



INCREASING FISH PRODUCTION BY MARICULTURE IN MAHARASHTRA

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Introduction

Fish is a biological living resource that can be harvested year after year with sustainable development of fisheries sector. Fisheries are next to agriculture in terms of providing employment and food supply. Fish not only provides 4.3 billion people with 15% of high quality protein requirement globally, but also offers livelihood to 54.8 million people the world over and valuable foreign exchange to developing countries as well. However, by 2010, about 30% of the global marine fish stocks were overexploited, producing lower yields than their biological and ecological potential (FAO, 2012). Therefore, United Nations Commission on Environment and Development (UNCED) considers sustainable fisheries development by management and conservation of natural resources and enhancing valuable fish production by aquaculture. Aquaculture has been one of the world's fastest growing food production systems steadily increasing at 8.8% per year when compared to 1.6% for capture fisheries. In the last three decades (1980–2010), the world food fish production of aquaculture has expanded by almost 12 times to 60 million t in 2010. The production from coastal ecosystem through farming, which was less than 0.5 million t. in 1950, increased to 10 million t in 1990 and to 19.3 million t. by 2011 (FAO, 2012). Of the 600 species being cultured, 22 species account for 80% of the global production.

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 2010 (FAO, 2012). The land based aquaculture for fresh water carps, catfish, tilapia etc and brackish water culture mainly for shrimps and some fishes in coastal areas is well established in the country. It is estimated that the fish requirement of the country by 2025 would be of the order of 16 million tonnes, of which at least 10 million tonnes need to come from aquaculture. Therefore, development of strategies based on available resources is necessary to achieve the target.

In India, about 25 years ago, shrimp culture was advocated for utilization of coastal wetlands, food security and protein supplement to poor and employment generation in rural areas by adopting extensive culture practice to enhance shrimp production and foreign

exchange earnings by export. But, owing to illusion of higher profit margins, most of the entrepreneurs, including farmers, followed semi-intensive practice. This practice involves high initial costs and expensive inputs which rendered shrimp farming a capital intensive activity that could be pursued by very few. Yet, quite a number of shrimp farms (mainly for tiger prawn, *Penaeus monodon*) cropped up along the Indian coast and with annual production of about one lakh tonnes, it is now an established business in aqua-culture sector. However, the initial boom in early 1990s is over and the brackish water shrimp culture has been facing a number of problems since late nineties. Disease outbreaks are common and the input costs on feeds, chemicals, probiotics and farm equipments have escalated, which has deterred many entrepreneurs and companies as well, for setting up new farms. Most of the small farmers are thrown out of business as they could not afford the losses, as a result, they have either sold or passed on the farms to urban rich who are either 'Sunday farmers' or naive in shrimp farming. Moreover, as the cultured prawns are mostly exported and the international seafood markets are flooded by Chinese shrimps with very competitive prices, the profit margins from shrimp farming are rapidly dwindling, the farmers have been able to just break even their crops in the country. Nonetheless, the shrimp farmers are looking forward for an alternative to shrimp.

State of marine fish stocks in Maharashtra

Maharashtra with a long coastline of 720 km is endowed with 70 creeks and protected bays and rich marine fishery resources. The average annual marine fish landings during 2001-10 were of 3.6 lakh t valued at about Rs 2,322 crores contributed 0.5% to the GDP of the state. The marine fishery is multi-species supported by tropical species with relatively smaller size, fast growth, almost continuous breeding and low volume (biomass) nature with rapid turnovers. However, marine fishery is facing crisis since late nineties owing to overfishing, urbanization, domestic and industrial pollution and habitat degradation. Among the commercially important resources, Bombayduck, silver pomfret, elasmobranchs and lobster resources have declined significantly while vulnerable resources such as sand lobster (*Thenus orientalis*), Indian halibut (*Psettodes erumei*) and Karakara (*Pomadasyus hasta*) have almost disappeared and thread fin (*Rawas* and *Dhara*) and jew fish (*Ghol*) are facing severe depletion. The marine fishery is dominated by mechanized trawlers, purse seiners, gill netters and *dol* netters that venture beyond territorial waters in search of fish while small and marginal fishers practicing traditional fishing are deprived of fish in inshore and nearshore waters. Mariculture alone may offer them opportunities to conserve and grow fish in coastal waters for their livelihood by adopting capture based aquaculture.

Mariculture Culture technologies

Central Marine Fisheries Research Institute (CMFRI) has developed culture technologies for seaweeds, mollusks, finfish and sea cucumbers in marine waters which can be practiced in creeks, bays, and shallow inshore and nearshore waters. Most of them are with cost effective inputs and the farmers do not have to depend on exporters for marketing; the organisms can be easily turned into value added products, which can find easy domestic markets. However, the coastal waters should be pollution free and processing and packing should be according to international hygiene standards so that consumer will accept them readily.

Green mussel

Green mussel, *Perna viridis* is cultured on hanging ropes attached to bamboo scaffoldings in creeks and bays, where wave action and currents are not strong. Women groups in Kerala have been practicing mussel culture and selling shell on as well as canned meat in cities through retail outlets. In one hectare water spread area 250-300 t fresh mussels, without involving any expenditure on feed, can be harvested after seeding in about six month time. Similarly, clams (*Katelysia opima*, *Meretrix casta*, *Paphia malabarica* and *Villorita cyprinoides*) and blood clam (*Anadora granosa*) are reared in muddy bottom estuaries and creeks or along the shore in protected bays. They are highly nutritious and have good demand in domestic markets, either in fresh or canned form.

Edible oysters

Edible oysters (*Crassostrea madrasensis* and *C. cuculata*) which occur in intertidal areas are easily cultured off the muddy bottom on stakes, racks and rafts. The spat is collected on tiles and after putting them on ropes with strings they can be attached to poles in horizontal or vertical rows in 2-3 m deep bays. The oysters grow to marketable size, without extra feeding, in 8-10 months time. Large sized oysters have good demand at places of tourist interest and domestic markets as well. The shells of oysters, clams and mussels are also valuable for local lime industry. On shore pearl oyster farming is still in infancy and may take some years to perfect it to commence commercial farming.

Seaweeds

Seaweeds are marine algae some of which are of great economic importance. They are cultured in southeast countries on large scales, but in India they are mostly collected from the Tamil Nadu and Gujarat coast. At quite a few places in Tamil Nadu they are cultured along the shore. With the help of biotechnology, they are grown on shore in ponds. Although

most of the species (*Gelidiella acerosa* and *Gracilaria edulis*) in India are cultured for 'agar' industries and the species of *Sargassum* and *Turbinaria* for 'algin', many species are grown for salads and exported as 'nori' to Japan. In Maharashtra they can be cultured along the coast of Ratnagiri and Sindhudurg districts.

Mud crab

Edible mud crab (*Scylla serrata*) can be the best alternative to shrimps, but they have to be fed with trash fish and the ponds need a 2-3 feet enclosure to prevent their escapement. They grow to good size in 3-5 months and can be supplied at very attractive prices to domestic restaurants on demand. They can be packed alive and exported to Singapore and Hong Kong.

Sea cucumber

Sea cucumber is an unconventional species from which a product called *Beche de mer* is made. The natural populations of sea cucumber in noticeable quantities are found along the coast of Ratnagiri district near Malvan. Farming of sea cucumber (*Holothuria scabra*) along the edge of the shallow sea coast can also be undertaken, especially by the marginal fishermen in Malvan area.

Fin fishes

Culture of fin-fish such as grey mullet (*Mugil parsia*), milk fish (*Chanos chanos*), pearl spot (*Etroplus suratensis*) in poly-culture with shrimp is a perfected and profitable practice which farmers should adopt farming on commercial scale as they have very lucrative market demand in cities. If these fishes are harvested during lean period of monsoon months, the farmers can reap profit equivalent to shrimps. Pond culture of sea bass (*Lates calcarifer*) in Maharashtra is not new, the juveniles were traditionally impounded in backyard ponds in *Kharland* or *Khazan* areas in Raigad district, but rearing on commercial farming is now attempted. Culture of sea bass on commercial scale can be undertaken in shrimp ponds, particularly during monsoon months when salinity is very low and wild seed is available in creeks. The fingerlings of sea bass are also available from hatcheries and the fish, being highly carnivorous, can be fed on live prey fish such as Tilapia. Recently, American pompano has shown encouraging results for onshore culture in Andhra Pradesh.

Open sea mariculture:

In the past 3 years, open sea floating cage farming has been successfully demonstrated by CMFRI for seabass (*Khajura*), pompano, cobia (*Sakla* or *Modosa*) and lobsters (*Sheward*) in nearshore waters. The Institute has developed a cage farming hub at Karwar, where locally available fish varieties are being tried for open sea culture. With the success of demonstration

farms, the National Fisheries Development Board (NFDB) has come forward for funding cage farming in big way. In the case of small scale farmers, cage farming can be easily combined with their capture fisheries operations. A floating cage (3 m dia) can be used for rearing undersized commercial varieties of fish. Most of these varieties can be fed with low value bycatch netted by the fishermen and minimize the input costs. Red snapper and some of the perches (*Acanthopagrus berda*) grow to marketable size within 6-8 months which can enhance their income. In addition, once the fishermen practice rearing, conservation of fish resources which are already under threat from over-exploitation in coastal waters may become easier.

Over the years, environmental awareness has grown all over the world and consumers are interested in environmentally sound fish and products. Therefore, yet another alternative is organic farming of prawns. It is a method of sustainable aquaculture based on ecologically and environmentally sound practices. In this, shrimps are cultured using extensive practice *i.e.* low density farming without use of any antibiotics and chemical agents and minimizing soil and water degradation. Such organically grown shrimps, when certified, can fetch much better price to compensate for the lower production rates.

Thus, several alternatives to shrimp farming are available but farmers should adopt them willingly to continue aquaculture. The state should also take initiative to make legislations regarding leasing of coastal waters for mariculture which are still ambiguous and not favouring coastal mariculture.
