

2. TECHNOLOGIES FOR FISHERIES ENHANCEMENT

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By 2050, Global human population is projected to reach more than 9.2 billion, which is within estimates of the maximum carrying capacity of the planet. A fundamental question for science is whether it is possible to increase food production enough to feed a human population of that magnitude and will fisheries be sustainable as human population pressures and accompanying coastal development pressures continue. Capacity of multiplication of fish and fishery resources is considered far higher than from other sources and fisheries is considered to be the major source in meeting the future protein requirement of the human population. Marine fisheries enhancement is possible through three methods, harvest management, production enhancement and habitat management

Harvest Management: We can control fishing catch & effort – seasonal closures, size and catch limitations, area closures, incentives (catch shares), number of angler licenses (limited entry), spatial planning.

Production Enhancement: Mariculture, hatchery technology, sea ranching.

Habitat Management: We can identify, protect and restore essential habitat – EFH, MPAs, spatial planning, habitat preservation and restoration, artificial habitats

Mariculture:

Among these three measures product enhancement methods, mariculture provide direct results of production enhancement in quantifiable terms and rest are the indirect means to enhance the production. Mariculture is identified as a prime industry to tap the enormous sources of and very good potential for India. According to Food and Agriculture Organization (FAO), the projected global aquaculture production in 1995 was 19.29 million tonnes and it is expected to increase to 26.90 million tonnes by 2000 AD. Currently in India, there is a growing interest in aquaculture in order to meet the protein demand of the fast growing population. Marine finfish culture has been an established practice is now undergoing rapid development. Information on the relative abundance of cultivable fin fish seed together with physico-chemical conditions of the environment is an essential prerequisite for aquaculture. At present, in marine finfish culture practices only a part of seed requirement is met from the hatchery and most of the culture practices in India are supported by the supply of seed collected from the natural environment. The technology for the mass production of marine finfish seed by induced breeding are being carried out in various Institutions which started providing very promising results which will lead to adoption of finfish culture in India in large scale. India have developed technologies for mass scale seed production of seabass, cobia, pompano, prawns, crabs, Ornamental marine fishes etc.

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Mariculture development in India:

India is having a long coast line of 8129 Km with many estuaries, creeks, coastal lagoons, mudflat and swamps. In Many parts of India fish/shrimp culture are being carries out traditionally in natural and constructed ponds. Recently pen culture an cage culture are also being practiced in various states.

(i) Pond Culture



Shrimps are the major groups being cultured in saline ponds along Indian coast. *Penaeus indicus*, *P.monodon* were the majour species cultured. Recently *Penaus vannamei*, exotic shrimp species is also introduced to tide over the white spot disease prevalent in *P. monodon* stock.

In pond culture method fin fishes and shrimps are the majour groups cultured. Among finfishes, milk fish and mullets, pearlspot were cultured as monoculture as well as in polyculture with shrimps and other fishes. Monoculture of seabass, is being practiced in saline ponds all along Indian coast. Recently pompano also identified for a candidate species for pond culture in saline ponds.

Crabs *Scylla* spp are being cultured in south west coast of India as culture practice or as a fattening method.

(ii) Pen Culture

Pen culture method is found to be one of the better cuture method for Milkfish and Grey mullets. Recently seabass and pompano also are being cultured by pen culture method

(iii) Cage culture



Cage culture of fish was originated in the Far East and later adopted in several countries.

Estuarine cages were experimented in the country for many groups like Red snapper Rabbit fishes, Groupers, and sandwhiting and seabass. But lack of seed production techniques limited the progress of estuarine cages in seabass alone. However new development s in seed production in finfishes will be helpful in augmenting fish production from estuarine cages.

Marine cages:



Finfish seed production from hatcheries lead to the popularization of Marine cages are during last decade. Technology for marine cages, location testing of marine cages , Successful demonstration of the culture of different fishes like, seabass, lobsters, cobia, seabreams, snappers and groupers were demonstrated by CMFRI and in production terms it holds great future.

(iii) **Molluscan farming:**



Mussel farming is one of the most popular mariculture operations in the temperate countries. In India *Perna viridis* is the species extensively used for rope culture in south west coast of India. Mussels have anti-inflammatory, anti-histamine, prophylactic and therapeutic properties. Oysters are one of the most valued seafoods and are farmed extensively. In India, *Crassostrea madrasensis*, commonly known as the Indian backwater oyster is the most preferred species for farming. A number of clam species occur in the coastal regions of India. Experiments conducted to farm these species, indicated the feasibility of clam farming in pen and on bottom methods

Present status of mariculture in Karnataka

Karnataka state has 3 coastal districts and fisheries sector plays an important role in socio-economic development of the state. The State has 300 km coastline and most importantly. It has a pristine unpolluted brackishwater/estuarine area of about 8000 ha. in these three districts. Dakshina Kannada has 5 estuaries with a total area of 1140 ha, Udupi has 8 estuaries of 1885 ha and in Uttar Kannada there are 13 estuaries with about 4200 ha. The bivalve culture has been adopted by fishermen of Karnataka for last 10 years and small scale fish culture cages are also becoming a practice in many parts of Karnataka. Recent success in Open sea cage culture attracted many fishermen to venture into mariculture.

CMFRI has developed adaptable technologies in bivalve culture in Karnataka. Green mussel (*Perna viridis*) and edible oyster (*Crassostrea madrasensis*) farming practice holds good potential in coastal and estuarine areas of Karnataka. Breakthrough in extraction of GME will increase the demand for bulk quantities and for meeting the demands of the market Standardization of clam farming protocols are being carried out for advising on ideal relaying densities in suitable substratum this may boost the sustainable production of bivalves along Karnataka coast.

Crab fattening is a relatively non-intensive form of mariculture technology. 'Soft crabs' collected from creeks and inshore waters can be maintained in prepared ponds for fattening. The advantage of the

crab farming activity for small-scale fishers of the coastal areas relies on the fact that it can ideally be carried out in smaller areas (<0.25 ha) as short-duration crops. By virtue of its meat quality and large size, the mud crab, *Scylla tranquebarica* has gained prominence in live crab export trade from India. At present, live water crabs are not exported from Karnataka and it is sold in local markets at comparatively low prices. These natural seed resources can be harnessed optimally and used for farming activity as small-scale grow-out operations in suitable coastal areas of Karnataka. Up-scaling of these techniques have to be tried and the techno-economic viability confirmed and transferred to farmers. Hatchery in East coast of India developed seed production technologies and it holds good potential for crab culture in Karnataka

By Designing and propagating integrated aquaculture units in estuaries and backwaters to rear fishes will boost the aquaculture production of the state and also empower the fishermen to increase the production and provide alternate livelihood in lean fishing period. In all estuaries and coastal waters, where fishery is prevalent a large quantity of juvenile fishes are caught and being discarded due to its smaller size. Out of the discarded fishes there are large numbers of fast growing fishes, if they are identified well and its culture technologies are propagated this will go long way in boosting fish production. Standardization of small-scale capture based farming units for red snapper and seabass has been developed and practiced in Kundapur district and there is a great demand for seeds for small scale culture in the state. Marine cages for rearing Seabass, redsnapper, seabreams, cobia and pompano has been demonstrated in mariner cages in Karwar and there is a good potential for increase in marine fisheries production through marine cages.

