Growth in fleet size and investment in marine fisheries and scope for open sea mariculture

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Fishing has been considered as a primary livelihood option since time immemorial, for the occupants of the coastal belt in India, stretching along 8129 kms. Fisheries play a predominant strategic role in the economic activity of our country by its contribution to national income, food and employment. It supports the deprived coastal community and serves as an important foreign exchange earner contributing substantially to food and nutritional security. It is also a principal source of livelihood to people in coastal areas. Fisheries contribute about 1 per cent of India's GDP, which forms about 4.12 per cent of the agricultural GDP (2003-04). The total fish production during the four decades (1950-51 to 1990-91) showed an annual average compound growth rate that varied between 3.35 to 4.62 percent. About 12.2 lakh fisherfolk operate diverse types of craft-gear combinations with regional and seasonal variations all along the Indian coastline. The secondary sector provides employment to more than 15 lakh people and another one lakh people is employed in the tertiary sector. Decline in catch rates coupled with increasing domestic and international demand of high value species has resulted into more conflicts in sharing of resources, increase in migration of fishing units and labourers, emergence of multiday fishing even extending beyond 15 days and consequent socioeconomic disturbances. In this context, there is good scope to increase our food fish production through open sea mariculture by adopting location specific appropriate technologies.

The backdrop of fisheries legislations enacted in India traces back to 1857, when the Indian Fisheries Act was endorsed. It was meant to regulate riverine fisheries and fisheries in inshore waters, to prohibit the use of poisons and dynamite in fishing, and to protect fish resources in selected waters through regulation of, among other things, the erection and use of fixed engines (the reference is to nets, cages, traps, *etc.*), the construction of weirs, the use of nets of certain types and dimensions, *etc.*

The present day scenario is governed by various sets of enactments essentially having bearing on the marine fisheries sector. These legislations include Maritime Zones Act (1976) which recognizes the sovereign rights to conservation and management of living resources in the Indian EEZ, in addition to their exploration and exploitation. Another important regulation governing the marine fisheries is Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act (1981) and Rules (1982). Fisheries within the 12-mile territorial limits are managed under the Marine Fishing Regulation Acts (MFRAS) of the maritime States of India. The main emphasis of MFRAS is on regulating fishing vessels in the 12-nautical mile territorial sea, mainly to protect the interests of fishermen on board traditional fishing vessels. Thus, the Act has been

mainly used for the purpose of maintaining law and order at sea. The MFRAS were first implemented in the States of Kerala and Goa in 1980. They were subsequently enacted in other States, the latest being in 2003, in Gujarat. While the earliest MFRAS were enacted only for regulation of fishing vessels along the coastline of the State, the Gujarat MFRA provides for protection, conservation and development of fisheries in inland and territorial waters of the State of Gujarat and for regulation of fishing in the inland and territorial waters along the coastline of the State. The Coastal Regulation Zone Protection Act, (1986) outlines a zoning scheme to regulate development in a defined coastal strip. The Notification defines the coastal stretches of seas, bays, estuaries, creeks, rivers and backwaters which are influenced by tidal action in the landward side, up to 500 m from the high-tide line (HTL) and the land between the low-tide line (LTL) and the HTL, as the CRZ. The Environment Protection Act, (2002) authorizes the Central government to protect and improve environmental quality, control and reduce pollution from all sources, and prohibit or restrict the setting and/or operation of any industrial facility on environmental grounds. The Biological Diversity Act (2002) provides for the conservation of biological diversity, the sustainable use of its components and, significantly, the fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and related matters. Open sea mariculture requires adequate legislative support from the Government for leasing out of suitable sites. The legislation so far enacted by the central Government and various state Governments focussed mainly to regulate the harvesting of open sea resources rather than considering the farming in the sea.

At present (2003-04) there are 2251 traditional landing centres, 33 minor and 6 major fishing harbours in the marine fisheries sector of India. About 1.77 lakh of fishing crafts are in operation comprising 76596 traditional non-mechanised fishing crafts, 50922 motorized crafts and 49070 mechanized crafts operating different gears as shown in Table 1.

Table 1 Growth rate of marine fishing fleets in India (1961-62 to 2003-04)

Year	SECTOR							
	Non-mechanised		Motorised		Mechanised		Total	
	Number	Growth Rate (%)	Number	Growth Rate (%)	Number	Growth Rate (%)	Number	Growth Rate (%)
1961-62	90424	—	—	—	—	—	90424	—
1973-77	106480	18	—	—	8086	—	—	—
1980-81	137000	29	—	—	19013	135	156013	73
1997-98	160000	17	32000	—	47000	147	239000	53
2003-04	76596	-52	50922	59	49070	4	176588	-26

The trends in the growth rate of fishing units indicate the possible phasing out of non-mechanised Canoes at least in certain regions, which ultimately reflected a negative growth of 52 per cent by them during 1997-98 to 2003-04. This downtrend is compensated in the motorised sector implying large-scale motorisation of existing traditional crafts. Mechanised crafts displayed a major boom during 1980s and 1990s. The growth rates were 135 and 147 per cents respectively in 1980 and 1997, due to diversification and extended area of operation. While mechanized trawlers and gillnetters are common all over Indian coast, dolnetters are popular in Gujarat and Maharashtra coasts, purseseines in Goa, and Karnataka coasts, pair trawling in Tamil Nadu and sona boats in Orissa coasts, depending on the regional and seasonal abundance of resources. When the technical efficiency of a particular gear is better than the other, the lesser efficient gears gradually disappear from the operation.

The gross capital investment on fishing units in Indian marine fisheries sector during 2003-04 works out at Rs. 10,532crore in which mechanised sector constitutes about Rs. 9,049 crore, more than a three-fold increase from 1997-98. The increase in investment on mechanised trawlers and gill-netters are comparatively higher than other sectors. The capital investment on motorised sector also almost doubled from Rs.456 crore during 1996-97 to Rs. 861 crore during 2003-04. However, as expected, the non-motorised sector has shown a decline in investment from Rs. 923 crore during 1996-97 to Rs. 622 crore during 2003-04 in tune with their decline in production and diminishing returns. Further, substantial numbers of these units were converted into motorised units.

The estimated gross capital investment on fishing equipments alone works out to Rs. 4,117 crore at 1997 price level , in which 58 per cent is in the small scale mechanized sector, 9 per cent in deep-sea vessels, 11 per cent in motorized sector and 22 per cent in non-mechanized sector. It may be noted that out of the total capital investments on fishing equipments, during 2003, 86 per cent is constituted by mechanised sector, 8 and 6 per cents respectively by motorised and non-mechanised sectors.

The overall per capita investments of an active fisherman in 2003-04 was Rs.86,290 ranging from Rs.17,024 in the non-mechanised sector to Rs. 2,19,319 in the mechanised sector. During 1997, the overall per capita investment was Rs. 40, 363, where the investment per head in mechanised sector was Rs.1, 25,689, motorised and non-mechanised sectors invested Rs. 26, 835 and Rs. 13,979 respectively per active fisherman in India. Further, fishing intensity is directly related with capital investment vis-à-vis number and type of nets they are possessing. A catamaran owner having different types of nets can have more number of fishing days. If he is having only one type of net, he will be having only lesser number of fishing days. In India, most of the non-mechanised fishermen are having one or two fishing nets, which are not sufficient for efficient operation for the whole year.

In the open access marine fisheries, mode of ownership on means of production by fisherfolk greatly influences the occupational pattern and socio-economic status. The type and number of fishing implements owned is the yardstick to measure the economic well being of a fisher household. In India, hardly 13 per cent of the active fishermen in the marine fisheries sector have ownership on craft and gear in 2003 and another 3 per cent possess only gears. The proportion of owner operators in marine fisheries declined over the years with the increasing capital requirement for possessing motorized and mechanized fishing units. In the mechanised sector 12 per cent, motorised sector 9 per cent and traditional sector 21 per cent have ownership on crafts and gears. Most of the non-motorised units are operating as family enterprises not even realizing the operating cost of the labourers. Lack of finance and credit facilities does not allow these fishermen to go for modernization and come out of the vicious circle of poverty and low-income trap. Disguised unemployment is rampant in capture fisheries and fisherman need alternative avocations for their livelihood. The inter and intra sectoral migration also need to be arrested for balanced and sustainable development of the coastal sector. Fishermen are in general unwilling to shift from fisheries sector for any other employment. Hence, mariculture is one of the most acceptable and viable occupations for coastal fisher folk.

A report of the consultative group on international agricultural research states that within the next 15 years, fish farming and sea ranching could provide nearly 40 per cent of all fish for the human diet and more than half of the value of the global fish catches. According to a report of the FAO, the world aquaculture production is projected to increase by 2.69 times by 2025 AD. India as a leading country in Asia in aquaculture production should be able

to achieve at least a production of 2mt (0.1mt finfish, 1.0mt crustaceans, 0.3mt molluscs and 0.6mt seaweeds) through mariculture by the year 2025 AD, *i.e.*, 3.9 per cent of projected global aquaculture production of 51.8mt. With improvements in the domestic market, diversification of marine products exports, availability of a vast range of cultivable candidate species, several culture technologies and hydro climatic (or agro climatic) zones for coastal mariculture and sea-farming, India is poised to become one of the world's leading producers of mariculture products.

Issues related to Coastal Regulation Zone (CRZ), Integrated Coastal Zone Management (ICZM) and the unfounded apprehensions that coastal mariculture would adversely affect the environment, are leading to unnecessary or avoidable litigations retarding the growth of the mariculture sector. It is worth to note that the present shrimp oriented, land-based coastal mariculture has resulted in the under-utilisation of the technologies developed for the culture of bivalves, seaweeds and pearls, and hence, requires being diversified and broad-based to take maximum advantage from the high production potential of tropical aquaculture farms.

The information from various segments reveals that the marine fisheries in India is currently undergoing through a phase of socio-economic cum ecological turbulence. A versatile study on responsible fisheries observes that the major factor that endangers its sustainable utilization is the open access nature of marine resources and the veritable lack of an enforceable property rights regime or unanimously agreeable regulatory mechanisms. There are many activities, which adversely affects the sustainability of marine resources including shallow water mining, use of improper crafts, ghost fishing, destruction of mangrove forests, *etc.* Development processes such as urbanisation, industrial pollution and eutrophication of estuaries have also jeopardised the fragile ecological dynamics of the coastal area.

The concept of Responsible Fisheries advocated by FAO through its Code of Conduct for Responsible Fisheries is an epitome among global efforts for realising the coveted goal of sustainable utilization of our marine resources. The Code is a landmark in marine development thinking as it represents the consensus achieved by more than 150 nations across the world on the directions we should follow in order to avoid resource depletion due to irrational utilisation behaviour pattern shown by various stakeholders. Stock enhancement through artificial reefs and fish farming in the cages are better technological options to counter problems of resource depletion.

Scope for open sea mariculture

Prospects of Open sea mariculture

- Alternative source of income
- Better resource productivity
- Entrepreneurship development
- Societal empowerment lower and
- Lower gestation period.

Problems of cage culture

- Lack of coherence among social groups
- Issue of free rides among the commons
- Problem of mute participation
- lack of social commitment
- Problems in revenue sharing system
- Resource ownership issues
- Need for finding progressive fisher folk
- Risk taker and innovator
- Entrepreneurship development

The following interventions are required for promotion of cage culture

1) Cages
   - Increasing the life of the cage
   - Cost reduction of the cage
   - Optimization of cage and mooring system
   - Provision of subsidies for the cage construction
2) Site selection and candidate species
   - Identification of congenial site considering the hydrographic and environmental parameters
   - Identifying location specific candidate species with better productivity inputs are required
3) Inputs
   - Input standardization
   - Cost minimization
   - Revenue sharing approach

The other interventions are increasing density and revenue sharing approach.

Participatory approaches for cage culture

- Sharing of accountability and responsibility
- Security for group conflicts and sabotage
- Institutional support in the event of uncertainties
- Reward for risk bearing
- Encouraging a public private community participatory approach

There is enormous scope to enhance food fish production from the sea through mariculture. Adaptability of capital intensive fishing technologies in the capture fisheries will further escalate the cost of production and price of fish. Unlike land, water resource is not a limited factor of production for coastal states for adopting mariculture practices. Hence, legislative support is vital for the promotion and propagation of open sea mariculture. It provides better option for enhancing the livelihood opportunities of the fisherfolk in the coastal sector without any migration.