

# DEVELOPMENT OF SEA FARMING IN INDIA –PERSPECTIVES FROM AN EXPORT ANGLE

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## **1. Introduction**

Sea farming has become a promising area of aquaculture all over the world and is one of the most important and rapidly growing components of Asian aquaculture contributing substantially to the increased demand for high value seafood items in the global market. India has a long tradition of aquaculture from time immemorial and is a leader in the world after China, contributing to about 5.2% of the total production in 2003(FAO, 2005). A sub continent, with seas all around on three sides, India has a long coastline of about 8129 km. The country's continental shelf is estimated as 0.5 million square km, within its Exclusive Economic Zone (EEZ) that extends to 2.2 million square km. The southern edge of the Indian peninsula extends in to the Indian Ocean, with the Bay of Bengal in its eastern part and the Arabian Sea in the west. The main land is surrounded by groups of islands both in the east as well as the west coasts. The Andaman and Nicobar group of Islands are located in the Bay of Bengal, while the Lakshadweep group of islands are scattered in the Arabian Sea. The sea coast along the main land and around the islands provide vast scope for development of sea farming, which has considerable potential to augment production of seafood for the domestic as well as export markets.

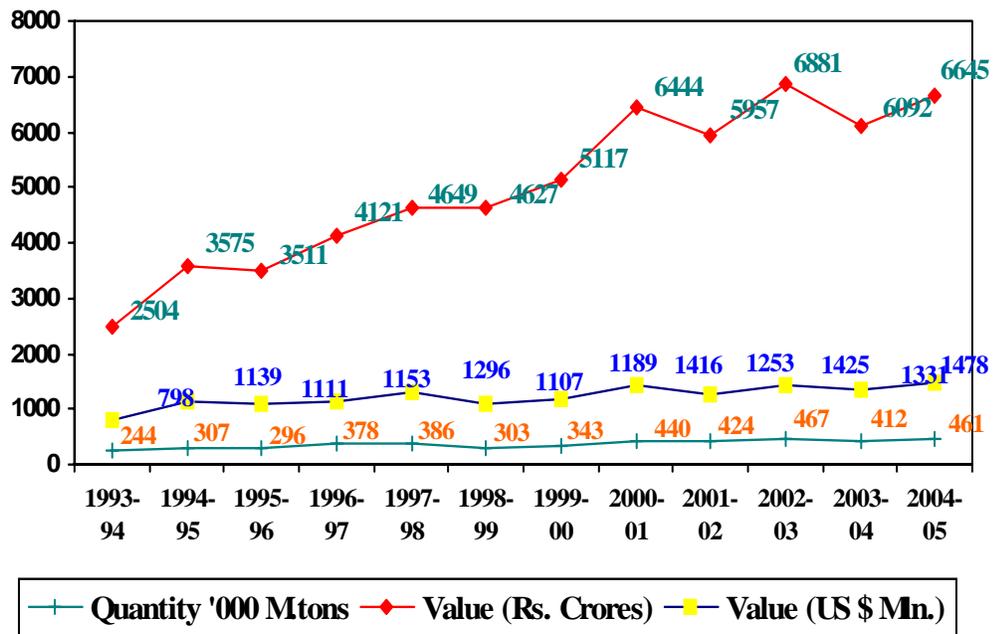
## **2. Status of Coastal Aquaculture**

But, despite the huge potentials, the development of coastal aquaculture in India has been rather confined to brackishwater shrimp culture and fresh water scampi culture in the maritime states. In fact, the country has a rich tradition in shrimp culture, as various traditional practices were followed in different regions to grow and harvest shrimps in its natural habitats. Taking a cue from the traditional practices, scientific systems have subsequently been evolved to culture shrimps in protected and manually controlled regimes. Presently, over 1,67,500 ha area is under shrimp farming in various coastal states, out of which as much as 50,000 ha is still adopting traditional practices. Similarly, fresh water prawn farming is also becoming more popular in India, as its scope is not just restricted to the coastal states, but also making inroads in to the inland states. Currently

about 42,000 ha is estimated to be under freshwater prawn farming and with the standardisation and stabilisation of technology, this sector is poised to expand further.

The marine products export from India has been rising over the years and the current export is worth about US \$ 1478 million. Frozen shrimp is the largest export item in terms of value, contributing 64% of the total export earnings, followed by frozen cephalopod (15%), frozen fish (11%), dried fish (2%), etc. European Union with a share of 26% is the largest market for the seafood from India, followed by USA (23%), Japan (18%), China (10%), South East Asia (9%), etc. Presently, we have capacity to process 16,250 tons for seafood per day, as about 425 processing plants with modern facilities are engaged in this sector. The lack of availability of adequate raw material is one of the major problems faced by the seafood processing plants, as the average capacity utilization is only about 20%. In view of the situation, the Govt. of India is considering to create in “Seafood Hub” in order to consider the import of raw materials for processing and re-export.

**Fig. 1. Export performance of marine products 1993-94 to 2004-05**



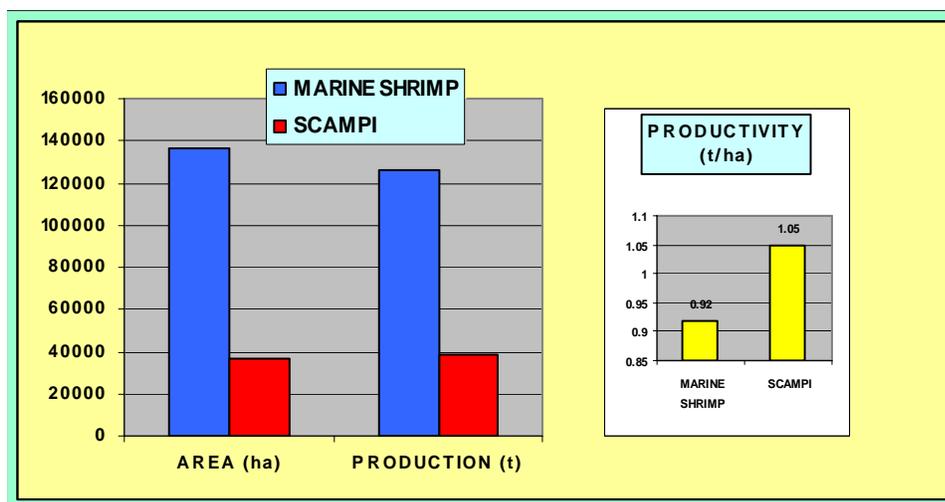
As stated above, shrimps play an important role in seafood export earnings of the country. It is estimated that nearly 63% of the shrimp exported is sourced from coastal aquaculture. Hence, coastal aquaculture has a significant role in marine products exports from the country. The development of brackishwater shrimp farming as well as fresh water prawn farming has been well

supported by the process of backward and forward integration with necessary ancillary industries. Presently there are about 350 hatcheries in India with a built in capacity of 14 billion seed per annum to supply quality seeds of both shrimp and scampi. Broodstock collectors, nauplii producers, nurseries, water quality analysis laboratories, PCR Labs etc are also functioning to support the operations.

Another vital sector for the sustainable development of coastal aquaculture is the feed and feed inputs. Over 30 domestic feed mills are supplying shrimp feed to the farmers, apart from the imported brands. Various forms of other inputs such as probiotics, immunostimulants, Zeolite, BKC etc are also marketed to help successful crops. The shrimp farms in the country have been periodically affected by white spot syndrome viral disease and the farmers are adopting various management measures to prevent crop loss and ensure sustainable production levels.

The Marine Products Export Development Authority (MPEDA) of Government of India has been playing a major and significant role for promoting coastal shrimp and scampi cultivation in the country, as shrimps constitute the major revenue earner in the export market. The revolution in coastal shrimp culture started when MPEDA established two modern shrimp hatcheries in the east coast, with overseas technological tie-up. Subsequently, scientific commercial shrimp farming practices were also demonstrated to farmers through pilot projects. This sector, which has witnessed a sudden upsurge with large-scale development, faced several challenges from environmentalists, lawmakers, financiers, etc. apart from in-house problems such as the onslaught of diseases. However, the situation got stabilized and now streamlined with the enactment of the Coastal Aquaculture Authority Act facilitating statutory and regulatory control over coastal farms.

Small and marginal farmers largely run the shrimp culture sector in India. In order to empower these farmers, MPEDA has mooted the concept of forming “Aquaculture Societies” in various farming villages, through a project undertaken by MPEDA in association with the Network of Aquaculture Centers in Asia-Pacific (NACA), Bangkok on Shrimp Disease Control and Coastal Management in India. Aquaculture societies are expected to improve the socio-economic condition of the small scale and marginal farmers by assuring them sustainable production levels through adoption of Better Management Practices (BMPs) to reduce the risk of diseases and improve production and productivity.



**Fig.2. FARM PRODUCTION OF MARINE SHRIMP AND SCAMPI DURING 2004-2005**

The country is estimated to have about 1.2 million ha. of areas, suitable for undertaking brackishwater aquaculture. However, the development so far, has been only about 15% of the available area, and the scope for further expansion is therefore enormous. In order to regulate the development of coastal aquaculture in an environmentally and sustainable manner, the Coastal Aquaculture Authority (CAA) has been authorized by the Government of India to license the aqua farming activity in the coastal region for which, the norms and guidelines are already framed by the CAA. This Authority, although national in character will be working through the state governments for the governance of coastal aquaculture sector.

### **3. Aquaculture Diversification Programmes**

#### **Attempts for Mariculture in India**

As stated above, the development and progress of coastal aquaculture efforts in India have been concentrating mainly on shrimp or scampi so far especially in the coastal areas on the landward side due to their economic importance, as well as the ready availability of technology and ready market for the produce. Pilot or experimental trials have been attempted for other species of commercial importance. The Indian research institutes have already standardized the breeding technologies for many of the potential species in our waters. However, commercialisations of such efforts have not been materialized due to various reasons. The potential candidates for mariculture in Indian coast are listed in the following table.

**Table 1. Details of Potential Aquatic species for sea farming in India**

Sl.no	Variety (Common Name)	Species Name
1	Asian sea bass	<i>Lates calcarifer</i>
2	Grouper	<i>Epinephelus spp</i>
3	Milkfish	<i>Chanos chanos</i>
4	Mullet	<i>Mugil cephalus</i>
5	Silver Pomfret	<i>Pampus argenteus</i>
6	Cobia	<i>Rachycentron spp</i>
7	Tunas	<i>Thunnus sp, Euthunnus sp.</i>
8	Mud Crab	<i>Scylla serrata</i>
9	Rock lobster	<i>Panulirus spp</i>
10	Edible oyster	<i>Crassostrea spp</i>
11	Pearl oyster	<i>Pinctada fucata, P. margaritifera</i>
12	Mussels	<i>Perna viridis, P. indica</i>
13	Clams	<i>Anadara granosa, Paphia malabarica</i>
14	Sea cucumber	<i>Holothuria scabra</i>
15	Sea weeds	<i>Gracilaria, Gelidiella, Kappaphycus etc.</i>

Pioneering experimental level works on breeding and rearing of various potential species have been carried out in India by the ICAR research institutes like Central Marine Fisheries Research Institute (CMFRI) and others, as early as 1970s. These pilot scale attempts have proved that the breeding and rearing of the potential species are possible and the technology was made available for transferring to the entrepreneurs. However, the transfer of the technology did not result in large-scale development of mariculture activities due to lack of policy to attract investment in this sector. Hence, the coastal aquaculture remained as an infant and focused only towards shrimp culture, for nearly three decades.

However, there have been attempts by private entrepreneurs to start pond culture of finfishes such as Seabass, Milkfish, etc. Fattening projects on Mud crabs and Lobsters were also found to be feasible by the local farmers. Further, a major project for cultivation and processing of seaweeds has been recently started in the south east coast by a private company. Although molluscs culture has been primarily at sustenance level by the local fisherman, attempts have been already made for organized culture of mussels, oysters, clams, etc in some coastal villages. But such projects faced serious marketing problems due to limited production levels. Besides, so far there has been no system in India to classify suitable water for shellfish culture on account of water quality and quarantine measures to meet international product standards. Hence, more efforts are required in this direction.

## **4. Major constraints**

### **a) Policy for Mari culture**

Although enriched with vast natural resources and numerous potential species, the sea farming practices have not picked up in the country, perhaps due to the lack of a policy for usage of open water bodies. The coastal areas of the country are densely populated and their major occupation is related to fishing and ancillary activities. Therefore, demarcation of suitable areas for a relatively new venture such as mariculture may invite multi user conflicts. Therefore, to initiate such projects, it is very important to involve the local community and frame suitable policy for aquaculture. Coastal Aquaculture in the open waters requires statutory support and the Government is yet to take major policy decision in this regard. Therefore, any major effort for commercialization of the technology for mariculture of various species will depend on the policy framework.

### **b) Technology**

Although a variety of endemic species are available in Indian waters, standardisation of the requisite technology for breeding and culturing potential species is yet to be done on commercial scale. Therefore, streamlining the technology for commercially important varieties and identifying the product or markets for such species requires special attention. If such products identified are sourced from candidates of exotic in nature, then the import of such species in India require specific permission from a committee set up by the Government of India, viz “Committee for Introduction of Exotic Aquatics into Indian waters”. Similarly, such technology for the projects will have to be borrowed from abroad through joint venture programme, or bilateral assistances.

### **c) Finance**

Small and marginal farmers largely handle and operate coastal Aquaculture enterprises in India. The corporate bodies who had earlier promoted semi intensive type of farming with vertically integrated facilities had a slump and have almost withdrawn from this field. As a result, the financing sector is not too ambitious about aquaculture projects. Hence, Government support and active participation of financial institutions may be essential to provide initial thrust to new ventures.

### **d) Manpower Resources**

The substantial manpower available in the subcontinent is comparatively cheaper, whether skilled or unskilled. However, to train the available human resources for capacity building to meet the desired standards of knowledge and technology, considerable efforts are required, especially for tuning to the demands of the new sector. Managing the open sea cage culture farms is one such area in which expertise is not readily available in India.

#### **e) Environmental Impacts**

The mariculture farms using offshore waters could be classified under the following:

- Land based flow through systems
- Land based recirculation systems
- Offshore cage farms

The pollution load from each such system will depend upon the type of technology adopted, as well as the intensity of operation. Moreover, some regions off the coast in the mainland as well as around the Island are protected areas due to their ecological sensitivity. Therefore, while planning to undertake any major endeavors with reference to sea-based aquaculture, the environmental impact effects should be studied to ensure ecological perseverance as well as long-term sustainability to the project.

#### **f) Marketing issues**

Apart from shrimp and scampi culture, the isolated attempts on coastal aquaculture were facing serious problems with regard to marketing the produce. While domestic marketing could be explored for value-added products from mariculture, the major projects are required to be planned on a market driven strategy with an eye on the emerging markets and products. The fast moving products in the international markets need to be identified for deciding the species suitable for mariculture so that such efforts are remunerative and economically feasible.

#### **g) Sea Ranching and marine husbandry**

Apart from directly contributing to the exports, sea farming programmes can also participate in replenishment of natural resources by adopting suitable sea ranching and marine husbandry operations which are in practice in some other countries for augmenting the sea catches. Such programmes, however requires cooperation from hatchery operators to supply disease free seeds and from fishers to protect the same till they reach substantial size in natural waters before harvesting.

### **5. Diversification of Coastal Aquaculture – MPEDA's initiatives**

Shrimp remains as the single largest and maximum value earner among the seafood exported from the country. It is estimated that cultured shrimps constitute 63% of the quantity of shrimps exported from India. Therefore, in order to diversify the export basket, the Marine Products Export Development Authority (MPEDA) has set out an action-oriented plan during the next five years. The plan envisages increasing the share of non-traditional cultured varieties to about 50% of the total production from aquaculture. In order to concentrate on the diversification of coastal aquaculture, MPEDA has therefore, constituted a separate Society viz, Rajiv Gandhi Centre for Aquaculture

(RGCA). RGCA has embarked upon various missions to standardize and popularize the aquaculture of potential species in Indian waters, which have commercial significance. The following are some of the activities recently taken up by this organization.

- a) Breeding of Asian Seabass (*Lates calcarifer*)
- b) Cage culture of Asian Seabass
- c) Fattening of Rock Lobsters
- d) Breeding and culture of Mud Crabs( *Scylla serrata*)
- e) Artemia production
- f) Breeding and culture of Groupers
- g) Tilapia culture

The Marine Products Export Development Authority has been in regular contact with International organizations to bring in techno economically feasible technologies to India for adoption of the same by Indian entrepreneurs. We have also taken up few demonstration projects in the farmers' pond for encouraging the farmers to take up alternate culture of species such as Sea bass, Mulletts, Milkfish, Mud crabs, Mussels, Oysters, Clams etc.

With a view to propagate mariculture in the country, a detailed feasibility study was undertaken during the 1990's; through an overseas agency to micro survey the Indian coast for studying its potential for offshore farming. The survey revealed that India has great potential for offshore farming, along the continental coast of South India and the island coasts. The meteorological and hydrographical data have shown that the maximum wave and current actions are compatible with the best of offshore fish farming equipment. Wave conditions in the Arabian Sea seemed to be little tougher than in Bay of Bengal.

The water quality conditions along the coast were found to be stable and good except in the west coast during the south west monsoon, during which upwelling is a common phenomena, creating oxygen depletion zones, followed by algal blooms which can adversely affect farming operations. The availability of suitable sea and land areas, service, transport facilities etc, were generally found to be adequate except in remote island locations.

On the basis of this survey it was concluded that about 2000 sq. km. of sea surface is ideally available to take up offshore farming and a production potential of 8 million tones of high quality marine fish is harvestable through cage culture practices.

## **6. Conclusion**

According to a vision formulated by MPEDA, the seafood export from India is targeted to reach US \$ 4 billion by 2009-10. The contribution of aquaculture sector is expected to rise from the current level of US \$ 0.7 billion to about US \$ 1.5 – 2.0 billion for making this vision in to a reality. There is a growing demand for marine finfish, and offshore fish farming can offer new vistas for India in aquaculture not only to achieve the set target apart from consolidation and expansion of shrimp or scampi culture in the coastal stretches for national economic development and also to ensure livelihoods to many more people. This of course, calls for a positive strategy to formulate policies conducive for development. Sustainable development and progress of marine farming requires substantial building of skills in health management and market diversification as key issues, in addition to smooth flow of finance. Concerted efforts from all sides may lead in to such developments in the imminent future.

## **7. Acknowledgements**

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