Annexure I.
(18)

Marine Fisheries in Indian Economy

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Marine fisheries sector has undergone vast structural changes during the last few years. The shift from the traditional to motorised and mechanised fishing is a major one. Export of processed fish and development in the internal marketing system transferred several backward regions along the coast into commercial centres. In spite of increased landings, the catch rate decreased due to over capacity in fishing fleet. Present status of fishing in Indian economy with respect to production, processing, marketing, earnings and related aspects are analysed. Suggestions for improving the socio-economic status of fishermen by proper management of resources, fishing regulations, product diversification, better bycatch utilisation etc. are also presented.

Key words: Exploitation, fishing fleet, economy, employment, investment, infrastructure, marketing, earning

Availability of technologies was a motivation for increased capital investments and higher fishing intensity in the marine fishery sector. However, the increase in production is not commensurate with investment as yield is showing an inverse relationship. Balanced exploitation of resources is essential for sustainable development. In appreciation of the importance of fishing in the Indian economy the present study was undertaken at macro level with the following specific objectives.

- To examine the exploitation trend and contribution by mechanised, motorised and non-mechanised fishing units in total production
- To evaluate recent structural changes in marine fisheries economy and its implications.
- To estimate employment generated in harvest and post-harvest sectors.
- To analyse sector-wise capital investment, earnings and capacity utilisation of fishing fleets and processing facilities.
- To assess the marketing problems, utilisation pattern of marine fish and fishermen's share in consumers' rupee.
- To suggest policy measures for sustainable long-term development of marine fisheries.

Materials and Methods

Both primary and secondary data were collected. Data on labour requirements for each craft-gear combination in fishing and employment in the processing and

subsidiary activities were collected from sample centres. Marketing costs, handling and transportation charges and, price of different fish at primary, wholesale and retail points were collected weekly during 1996-97 at selected markets in different maritime states using simple-random-sampling technique. Most of the major fish landing centres in each maritime state were selected for primary data collection. Data on the price of identical size fish in primary, wholesale and retail markets of each marketing channel were collected.

Secondary data on fish production, exports and strength of fishing fleet were collected from Central Marine Fisheries Research Institute (CMFRI), Marine Products Export Development Authority (MPEDA) and concerned government departments. A simple logical tabular analysis was used to meet the objectives set forth.

Results and Discussion

Exploitation trend and sector-wise contribution

Marine fish production in India was 2.4 m t in 1996 which is about 7% higher than that in 1995. Of this about 72% was landed by mechanised boats followed by motorised (19%) and artisanal sectors (9%) (Anon, 1978; 1997). Although the level of exploitation is less than the potential yield of 3.9 m t, there has been very high concentration of fishing effort on some species in certain fishing grounds. There is over-exploitation of some resource in the 0-50 m zone. The mechanised fleet is concentrating more on shrimp, which is already declining in catch. The demand for shrimp and cephalopods for export has intensified mechanisation and motorisation of fishing craft.

Table 1. Sector-wise marine fish landings (tonnes)

Year	Mechanised	Motorised	Non-mechanised	Total
1991	1337430	401197	418635	2157262
1992	1533348	384141	359751	2277240
1993	1528437	332774	314956	2176167
1994	1658803	351841	314497	2325146
1995	154434	406024	274657	2225024
1996	1665183	445064	270598	2380845

Contribution of mechanised and motorised sector in the landings steadily increased over the years (Table 1). While landings from mechanised boats increased from 1.33 m t in 1991 to 1.66 m t in 1996 that of the non-mechanised sector decreased from 0.42 m t to 0.27 m t. The landings from motorised sector remained more or less the same. In the small scale sector, the average annual catch per unit ranged from 0.3 t for a non-mechanised unit in the Northwest coast to 280 t for a purse seiner in the Southwest coast. There is a general decline in the catch per trip of different type fishing units over the years due to increase in fishing pressure (Table 2).

Table 2. Average catch per trip of different types of fishing units (kg)

Year	Mechanised	Motorised	Non-mechanised
1991	461	190	57
1992	363	180	52
1993	364	139	48
1994	508	126	54
1995	307	189	51

Structural changes in marine fisheries economy

Capture fisheries is a common property resource. Competition among fishermen for increasing catch continuously promotes structural changes in the coastal economy. Fishermen households along the coastal belt increased from about 0.35 million in 1980 to 0.5 million in 1997. Fishermen population in the coastal villages increased from 2 million in 1980 to 3 million in 1997 (Table 3). Average fishermen households per village declined from 146 to 137 and the active fishermen per village increased from 193 to 282 during 1980-1997. Similarly when the total marine fish production increased from 1.5 m t in 1980 to 2.3 m t in 1997, the annual per capita production per active fishermen declined from 3250 kg to 2240 kg during the same period.

Table 3. Socio-economic profile of marine fishermen in India

Parameters	1980	1997
Marine fishermen households, million	0.350	0.50
Marine fishermen population, million	2.050	3.0
Average size of fishermen households	6	6
No. of active fishermen, million	0.462	1.025
No. of landing centres	1630	2251
No. of marine fishing villages	2397	3638
Average fishermen households per village	146	137
Average fishermen population per village	855	825
Average no. of sea-going fishermen per village	193	282
Ratio of active fishermen to total population	1:4	1:3
Marine fish production, million tonnes	1.5	2.3
Per capita production per active fishermen, kg	3250	2240

Ownership of means of production is an important indicator for assessing the socio-economic status of fishermen communities. During 1997, only 23% of the active fishermen in the marine sector owned fishing implements whereas in 1980 it was 28%. The active fishermen owning non-mechanised units declined from 39% in 1980 to 25% in 1997(Table 4), probably because of conversion of non-mechanised units into motorised units. Among the fishermen operating motorised units 19% had their own units in 1997. The ownership among active fishermen in mechanised sector increased from 17% in 1980 to 24% in 1997. Mechanised fishing units increased from 19013 to 47,000 and artisanal units including motorised boats from

0.137 million to 0.192 million in the above period (Table 4). Active fishermen in capture fisheries increased from 0.322 million during 1977 to 0.462 million in 1980 and to 1.025 million in 1997. But the continuous increase in fishing effort led to lower per capita production in artisanal units.

Table 4. Structural changes in fishing fleet, active fishermen and production

Item	Year	Non-mechanised	Motorised	Mechanised
Fishing fleet	1980	137000	-	19013
	1997	160000	32000	47000
Active fishermen	1980	348000	-	114000
	1997	65000	17000	20000
Marine fish production (%)	1980	60	-	40
	1997	13	19	68
Annual average production (t)	1980	6.57	-	32
	1997	1.7	13	33
Annual per capita production per active fishermen (kg)	1980	2590	-	5260
	1997	420	2390	8130
Ownership by active fishermen, %	1980	39	-	17
	1997	25	19	24
Number of persons employed	1997	655,000	170,000	200,000

Intensive mechanisation in the marine sector led to increase in production but marginalised the traditional sector. Mechanised sector landed hardly 30% of the total catch in 1974, which rose to 40% in 1980, and to about 72% in 1996 (Silas *et. al.*, 1976, Sathiadhas, 1997). While the annual per capita production of active fishermen in the non-mechanised sector declined from 2590 kg in 1980 to 420 kg in 1996-97, it increased from 5260 to 8130 kg in the mechanised sector. The annual average per capita production of active fishermen in the motorised sector was 2390 kg during 1996. Presently, about 59% of the production in the artisanal sector is contributed by motorised units, the non-mechanised units contributing only 9%. The annual average production of a mechanised unit works out to 33 t, motorised unit 13 t and non-mechanised unit 1.7 t.

Replacement of cotton twines and coir ropes by synthetic filaments for the fishing gear in the late fifties (Bapat and Kurian, 1981) increased their durability and operational efficiency. Improvement in fishing gear based on resources and location specific needs is a continuous process. Mesh size of many nets is very much reduced leading to catch of large quantities of juveniles affecting the sustainability of fisheries.

The post-harvest sector also showed substantial growth in infrastructure, internal marketing and exports. The number of freezing plants increased from 264 in 1977 to 372 in 1996. Ice making plants showed a marginal increase i.e. 131 in 1977 to 148 in 1996; but registered peeling sheds showed a significant increase from 83 in 1977 to 900 in 1996. Cold storage facilities and thrust on preservation and quick transportation improved distribution and marketing system. The extent of spoilage of fish at landing centres as well as during distribution is considerably reduced due to

wide spread use of ice. The export earnings also increased from Rs 46 million in 1960-61 to Rs 40500 million in 1996-97. The fisher-folk got better prices for their catches and gained respect and recognition in society as primary producers of raw materials for export

Employment

Marine fisheries provide substantial employment in production and post-harvest sectors. The manpower employed in active fishing alone is currently estimated at 1.025 million (Table 4). Of the 200,000 employed in mechanised sector, only 10,000 are in deepsea vessels. Post-harvest operations provide employment to another 1.2 million, out of which domestic marketing employs one million and export marketing 0.2 million. On an average, every 5 kg marine fish produced provides employment to 2 persons, one in harvest and another in post-harvest sector.

The manpower employed in active fishing in the mechanised sector is estimated at 0.2 million, of which 0.15 million are engaged in trawl fisheries alone and the remaining 0.05 million in gill netting, dol netting, purse seining and deepsea fishing. The motorised sector employs 0.17 million where 66% are engaged in the operation of ring seines, mini trawls and gill nets and the rest in motorised dugout canoes, catamarans and plywood boats. The non-mechanised sector provides employment to 0.655 million with 0.27 million in catamarans, 0.2 million in plank-built boats and the rest in dugout canoes, masula boats and others. The pre-harvest operations provide job to about 0.1 million in activities such as boat building and repairing, net mending, supply and repair of engines, diesel, kerosene and other essential items at the landing centres. About 25% of those employed in pre-harvest operations are women, mostly in net making. Export and internal marketing provide employment to 1.1 million; 0.2 million in export marketing and 0.9m in internal marketing. Auctioneers at landing and wholesale centres, those involved in transportation, loading, unloading, packing, distribution of ice, commission agents, wholesalers, retailers etc. come under the post-harvest sector. People involved in wholesale and retail marketing is estimated at 0.5 million of which 50% is women.

Women, although not involved in active fishing, contribute substantially in the pre-and post-harvest operations. About 25% of the labour force in the pre-harvest activities, 60% in the export processing and 40% in the internal marketing are women. Altogether, out of the total work force of 1.2 million about 0.5 million are women.

Capital investment, earnings and idle capacity

Capital investment in fishing implements at the current price level (1996-97) is Rs 41,170 million (Table 5). The overall per capita investment in labour for active fishing works out to Rs 39,970. Per capita investment for fishing labour is Rs 13,979 in the artisanal sector, Rs 26,835 in the motorised sector and Rs 1,25,689 in the small-mechanised sector. Gross earnings from the marine fisheries worked out at landing centre level (Table 6) during 1995 was Rs 74090 million. Penaeid shrimp alone accounted for 38% of the gross earnings followed by carangids (12%) and cuttlefish (9%).

Table 5. Estimated capital investment (Rs million) in fishing implements (1996-97)

Sector	Type	No. of craft	Investment
Mechanised	Trawlers	37574	18787.0
	Gill netters	6373	2549.2
	Dol netters	1219	487.6
	Purse seiners	1118	1341.6
	Others	716	716.0
	Sub total	47000	23881.4
Non-mechanised	Plank-built boats	36921	41922.1
	Dugout canoes	17270	2181.6
	Catamarans	94427	2360.7
	Others	11382	491.5
	Sub total	160000	9225.9
Motorised	Ring seine	141	1570.5
	Plank-built boats	9423	1884.6
	Dugout canoes	6283	314.2
	Catamarans	10639	478.8
	Plywood boats	2514	314.3
	Sub total	32000	4562.4
Deepsea vessels		180	3500.0
Total		2,39180	41169.7

The dwindling catch per unit operation, in spite of the overall increase in total landings, is indicative of excess capacity in fishing. Introduction of technologically advanced, capital-intensive fishing implements made the old units less economical and non-operational thereby creating large idle capacity in fishing fleet and consequent underemployment. The average annual catch, calculated on 200 fishing days, works out at 75.6 t for mechanised boats, 37.8 for motorised units and 10.2 for non-mechanised units. Only 20,428 of existing mechanised, 10,741 of motorised and 30,000 of the non-mechanised fleet effectively operated against a fleet strength of 47,000, 32,000 and 180,000 respectively, the rest remaining idle. The idle fleet is 56.5%, 66.4% and 85.3% respectively in these sectors. Stiff competition to harvest the resources with excessive fishing fleet results in less number of fishing days and high level of underemployment.

Marketing

Fish marketing involves all functions from catching to final disposal. Demand for, and price of, fish are increasing. Currently, about 50% of fish consumed fresh is in and around the producing centres, 43% in the demand centres located upto a distance of 200 km from the coast and only 5% in the centres located beyond 200 km (Sathiadhas *et. al.*, 1995). There is vast potential for marketing hygienically processed and packed dried fish in hinterlands and canned fish in cities and defence establishments (Devaraj, 1987). However, the infrastructure is principally oriented towards export marketing. The fishermen's share in the consumer's rupee is the best

Table 6. Estimated catch and gross earnings during 1995 (landing centre level)

	Average price Rs/kg	Total catch (tonnes)	Value (Rs million)
Elasmobranch	33	69243	2285.0
Eels	20	6119	122.4
Cat fishes	32	38108	1219.5
Clupeids	9	419865	3778.8
Bombay duck	11	92687	1019.6
Lizard fish	7	33820	236.7
Half beaks & full beaks	22	5747	126.4
Flying fish	22	4090	90.0
Perches	22	138150	3039.3
Goat fish	11	9601	105.6
Threadfins	33	10489	346.1
Croakers	28	166917	4673.7
Ribbon fish	11	73743	811.2
Carangids	46	196832	9054.3
Siverbelly	7	64752	453.3
Big jawed jumper	28	7152	200.3
Pomfrets	50	44593	2229.7
Mackerel	11	176830	1945.1
Seer fish	55	45853	25215.0
Tuna	19	37789	718.0
Bill fishes	13	1388	18.0
Barracuda	28	14679	411.0
Mullets	22	6498	143.0
Unicorn cod	17	139	2.4
Flat fishes	22	38181	840.0
Crustaceans			
Penaeid shrimp	150	186623	27993.5
Non-penaeid shrimp	5	73999	370.0
Lobsters	275	1946	538.2
Crabs	14	30744	430.4
Stomatopods	6	66330	398.0
Cephalopods	60	116841	7010.5
Miscellaneous	11	87380	961.2
Total	32.68	2267128	74090.1

index to measure the efficiency of the fish marketing system. Marketing studies at the all India level indicate that the fishermen's share in the consumer's rupee ranges from 30% to 68% for different species/groups of marine fish (Table 7). Marketing costs including transportation range from 6 to 13%, wholesalers receive 5 to 32% and the retailers 14 to 47% of the consumer's rupee for different species/groups of marine fish. State-wise analysis indicates that the fishermen in Gujarat receive 37 to 83% of the consumer's rupee while in Maharashtra it ranges from 36 to 81% (Table 8). In certain producing-cum-consuming cities, middlemen create great

disadvantages to both fishermen and the consumers. Fishermen's associations can take up fishing and selling the catch directly to the consumer which will benefit them and the consumer by eliminating the middlemen.

Table 7. Share of consumer's Rupee for different marine fish (1996-97), %

Name of fish	Fishermen	Handling & transportation	Wholesalers	Retailers
Seer fish	68	6	12	14
Pomfrets	60	7	9	24
Barracuda	40	9	30	21
Tuna	45	9	28	18
Sharks	43	10	32	15
Catfish	56	10	10	24
Mackerel	50	9	11	30
Sardines	33	12	23	32
Ribbon fish	48	10	12	30
Rays	47	13	22	28
White bait	40	12	28	20
Lizard fish	35	12	15	38
Goat fish	57	11	16	14
Threadfins	42	9	20	29
Croakers	48	11	14	27
Silverbelly	30	15	8	47
Big jawed jumper	55	10	9	26
Mullets	41	9	17	33
Half & full beaks	65	9	10	16
Cephalopods	65	10	5	20

Policy implications

The traditional fishermen are caught in the low-income trap due to diminishing returns. Marginalisation of the artisanal fishing by mechanisation creates conflicts among fishermen and warrants immediate attention. There is no scope to increase fishing effort in the inshore waters as it is already overexploited. It becomes essential to introduce regulations to keep the level of fishing effort under control. Responsible fishing by voluntary reduction of fishing effort and mesh size regulations in various gears is an important need. Community participation in fisheries management should be introduced by creating awareness among fishermen and encouraging 'co-operative fishing' instead of 'competitive fishing'.

The annual discards of bycatch by multi-day fishing fleet have been considerable over the years. A system should be devised for its effective utilisation. Processing bycatch into value added products could partially utilise the idle capacity in the fish processing plants.

The seasonal nature of fishing and the risk and uncertainties associated with it often push the fishermen into poverty. Alternate employment opportunities are very

few and opportunity cost of fishermen is almost zero. The pace of economic development of coastal area is not commensurate with other regions and the overall socio-economic status of fishermen is comparatively lower than that of other sectors. Balanced development of the coastal agro-climatic zone with the integration of capture and culture fisheries combined with agriculture, horticulture, forestry and animal husbandry is essential for providing productive employment and improving the socio-economic condition of the coastal rural communities.

Table 8. Share in consumer's Rupee for different fish in different states (1996-97)

Name of fish	Percentage share to fishermen					
	Gujarat	Maharashtra	Karnataka	Kerala	Tamil Nadu	Andhra Pradesh
Seer fish	71	81	40	65	49	49
Pomfrets	64	68	46	43	51	53
Barracuda	-	36	55	53	54	24
Tunas	63	43	-	51	60	36
Sharks	45	36	40	63	60	17
Cat fish	37	76	35	58	63	33
Mackerel	50	50	33	50	55	26
Sardines	60	57	54	43	63	58
Ribbonfish	83	60	41	37	55	36
Rays	-	-	-	30	57	40
White bait	-	-	33	26	48	22
Lizard fish	44	43	31	30	53	36
Goat fish	-	-	-	60	60	42
Threadfins	43	-	-	-	53	23
Croakers	56	45	38	31	63	27
Silverbelly	-	-	-	35	32	21
Big jawed jumper	-	-	60	45	67	44
Mullets	-	45	42	59	46	38
Half & full beaks	-	-	-	61	65	-
Cephalopods	63	75	71	71	61	44

A national census of marine fishermen, craft and gear (Anon, 1980) is still the basic data in this field. Data on socio-economic parameters later published by various State governments either through census or periodic updating have a number of discrepancies. A census of craft, gear and other socio-economic parameters of fishermen should be conducted once in five years for providing the much needed information base for planning fisheries development and coastal zone management.

Promotion of eco-friendly coastal aquaculture is vital for generating employment and higher income for coastal fishermen. Hence region-wise Geographical Information System of the coastal agro-climatic zones for coastal zone management and development should be prepared in consultation with experts from capture and culture fisheries. A cautious fish marketing policy for domestic and export marketing should be framed. Periodical dissemination of information on prevailing prices of

commercially important varieties of fish in different markets will be much useful to the fishermen, traders and consumers. Only products, which are capable to fetch competitive price, should be exported and the rest should be sold in the domestic market.

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