

## **PRESENT STATUS AND SCOPE FOR INCREASING MARINE FISH PRODUCTION IN INDIA**

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### **1. Introduction**

Marine fish production in the country has been in doldrums for the past few years, both in the capture and culture fisheries sectors, the former crippled because of undue concentration of fishing effort in the coastal area, mainly in the pursuit of shrimp by trawling day in and day out for about 50 years and the latter mainly plagued by disease of cultured shrimp. In both the cases, shrimp has been the target for obvious reasons of high value and export demand. The stalemate should be broken by focusing attention to resources other than the shrimp, diversifying fishing to exploit under and unexploited resources of the entire EEZ and utilize naturally available seed resources of fin-fishes, crustaceans and molluscs for production of seafood from cultivable salt water bodies along the coast, inshore area and open sea by application of modern technology.

### **2. Present status**

Marine fish production in the country increased from a meager 0.5 million tonnes in the 1950's to 2.66 million tonnes during 2003 which is mainly based on multicraft, multigear and multispecies. The means of production include mechanized boats (46,918), motorized boats (31,726) and artisanal craft (1,59,481) all in excess by 55, 60 and 81% respectively. There are 2,271 landing centers, 6 major and 33 minor fishing harbors. In the year 2000, of the total production of 2.7 million tonnes, 64% was contributed by the mechanized sector, 8% by the artisanal sector and 1% by the deep-sea sector. The increase in capture fisheries production over the years was attributed mostly to improvements in craft and gear, increase in fishing intensity, multi day fishing extending to deeper areas with better communication and fish finding facilities, post harvest handling, on board processing, preservation, storage and value addition of products. While these developments were positive, negative trends soon set in the form of declining total catch and catch per unit of effort, decrease in recruitment and uneconomical fishing. These adverse effects created and lead to several controversial issues. The chief among these are the sectorial clashes between artisanal and mechanized fishing sectors, degrading of the coastal benthic ecosystem, imposing closed seasons, ban on certain destructive fishing activities, capture of juveniles of several species (about 10% in trawl by-catch), discard of low value fishes at sea (estimated to about 0.3mt. from shrimp trawlers), variations in mesh and net dimensions, disputes between fishermen from other States, over capitalization, licensing of foreign fishing vessels, pollution of the sea and lack of national fishing policy. These and the other issues connected with the open access system became counter productive in the past few years.

While fishing intensity in the coastal area far exceeded the optimum level, it is far below the required level in the island territories of Lakshadweep and Andaman and Nicobar which abound

in very rich resources, especially of tunas and tuna-like fishes, other fin-fishes, squids and cuttlefishes. Although precise and up to date data are not available, production from Lakshadweep has been about 7,000 tonnes per year and from the Andaman and Nicobar islands about 31,000 tonnes per year. As capture fisheries scenario started showing negative signs of development, a sudden interest cropped up in coastal aquaculture to farm the high value shrimp (mainly *Peneaus monodon*) which, in the past about 20 years developed very rapidly, rather in an uncontrolled and unregulated manner resulting in a collapse due to spread of diseases and other issues. At present, shrimp farming is beset with a number of social, legal, economic, and environmental and disease problems which need to be solved to achieve sustainability.

### **3. Scope of increasing marine fish production**

#### **3.1. Scientific management of the exploited fisheries**

The open access system in operation for over 50 years has been a boon as well as bane for the inshore fisheries. This should gradually be switched over to a regulated regime. In the mean while, further damage to the over stressed stocks should be avoided by curtailing fishing intensity to an optimum level by fixing restriction of mechanized and artisanal fishing fleets per area / region. Mesh sizes and dimensions of various nets have to be fixed to eliminate capture of juveniles and sub adults based on results of scientific research on size at first maturity, spawning seasons, nursery grounds and migration. The operation of destructive gears like ring-seins, stake nets, purse-seins, and bag nets has to be restricted in sensitive regions where abundance of juveniles and spawning schools occur in space and time. Fishing bans, wherein operation have to be made scientific and uniform throughout the entire coast to provide respite to the stressed stocks and save at least a part of spawning stocks of certain commercially important species. Post-harvest losses, mainly the discards, have to be reduced by increasing the mesh sizes of nets or by providing extra on-board fish hold capacity. Under- sized lobsters and crabs are to be released back into the sea.

#### **3.2. Generation of additional production**

##### **3.2. 1. Capture of underexploited and unexploited resources**

Good stocks of tuna and tuna like fishes are known to be available in territorial/coastal waters of India, with the potential of 2.8 lakh tons, of which only about 23 % are harvested. The surplus mechanized boats (resulting from scientific evaluation of the coastal resources and fixing of appropriate number required for optimum fishing intensity) should be made capable of tuna long lining to diversify and conduct eco-friendly fishing in coastal areas and contribute to foreign exchange earnings. Gill net operation from such boats in multi-day fishing can also boost capture of quality fishes.

Non-conventional resources of the Bulls eye (*Priacanthus* spp.), Green eye (*Chlorophthalmus* spp.), Indian ruff (*Psenopsis* spp.) and the Indian drift fish (*Ariomma indica*) from deeper waters are expected to yield substantial quantities though not precisely estimated and the economics of exploitation not known. Deep-sea pandalid prawns, oceanic sharks and bill-fishes are of high commercial value which would contribute to increase in production when harvested.

A potential of about 100 million tones of myctophids (*Benthoosema pterotum*) available in the central Arabian Sea, awaits harvesting and processing for fishmeal.

### **3.2.2. Exploitation of reef fish resources**

Several families of commercially important reef fishes abound in the four major reef areas of the country, the Gulf of Mannar, Gulf of Kutch, the Lakshadweep and Andaman and Nicobar islands. Unlike in several other parts of the world, hardly any attention has been paid to these edible and non-edible (ornamental) fishes. These resources have to be estimated area wise and rationally exploited for food and ornamental purposes by adopting suitable methods of fishing.

Coral reef areas offer excellent fishing grounds for resident and non-resident species of fish. Fisheries for non-resident groups probably reached commercial proportion in the Gulf of Kutch and Gulf of Mannar obviously because of the extensive shallow fishing grounds, proximity to main land coast facilitating operation of fishing boats and marketing facilities. Contrarily, although expansive but deep sea areas available around Lakshadweep and Andaman and Nicobar Islands, the fisheries for non resident species have not developed because of the oceanic location of the islands and lack of demand and organized markets. This untapped rich fish wealth waits harvesting, to add to the total production. The resident and edible populations are exploited to a certain extent by indigenous methods of fishing, purely at sustenance level.

The wide variety of marine ornamental fishes which are invaluable for a yet to be developed export trade are quite abundant in Lakshwadeep, Andamans and the Gulf Mannar. At present, there is no systematic exploitation of these resources for reasons of ignorance of their availability, behavior, aesthetic value, capture, maintenance, packing and transportation. This resource should be rationally exploited for domestic and export trade.

### **3.2.3. Exploitation of fisheries resources of the Andaman and Nicobar islands and the Lakshadweep**

It is well known that these two groups of islands abound in rich fish resources, which are hardly fished at any commercial level, except for the skipjack in Lakshadweep. Reef areas, rocky outgrowths and the vast open, deep waters around the islands are rich in several commercially important stocks. Examination of catch composition in these two regions indicates the occurrence mostly of either too small or too large fish due to inadequacy of fishing effort. From the renewable natural resource point of view, this should be considered a national wastage. It is therefore expedient that all the identified resources of these islands are harvested to optimum level to increase fish production.

#### **a) Andaman and Nicobar islands**

Fishing at present is limited to near shore areas by traditional and motorized boats, using gill nets and hooks and lines. Fishermen who settled down belong to Tamil Nadu, Andra Pradesh and Orissa states. Annual production of fish was estimated to be a meager 31000 tones against a potential of 1 61500 tones for the coastal fisheries (pelagic and demersal stocks) and 82000 tones for oceanic stock. The oceanic tunas are practically not exploited while the coastal tunas are captured to a limited extent. Important pelagic species/ groups of the region include the

mackerel, lesser sardines, anchovies, other clupeids, carangids, seer-fishes, pelagic and deep sea sharks, coastal tunas, bill fishes, reef fishes and ornamental fishes. The demersal groups include perches, mullets, pomfrets, polynemids, sciaenids, silver-bellies, catfishes, prawns, lobsters and crabs. Most of the groups are under exploited and their potentials not determined.

The geographical location and vastness of EEZ around the islands offer ample scope for stepping up production. The rich resources of finishes, crustaceans and molluscs are grossly under-exploited. By introducing suitable mechanized vessels of various dimensions and resource specific vessels operating diversified fishing gears, the resources can be fully exploited. Crabs and lobsters can be farmed in pens and cages. Green mussels can be cultured at a small-scale level. Since the coral reef, mangrove and sea grass ecosystems are extensive life supporting systems, they should be protected and rejuvenated. Sponges, soft corals and gorgonids, which are abundant in the area need to be rationally exploited for extraction of various bioactive compounds. A sound database on all marine biological resources of the area should precede exploitation of the resources. However, assessment and continuous monitoring are necessary for the conservation of resources. Because of the very high potential for capture and culture fisheries, immediate necessity would be the development of required infrastructure, human resource development and training of skilled personnel. Skilled pole and line fishermen from Lakshadweep and gill net, long line, hook and line, trolling, and trap fishermen from Tamil Nadu should be encouraged to fish in the area and also train simultaneously the sturdy local people, especially of Car Nicobar island, to take to fishing.

#### **b) Lakshadweep**

The only organized fishery for skipjack tuna (*Katsuwonus pelamis*) tuna is in Lakshadweep. Annually, on an average, about 70000 tones of tuna are landed by the pole and line fishing, using live bait fishes. While skipjack contributes to about 90% of the total catch in the pole and line fishery, young yellow fin tuna (*Thunnus albacores*) dominates in the troll line fishery. Second in abundance to tuna, are the sharks and rays for which no organized fishery exists in spite of great potential and high demand for dried shark fins. Other popular food fishes are lethrinids, lutjanids, kyphosids, carangids, coryphaenids, polynemids, serranids, mullids, hermiramphids, belonids and flying fishes. Production of these fishes can be stepped up by intensification of fishing with gillnets, long lines, hooks and lines, troll lines, shore-seines, cast nets and traps. The potential resources of tuna in Lakshadweep are estimated to range between 50,000 and 90,000 tones. Enhancement of the area covered and duration of fishing through introduction of boats with adequate navigational, chilling and storage facilities would lead to richer harvests. Tuna environmental study would enable location of productive fishing grounds and prediction of area and temporal abundance of tunas. Conservation of coral reef ecosystem and culture of live bait fishes would augment tuna and reef fish production. Adoption of remote sensing data on sea surface temperature would facilitate location of productive tuna fishing grounds in wider areas in limited time.

#### **3.2.4. Farsea fishing**

The oceanic tuna resources of the country remained under exploited. Indigenous vessels, should quickly harvest it with trained crew in long lining and pole and line fishing, gill nets and purse

seines, especially around the Andaman and Nicobar Islands and the Lakshadweep. Two bases, one in each of these areas, have to be developed for intensive fishing, pooling, handling and processing the catches and air lifting to main land and importing countries. Resource specific vessels over 20 m OAL (wholly Indian owned) to operate in oceanic areas of the EEZ and in international waters should be pressed in for fishing tunas and squids. Application of remote sensing techniques for scouting schools and reaching productive fishing grounds in lesser time would be an added advantage. Advent of ocean satellites fully equipped for this purpose can revolutionize ocean fishing. For the country to reap rich harvests of fish from the open waters of EEZ, poaching and fishing by foreign vessels with Indian flag of convenience should be curtailed.

### **3.2.5. Installation of artificial fish habitats (AFHS) and fish aggregating devices (FADs)**

The attraction of fish for food and shelter to floating or sunken objects in the sea is well known. Less productive areas in the sea for direct fishing in the coastal areas can be made to yield fairly good catches of fishes, especially perches, carangids, tunas, squids and cuttle fishes. Various materials like logs of wood, concrete blocks, ferro-cement and polyethylene structures are used for construction of artificial fish habitats on which algae, microorganisms and invertebrates settle down, creating a food chain for higher animals to feed on. Experiments conducted by the Central Marine Fisheries Research Institute (CMFRI) along the south-east and south-west coasts indicated attraction of quality fishes, which could be caught at specific locations without much hunting. Coastal fishermen cooperatives can take advantage of the method for effective management. Unproductive, barren tracks of coastal areas can thus be made productive. Purse seining in conjunction with FADs in open seas is a distinct possibility of increasing production of oceanic tuna.

### **3.2.6. Sea ranching**

In the context of overexploitation and depletion of coastal stocks, this method of releasing young ones of commercially important species into the bays, lagoons, backwaters, lakes and inshore areas replenishes the dwindling stocks, especially of localized and demersal species. Initial experiments by CMFRI with the penaeid prawn, *Penaeus semisulcatus*, the pearl oyster, *Pinctada fucata* and the clam, *Paphia malabarica* indicated good results in recruitment to the fishery in the case of the prawn, density increase in pearl oyster and production in the case of clam. However, large-scale trials have to be conducted and commercial applications proved. For the method to be successful, large-scale production of seed and rearing facilities for the identified species are necessary. The method would be particularly suitable to replenish the stocks of endangered marine animals suitable and at present unutilized water bodies in coastal areas can be made productive by ranching.

### **3.2.7. Sea farming**

Farming of fin-fishes, crustaceans and molluscs in the sea and brackishwater has great potential in the country because of availability of suitable species, locations and the technology packages. The CMFRI developed techniques to breed and culture shrimp, crabs, edible oyster, pearl oyster, mussels, clams, sea cucumbers and seaweeds. Shrimp is cultured extensively by

development of hatcheries and using naturally available seed. For others, technologies have not yet been commercialized for want of entrepreneurship and other logistics. In the meanwhile, commercial production of oysters and mussels is being done along the south - west coast by using seed from nature to produce about 4000 tones per year. Fattening of crabs and lobsters is being practiced in a similar manner. Other production-oriented activities include backyard hatcheries for shrimp; cottage level prawn feed manufacture, prawn brood stock banks and seaweed culture. These activities need encouragement, financial backing, administrative and legal sanctions, location, protection and reservation of sites for sea farming, transportation, processing and marketing facilities.

Pen culture in shallow saltwater bodies and cage culture in coastal and open seas offer immense scope for increasing marine fish production by utilizing naturally occurring seed of several fin-fishes. CMFRI conducted experiments in the past to culture groupers, seabass and pearl spot in cages. Lobsters and crabs are fattened in cages in parts of south - east and south - west coasts. Groupers are fattened in cages in Andamans. Pen culture of milkfish and mullets was attempted in the lagoons at Mandapam. Polyculture of fin-fishes, shrimp and sea cucumbers was experimented at Valinokkam bay (south - east coast) where pearl oysters, mussels and sea cucumber were also cultured in cages. Important potential sites for cage farming include Andaman and Nicobar islands, Lakshadweep, Gulf of Mannar and Goa region. Estuaries, lagoons, and brackishwater lakes could also be potential sites for cage and pen culture for suitable species. However, organized cage/ pen culture activities are yet to be developed in the country.

#### 4. Conclusions

For sustaining the present level of marine fish production from the inshore area, the country has to quickly move from the present open access system to a regulated regime based on sound scientific advice. For augmenting production, primary attention should be towards exploitation of oceanic resources, especially tunas, squids and cuttlefishes. The fisheries resources of Andaman and Nicobar Island and the Lakshadweep, including the reef fishes have to be fully exploited by diversification of fishing methods, processing and marketing on mainland and abroad. The life supporting marine ecosystems like the coral reefs, mangroves and seagrass beds should be rejuvenated, nurtured and protected. Naturally occurring seed of several fin-fishes and shellfishes should be extensively used for culture in cages and pens in all suitable and unutilized saltwater bodies and the sea for enhancing production.

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