

# NEED FOR DIVERSIFICATION OF COASTAL AQUACULTURE

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There is large potential for coastal aquaculture in the vast stretches of shallow coastal waters, creeks, bays lagoons and mudflats along the northeast coast of India comprising Andhra Pradesh, Orissa and West Bengal. Considering the good prospects for mariculture along the Indian coasts, the Central Marine Research Institute has carried out research and developed techniques for the culture of several groups of cultivable organisms like prawns, finfishes, crabs, the molluscan shellfishes like oysters, mussels, clams, pearl oyster and cephalopods, holothurians and seaweeds. In addition techniques have been evolved for the spawning and larval rearing of prawns, crabs, molluscs and echinoderms in controlled conditions which enable production of seed in a hatchery for the purpose of culture. The CMFRI is also propagating the aquaculture technologies and economics of the same through training programmes and extension programmes including lab to land programmes, fishermen entrepreneurs and scientists meetings, participation in exhibitions and information media.

Although mariculture techniques have been developed for a number of cultivable groups, entrepreneurs have been attracted by the culture of only the penaeid prawn *Penaeus monodon* as it gives high returns for investments made through export of frozen prawns. A few are culturing the

mud crabs *Scylla serrata* and *S. tranquebarica*, which also fetch high price in the export market.

## Prawn Culture

While several prawn species like *P. monodon*, *P. indicus*, *P. semisulcatus*, *Metapenaeus dobsoni*, *M. monoceros* and *M. affinis* could be cultured, culturists prefer farming of the tiger prawn, *Penaeus monodon* as it fetches very high price in the export trade. Hatcheries have been established at several places along the coast and the seed produced are stocked in prawn farms. In addition to hatchery produced seed, seed collected from the estuarine systems of the rivers like Krishna, Godavari, Mahanadi and Hooghly are also used for stocking farms. In such operations, after taking the seed of *P. monodon*, postlarvae and juveniles of other prawn species as well as finfishes like milkfish, mullets etc., are discarded which is highly destructive and should be banned through legislation.

Prawn culture, which is highly lucrative, is carried out in small and large farms extending over scores of acres especially in Andhra Pradesh and high yields are obtained. Often prawn farming is not carried out, as it should be. There are many wrong and harmful practices like the use of poor quality seed, high stocking densities, the use of poor quality or

excessive feed, unnecessary use of antibiotics and poor quality water, due to inadequate aeration, insufficient water exchange or contamination by effluents from adjacent farms. Due to these reasons, there is outbreak of viral or bacterial diseases, which leads to mortality of the cultured prawns. When disease sets in, the prawns are harvested to reduce havoc. Since 1994 the disease problems are recurring every year. With due care, precautions and proper farm management, it is possible to avoid mortalities and get fully grown cultured prawns. Despite many drawbacks and problems, production from farming has been increasing in recent years and 80,000 tonnes of cultured prawns are harvested annually from Indian coasts with Andhra Pradesh ranking first. Generally two crops are obtained from farming in most of the prawn farms.

### Crab Culture

The green crabs *Scylla serrata* and *S. tranquebarica* which are another delicacy is cultured by collecting juveniles from nature and stocking in coastal farms. The juveniles can be stocked at a density of 5000/ha. A production rate of 2500 kg/ha/crop has been indicated by CMFRI. For conducting crab culture commercially, production of juveniles adopting hatchery techniques is essential as dependence on nature for seed will deplete natural stocks. Hatchery techniques have also been developed by CMFRI for *Portunus pelagicus* which is another cultivable crab of commercial importance growing to large size.

### Finfish Culture

There are good possibilities for practicing culture of the finfishes milkfish, *Chanos chanos*, and mullets *Mugil spp.* Collecting the fry and fingerlings, the fishes are cultured in small traditional farms in West Bengal. During the last two decades interest in culture of finfishes has declined due to the alternative attractive prawn farming. The annual production from coastal finfish culture in India is meagre and about 200 tonnes.

The success achieved by CMFRI at Mandapam Camp in breeding of the grouper, *Epinephelus tauvina* has opened avenues for taking up of further research to develop hatchery technology. The red bream *Argyrops spinifer*, snappers *Lutianus spp.*, Sea bass *Lates calcarifer*, the Indian tarpon, *Megalops cyprinoides* and marine ornamental fishes *Callyodon spp.*, *Amphiprion spp.*, etc. are the other finfishes suitable for culture along the coast.

### Culture of Edible Molluscs

The edible bivalve molluscan resources like clams and oysters are distributed in several places along the three states in the northeastern region. The standing stocks have decreased considerably, particularly during the last three decades due to the heavy exploitation. Experimental culture of oysters, clams and mussels at Visakhapatnam and Kakinada have given encouraging results. For judicious exploitation of the resources culture practices have to be carried out. The clam, *Meretrix casta* which is common along the coast can be cultured by bottom sowing method using the seed available in nature. There are large beds of the

blood clam, *Anadara granosa* in the Kakinada Bay. This species which thrives well in muddy sediment has been successfully cultured by CMFRI at Kakinada and trial samples exported to Japan. The blood clam can be cultured in different areas and exported to Japan where there is much demand.

The oyster *Crassostrea madrasensis* which is a delicacy and a balanced food could be cultured adopting rack and ren method in Bahuda estuary in Orissa, Sundarbans in West Bengal and at Kalingapatnam, Bhavanapadu, Bheemunipatnam, Kakinada, Machilipatnam and several other coastal places southwards in Andhra Pradesh. The green mussel, *Perna viridis* occurs sporadically along the coast at some places like Kakinada, Visakhapatnam and Chilka Lake. Initially mussel seed could be transported from Ennore or Chennai where they are abundant and cultured by pole, rack or raft culture methods depending on the depth of the culture site.

### **Pearl Culture**

Success has been achieved for the first time at the Visakhapatnam Research Centre of CMFRI in producing cultured pearls in the Indian pearl oyster, *Pinctada fucata* grown in onshore facility. This has indicated that it is possible to provide onshore environmental conditions suitable for the growing of pearl oysters and pearl culture. A large number of pearl oyster seed have been produced at the shellfish laboratory and further work is being initiated in nucleus implantation and on shore production of pearls making use of the technology developed.

### **Seaweed Culture**

Several species of seaweeds of economic importance are an important ancillary resource along the rocky parts of intertidal zone and subtidal waters. The seed resources along the coast have been surveyed and experimental culture of the seaweeds *Gracilaria verrucosa* and *Ulva* spp. has proved successful at visakhapatnam. There is good scope for culture of edible and agar and algin yielding and edible seaweeds along the coast on rope frames set in sheltered shallow waters free from strong wave and current action and predatory fishes. The cultured seaweeds grow fast and can be harvested at the end of three months. Tissue culture of *Gracilaria edulis* in controlled conditions at Visakhapatnam Research Centre laboratory has resulted in growth of explants and development of fresh shoots.

### **Coastal Aquaculture and Environment**

When coastal aquaculture is carried out, conservation of the coastal zone has to be given paramount importance. The coastal waters are a very sensitive and important zone between the land and open sea as they are highly productive and forms the nursery area for a huge number of marine flora and fauna. Selection of culture site and type and scale of culture should not affect the ecological balance and natural biota including the seed resources. Therefore great care has to be bestowed in the selection of farming site and magnitude of culture. Experience during the last two decades has shown that semi-intensive culture system is ideal from the point of view of production as

well as conservation of the environment. Construction of large farms along a continuous stretch should be avoided as it will lead to problems of pollution. Mangroves in Sundarbans in West Bengal and parts of Orissa and Andhra coasts should not be damaged and cut down to conduct aquaculture as they are of vital importance in the binding and conservation of the coast giving protection from the ravages of cyclones and tidal waves which strike the coast.

### **Future Prospects**

The coastal waters of the northeast coast receiving riverine discharges of the mighty perennial rivers, the Ganga, Brahmaputra, Mahanadhi, Godavari and Krishna and several small rivers with land run off are very productive and favourable for carrying out coastal aquaculture. There is urgent need for diversification of aquaculture in the area as culture of finfishes, crustaceans and molluscan shellfish will provide livelihood to the unemployed in the coastal parts where population density is high and poverty widely prevalent. Harvests from coastal farming will not only augment production but also bring seafood within the reach of coastal poor among whom nutritional deficiency is rampant.

The prospects for pearl culture are especially bright as there is ever growing demand for marine pearls and technology for production of cultured pearls is available.

There should not be any delay in the expansion and diversification of coastal aquaculture as coastlands in the region are being utilized for human habitations, seaside tourist resorts and industries. Entrepreneurs starting small scale diversified aquaculture have to be given incentives and support by the Government and banking sector by giving required area on lease and monetary help. In this regard the economically weak fisherfolk should be given preference as they should be encouraged and as they could be expected to work with keen interest and capability. Fisherwomen should also be encouraged particularly in molluscan shellfish culture and seaweed culture as they have more time than fishermen to spare and take care of culture work. Further the fisherwomen are good in marketing.

The personnel involved in diversified coastal aquaculture could take the guidance of the Scientists of Visakhapatnam Regional Research Centre and Kakinada Research Centre of CMFRI, which will enable them to conduct farming successfully. Diversification of coastal aquaculture carried out with care could be expected to step up production considerably in the new millennium.

