indicates scope for developing our resources which are at present not fully utilised. In India, marine finfish culture is still in the experimental stage and preliminary success has been achieved in culture and breeding of oronamental fishes.

Seaweed culture

Many species of agarophytes and alginophytes occur along the Indian coast and their farming methods have been developed. The vegetative propagation of ***Gracilaria edulis, G. corticata, Gelidiella acerosa*** and ***Sargassum spp*** has been demonstrated. High yields, (5kg/m^2) in the case of ***G. edulis*** and 3 kg for ***G. acerosa*** has been obtained in 80 days. It has been shown that bulk of the farmed aquatic plant production, 6.81 mmt in 1995 or 87.1% of total global aquatic plant landings including brown red and green seaweeds was produced as a food source for direct human consumption. In India studies have indicated the possibility of large scale seaweed culture along the southeast coast of India.

Bioactive substances from marine resources

Marine fauna and flora are rich in bioactive substances that have immense pharmaceutical value presently twenty two species of gorgonids are being exported from India for the production of bioactive compunds. The CMFRI has studied the biotoxicity of more than 118 species of benthic algae, sponges, gorgonids, alcyonarians, corals, molluscs, echinoderms and flagellates from the Indian seas around India. Current research thrust is to screen the occurence of organic chemicals and biochemicals such as cardiotonic polypeptides from sponges, anticancer agents and prostagladins from gorgonians and soft corals. The future holds great promise for the develpment of new drugs from these marine organisms and it is hoped that the first step that we have taken will be the backbone for further development.

Stock enhancement programmes through sea ranching.

The developments made in hatchery seed production techniques has made large scale seed production possible for different species of crustaceans and bivalves. This has helped the nation to augment the stocks through searanchin. The searanching programmes of Japan, China and US has helped them to develop the fishery of shrimps and finfishes. The ranching of pearl oyster seed / larvae and the post larvea of banana prawn in the Gulf of Mannar and Palk Bay has helped in the revival of barren pearl oyster beds and augmented the yield of ***Peneaus semisulcatus.*** Such stock enhancement programmes which help in the revival of capture fisheries are planned for sea cucumbers, clams and other lobsters.

Conclusion

While reviewing the recent developments in the Indian mariculture industry it is evident that the pace of growth of shrimp farming was suddenly hampered by disease incidences. Though the precise reason for this has not been established, diagnostic studies conducted in India and abroad have shown that there is a linkage between environment and health of the organism. Despite the crop failures, shrimp farming continues to contribute substantially to marine food production. The development of mussel and oyster farming as a rural / community programme in Kerala is a land mark in Indian mariculture. For rural upliftment similar programmes can be charted out for other maritime states also. The progress made in culture of marine ornamental fishes and pearl farming has indicated that an industry which can provide employment to several coastal fishers can be developed through proper planning and cooperation between planners, reseachers and industrialists. While charting out the developemental programmes it is imperative that awarness among the resource users about the significance of a clean and healthy environment for sustainable marticulture should be created.