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1 FISHERIES IN THE DEVELOPMENT OF INDIAN ECONOMY

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Abstract

Fisheries sector plays a vital role in Indian economy through substantial forex earnings, employment generation and ensuring nutritional and food security. Contribution of fisheries to total Gross Domestic Product (GDP) at current prices is about 1.3 percent. The fisheries economy of our country has undergone rapid structural changes during the last few decades. The vast technological options available to fishers led them for a fast shift from traditional to mechanised and motorised fishing methods in marine fisheries and from traditional to improved seed production and culture practices in inland fisheries. Market expansion in the internal distribution system coupled with the development of seafood export industry led the transformation of several backward regions along our coast into centres of commercial importance. Marine and inland fish production varied between 1.82 to 2.95 and 1.34 to 2.44 million tonnes respectively during the last ten years (1988-89 to 1997-98). The current per capita availability of fish works out to about 9 kg for the fish eating population. The haphazard growth of fishing units and infrastructure sector resulted into idle capacity of fishing fleets, manpower and processing plants in Indian marine fishing industry, while mushrooming of shrimp farms in coastal areas led to environmental crisis and outbreak of disease, severely affecting the shrimp production.

Employment in active fishing in marine fisheries almost doubled from about 0.6 million people during 1980-81 to 1.03 million in 1997. The pre and post-harvest sectors of marine fisheries provide employment of about 1.2 million people. Earnings of marine fish catch at landing centre level are estimated at about Rs. 9,450 crores in 1998, while that of inland fish at farm/landing centre level is placed at about Rs. 9,300 crores during 1997-98. In addition, fish, shrimp and prawn seeds worth Rs. 4,750 million are produced annually. The value of fish at consumer level is almost double the amount at landing centre/farm level prices. The forex earnings alone account for about Rs.4,627 crores in 1998-99. In domestic marketing, fishers share in consumer's rupee, varied from 30% for low quality fishes to 68% for high quality fishes.

Policy measures are suggested for sustained development of fisheries sector which include responsible fishing and regulation of fishing effort, adoption of eco-friendly aquaculture technologies, product diversification and market penetration in internal fish marketing, aggressive export marketing strategies with thrust on value added products and regular dissemination of fisheries information.

Introduction

India is bestowed with a long coastline of 8,129 km, with an Exclusive Economic Zone (EEZ) of 2.02 million square kilometres besides varied inland fisheries resources comprising rivers and canals (1,71,334 km), reservoirs (2.05 million ha), ponds and tanks (2.86 million ha), Beels, oxbow lakes and swamps (0.79 million ha) and brackishwater area (1.42 million ha). The growing population and ever increasing demand for cheap animal protein diverted our attention in recent years towards fisheries development to ensure and enhance our food security. Currently, there are about 3 million people inhabited in our 3,638 coastal fishing villages depending on marine fishing alone for their livelihood. Fish production increased from about 3.15 million tonnes during 1988-89 to 5.4 million tonnes during 1997-98.

Contribution of fisheries to total Gross Domestic Product (GDP) at current prices is about 1.3 percent. The current per capita availability of fish works out to about 9 kg for the fish eating population. Availability of innumerable technological options and its continuous upgradation motivated the fishermen to go for more capital investments and higher fishing intensity for maximum exploitation of marine fishery resources and optimum production from culture fisheries. However, the increase in production is not commensurate with investment as the fishing intensity and yield are showing an inverse relationship. Balanced exploitation of all types of resources is essential for attaining sustainable development of fisheries. The role of fisheries in the Indian economy is substantial for providing protein rich nutritional food, generating employment opportunities in the coastal and rural areas, encouraging entrepreneurial activities to empower the rural poor and stimulating the per capita earnings of fishers by efficient internal and external marketing. The present study examines at macro level the production trend, sectoral contribution, structural changes, employment generation, capital investment, earnings, capacity utilisation of fishing fleets, processing facilities and marketing problems in order to suggest appropriate policy measures for sustainable development of fisheries.

Materials and Methods

Both primary and secondary data have been collected and used for this study. Data about labour requirements for each type of craft-gear combination in fishing activities, number of persons employed in the processing plants of different capacities and various other subsidiary activities were collected from sample centres. Information on marketing costs, handling and transportation charges and price level of various varieties of fish at primary, wholesale and retail points have been collected weekly once at selected markets during 1996-97 in different maritime States. As far as possible, the major mechanised fish landing centres in each maritime State have been selected as primary market for collection of data. Further, special care has been taken to collect the price data of identical size of fish in primary, wholesale and retail markets of each marketing channel.

The secondary data pertaining to the marine and inland fish production over the years, exports and State-wise strength of fishing fleets have been collected from various publications of the Central Marine Fisheries Research Institute (CMFRI), Marine Products Export Development Authority (MPEDA), Central and various State Governments.

Results and Discussion

Production trend and sectoral contribution: An overview

a. Marine Fisheries

Marine fish production in India was estimated at 2.67 million tonnes in 1998, which is about 2% lower than the previous year. The pelagic fishes contributed about 49.2% of the total landings and the rest by demersal finfishes, mollusks and crustaceans. The landings of 19.53 lakh tonnes by the mechanised boats constitute about 73.2% of the total marine fish landings of the country during 1998 followed by the motorised (18.8%) and artisanal units (8%) (Anon., 1999).

The contribution of marine fish landings has been around 55 to 62% of the total fish production of our country during the last ten years. Although the level of exploitation of marine fishery resources in India is less than the potential yield of 3.9 million tonnes, there seems to be too much concentration of fishing effort on certain stocks in certain fishing grounds. It is explicitly known that the fisheries resources in the 0-50 m zone have been fully exploited. The shrimp catches increased from about 1 lakh tonnes during 1983 to about 2 lakh tonnes in 1998. The mechanised fleets of our coastal waters are concentrating more on shrimp trawling and the catch ratio of prawns from our near shore waters is declining. The production of cephalopods was only about 15,000 tonnes during 1983, which has increased to more than one lakh tonnes during 1998. The export demand for shrimps and cuttlefishes has added to the phase of intensification of mechanisation and motorization of fishing crafts in our country.

The sectoral contribution of mechanised and motorised landings steadily increased over the years (Table 1). While mechanised landings increased from 13.3 lakh tonnes during 1991 to 19.53 lakh tonnes during 1998 the non-mechanised

landings for the same period decreased from 4.2 lakh tonnes to 2.1 lakh tonnes. The landings from motorised sector fluctuated between 3.3 to 5 lakh tonnes. In 1998, Gujarat (7.03 lakh tonnes) ranked first in marine landings followed by Kerala (5.43 lakh tonnes) and Maharashtra (4.15 lakh tonnes). There was a general decline in the catch per trip of different types of fishing units over the years due to the increase in fishing pressure.

TABLE 1. Sector-wise marine fish landings in tonnes in India from 1991 to 1998

YEAR	MECHANISED	MOTORISED	NON-MECHANISED	TOTAL
1991	1337430	401197	418635	2157262
1992	1533348	384141	359751	2277240
1993	1528437	332774	314956	2176167
1994	1658808	351841	314497	2325146
1995	1544343	406024	274657	2225024
1996	1665183	445064	270598	2380845
1997	1962886	474364	288980	2726230
1998	1953330	501675	213479	2668484

b. Inland Fisheries

Inland fish production increased from 1.34 million tonnes in 1988-89 to 2.44 million tonnes in 1997-98. Inland fish production comes from capture and culture fisheries. The contribution of culture fisheries to inland fish production during the last 10 years increased from about 66% in 1990 to 75% in 1995. The increase in aquaculture production was around 124% during the period. The productivity and production were at very low level till the early eighties. A technological revolution that took place at this juncture in the shape of hatchery fish seed production and semi-intensive 'composite fish culture' catapulted India to the second highest aquaculture producer country in the world after China. The change in technology has helped in increasing unit area productivity from a level of less than a tonne per hectare to about 2 tonnes per hectare over a period of 10 years. The area under aquaculture has also gone up from 1.55 lakh ha to about 9 lakh ha. The revolution in the field of aquaculture was possible by induction of new technology, introduction of centrally sponsored schemes of Freshwater Fish Farmers Development Agency (FFDA) and implementation of IDA sponsored externally aided Inland Fisheries Scheme.

The contribution of inland capture fisheries to the inland fish production varied between 25% and 34% during the last 10 years. Though Inland capture fishery resources in terms of rivers and canals, reservoirs, estuaries and lagoons are noted for their variety and richness, their production potential is yet to be fully realised. The reservoirs hold maximum promise, as at the present level of management, their yield is on an average 30 kg/ha, whereas production of 50-100 kg/ha can easily be realised from large and medium reservoirs. The small reservoirs have the potential to yield even more (100-300 kg/ha).

Structural changes in the marine fisheries economy

Unlike agriculture and various other Industries, capture fisheries is a common property resource from time immemorial and competition among fishermen for maximum catch by adopting various technologies continuously promotes structural changes in the coastal economy of our country. The marine fishermen households located along our coastal belt increased from about 3.5 lakh during 1980 to 5 lakh during 1997. Fishermen population living in our coastal villages also enhanced from 2 million in 1980 to 3 million in 1997 (Table 2). At present, there are about 2,333 fish landing centres and 3726 marine fishing villages in our country (Anon., 1996). While the average fishermen households per village declined from 146 to 137 from 1980 to 1997, the active fishermen per village increased from 193 to 282 during the same period. Similarly when the total marine fish production increased from 1.5 million tonnes in 1980 to 2.67 million tonnes in 1998, the annual per capita production per active fishermen declined from 3,250 kg to about 2,600 kg during the same period.

TABLE 2. Socio-economic profile of marine fishermen in India - at a glance

PARAMETERS	1980	1997
Marine Fishermen households	3.5 lakh	5 lakh
Marine Fishermen population	20.5 lakh	30 lakh
Average size of fishermen household	6	6
No. of active fishermen	4.62 lakh	10.25 lakh
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
Per capita production per active fishermen	3250 kg	2540 kg

The human resource-base of India is a source of strength as well as weakness. The huge and rapidly growing mass of population along the coastal belt is a potential labour force which, if properly harnessed, can be a massive productive asset. Ownership of means of production is one of the most important indicators for assessing the socio-economic status of fishermen communities. During 1997, overall only 23% of the active fishermen of marine fisheries sector have ownership on fishing implements as compared to 34% in 1980. The active fishermen owning non-mechanised units declined from 39% during 1980 to 24% during 1997. One of the factors for decline in ownership of non-mechanised units is its conversion into motorised units in recent years. Among the fishermen operating motorised units, 19% have their own units at present (1997). The owners among active fishermen in the mechanised sector increased from 17% in 1980 to 24% in 1997. In general, the mechanised fishing units increased from about 8086 in 1977 to 47,000 in 1997 and artisanal fishing units including motorised boats from 1.14 lakh to 1.92 lakh during the same period. Active fishermen involved in capture fisheries were only 3.22 lakh during 1977 which has risen to 4.62 lakh during 1980 and 10.25 lakh during 1996-97 (Table 3). However, the continuous increase in fishing effort led to the lower per capita production of artisanal fishing units.

TABLE 3. Structural change in fishing fleets, active fishermen and production 1980 and 1998

	1980	1998
FISHING FLEETS		
• Non-mechanised	137000	160000
• Motorised	-	32000
• Mechanised	19013	47000
Total	156013	239000
ACTIVE FISHERMEN (LAKHS)		
• Non-mechanised sector	3.48	6.5
• Motorised sector	-	1.7
• Mechanised sector	1.14	2.0
MARINE FISH PRODUCTION (%)		
• Non-mechanised sector	60	8.0
• Motorised sector	-	18.8
• Mechanised sector	40	73.2
ANNUAL AVERAGE PRODUCTION (t)		
• Non-mechanised units	6.57	1.3
• Motorised units	-	16.0
• Mechanised units	32	42.0
ANNUAL PERCAPITA PRODUCTION PER ACTIVE FISHERMEN (kg)		
• Non-mechanised sector	2590	328
• Motorised sector	-	2951
• Mechanised sector	2560	9767

The intensive mechanisation phase which dominated Indian marine fisheries during the seventies and eighties not only led to the increase in shrimp and fish production, but also marginalised the traditional sector. Contribution of non-mechanised sector declined from 60% in 1980 to 8% in 1998, while that of mechanised sector rose from 40% to 73%. While the annual per capita production per active fishermen in the non-mechanised sector declined from 2590 kg in 1980 to a meagre 328 kg during 1998, it increased from 2560 kg to over 9000 kg during the same period in the mechanised sector. It is evident that the traditional sector went for rapid motorisation of artisanal fleets mainly to overcome their marginalisation. The annual average per capita production per active fishermen in the motorised sector is around 2,950 kg in 1998. Now within the artisanal sector, motorised units contribute about 59% of the production. In overall, the non-mechanised units contributed only 8% of the total landings during 1998. The annual average production of a mechanised

unit works out to about 42 tonnes, while for motorised unit about 16 tonnes and non-mechanised unit about 1.3 tonnes (Table 3).

Starting in late fifties, the durability and operational efficiency of fishing gears increased manifold over the years due to introduction of nylon twines and monofilament. Further there has been continuous improvement in fishing gears over the years based on resource oriented location specific needs. Some of the gears prominent a few years ago were either modified or displaced by new type of gears. The mesh size of most of the fishing nets has been reduced in recent years, which led to the catch of large quantities of juvenile prawns and fishes affecting the very sustainability of marine fisheries.

The post-harvest sector of marine fisheries also shown substantial growth in infrastructure development, expansion of internal marketing and boost in export earnings. The increase in number of freezing plants was 264 to 372, ice making plants from 131 to 148 and registered peeling sheds from 83 to 900 from 1977 to 1996 (Anon, 1997). The increase in cold storage facilities and thrust for preservation and quick transportation of fish improved our distribution and marketing system. The iced fish which was not readily accepted by the consumers in the initial years has, now gained almost total consumer acceptance. The extent of spoilage of fish at landing centres as well as various points of distribution channel has been considerably reduced due to wide spread use of ice, technological improvements in processing and transportation facilities. The export earnings of fishery sector have increased from Rs. 4.6 crores during 1960-61 to Rs.839.37 crores during 1990-91, Rs. 3,270 crores during 1994-95 and Rs. 4,627 crores during 1998-99. The marine products of India have attracted many new customers in foreign markets and brought about a new era of hope and optimism to the fishing community (Sathiadhas, 1997). The fisher-folk got better prices for their catches and gained respect and recognition in society as primary producers of raw materials for marine products export industry.

Employment scenario

Marine fisheries provide substantial employment to human resource both in the production and post-harvest sectors. The manpower employed in India in active fishing alone is currently estimated at 10.3 lakhs in marine fisheries (Table 4). The pre-harvest and post-harvest operations in marine fisheries including the internal and external marketing provide employment to another 12 lakh people.

The manpower employed in active fishing in the mechanised sector is estimated at 2 lakh people, of which 1.5 lakh fishermen are engaged in trawl fisheries alone and the remaining 0.5 lakh in gillnetters, dolnetters, purseiners and deepsea vessels. The motorised sector employs 1.7 lakh people in active fishing where 66% are engaged in the operation of ringseiners, minitrawlers and gillnetters and the rest 58,000 persons are employed in the motorised dugout canoes, catamarans and plywood boats. The non-mechanised sector provides the maximum employment to 6.6 lakh people where the majority of 2.7 lakh are engaged in catamarans, another 2 lakh in plank-built boats and the rest in dugout canoes, musula boats and others. The pre-harvest operations of marine fish provide job opportunities to about 1 lakh people. The activities such as boat building and repairing, net mending, supply and repair of engines, suppliers of diesel, kerosene and other essential items at the landing centres are coming under this category which provides active employment for 1 lakh people in our country. About 25% of those employed in the pre-harvest operations are women mostly engaged in net making. Export and internal marketing including transportation, processing, packing and selling at different stages provide employment to 11 lakh people, 2 lakh in export marketing and 10 lakh in internal marketing. The innumerable auctioneers at landing and wholesale centres, persons involved in transportation, loading, unloading and packing and distributors of ice, commission agents, wholesalers and retailers come under the post-harvest sector. The people involved in the wholesale and retail marketing is estimated at 5 lakh in which 50% are women.

TABLE 4. *Employment scenerio in marine fisheries of India*

	No. of persons employed (in lakhs)
Active fishing	
Deep sea vessels	0.1
Small mechanised sector	1.9
Motorised sector	1.7
Non-mechanised sector	<u>6.6</u>
Sub-total	10.3
Post-harvest operations	
Export marketing	2.0
Domestic marketing	10.0
Sub-total	<u>12.0</u>
Total	<u>22.3</u>

Even though women are not involved in active fishing in marine fisheries, they contribute substantially in the pre and post-harvest operations. About 25% of the labour force in the pre-harvest activities, 60% in the export marketing and 40% in the internal marketing are women. Altogether about 5 lakh women are employed in pre and post-harvest operations in the marine fisheries sector, out of the total work force of 12 lakh persons. The working conditions are poor and the wage-rates received by the women are comparatively low. The average monthly wage of a prawn-peeling worker is about Rs.800 in Mumbai whereas it varies from Rs.100 to Rs.1, 000 for those working in Kerala.

In case of inland fisheries, there are about 1.4 million active fishers and about 2 million part-time and occasional fishers, involved in aquaculture and capture fisheries.

Capital investment, earnings and excess capacity

The average initial investment of the fishing units has been worked out on the basis of data collected from sample units operating at selected centres in each region. Most of the boats were old ones and their resale value at the time of observation was considered to compute the gross investment. The capital investment in fishing implements in the marine fisheries sector at current price level (1996-97) works out at Rs.4, 11,697 lakh comprising Rs. 92,259 lakh in non-mechanised artisanal sector, Rs. 45,624 lakh in motorised sector, Rs.2, 38,814 lakh in small scale mechanised sector

and the rest in deep-sea vessels (Table 5). The overall per capita investment per labour for active fishing works out to Rs. 39,970. The analyses on sectoral per capita investment per fishing labour work out to Rs.13, 979 in the artisanal sector, Rs. 26,835 in the motorised sector and Rs.1, 25,689 in the small scale mechanised sector. The gross earnings generated from the marine fisheries at landing centre level have been worked out. The annual average price per kg of fish at landing centre level varies from Rs.6 for non-penaeid prawns to Rs.175 for penaeid prawns. The gross income generated from marine fish landings during 1998 works out at Rs.9, 450 crores (Table 6). The penaeid prawns alone accounted for about 40% of the gross earnings followed by the carangids (8%) and the cuttlefishes (8%).

TABLE 5. Estimated capital investment on fishing equipment (1996-97)

	Number of crafts	Estimated investments (Rs. in lakhs)
Mechanised		
Trawlers	37574	187870
Gillnetters	6373	25492
Dolnetters	1219	4876
Purse seiners	1118	13416
Others	716	7160
Sub-total	47000	238814
Non-mechanised		
P. Boats	36921	41921
Dug out canoes	17270	21816
Catamarans	94427	23607
Others	11382	4915
Sub-total	160000	92259
Motorised		
Ringseines	3141	15705
P. Boats	9423	18846
Dug out canoes	6283	3142
Catamarans	10639	4788
Plywood boats	2514	3143
Sub-total	32000	45624
Deepsea vessels	180	3500
Total		411697

The dwindling catch per unit of operation of different types of fishing techniques over the years in spite of the overall increase in the total landings clearly indicates that

there is excess capacity of fishing fleets. The introduction of technologically advanced and capital-intensive fishing implements made the existing older units less economical and non-operational thereby creating substantial excess capacity of fishing fleets and rampant under employment for the labour force. As per the estimated catch and effort data of the various types of fishing units during 1995 at NMLRDC of CMFRI, the average catch per trip works out at 378 kg, for a mechanised boat, 189 kg for a motorised boat and 51 kg for a non-mechanised unit. In the absence of latest estimates of catch per trip, assuming the same estimates, for 200 fishing days, the average annual catch works out at 75.6 tonnes for mechanised boats, 37.8 tonnes for motorised units and 10.2 tonnes for non-mechanised units. This means that the estimated number of units effectively operated are 25,840 as against the existing fleet size of 47,000 in the mechanised sector, 13,270 in the motorised sector as against the existing fleet size of 32,000 and 20,930 in the non-mechanised sector as against the existing fleet size of 1.8 lakh. In terms of percentage it is 55, 41 and 12 respectively. Thus, the excess fleets work out 45% in mechanised, 59% in motorised and 88% in non-mechanised sector. In fact, the stiff competition to harvest the resources with excessive fishing fleets in each sector results in less number of fishing days and high level of under employment among the labour force in Indian marine fisheries.

TABLE 6. *Estimated catch and gross earnings from marine fisheries during 1998 (landing centre level)*

Groups	Average Price/kg	Total Catch (tonnes)1998	Value (Rs. In lakhs)
Elasmobranchs	38	75262	28600
Eels	23	9573	2202
Catfishes	37	52649	19480
Clupeids	10	571661	57166
Bombayduck	13	122803	15964
Lizard fishes	8	24102	1928
Halfbeaks and fullbeaks	25	5926	1482
Flyingfishes	25	3320	830
Perches	25	154018	38505
Goatfishes	13	15765	2049
Threadfins	38	9346	3551
Croakers	32	199740	63917
Ribbonfishes	13	113783	14792
Carangids	53	147496	78173
Silverbellies	8	56528	4522
Big-jawed jumper	32	9121	2919
Pomfrets	58	49335	28614
Mackerel	13	177176	23033
Seerfish	64	54871	35117
Tuna	22	39684	8730
Billfishes	15	3337	501
Baracudas	32	21697	6943
Mulletts	25	7397	1849

Flatfishes	25	46817	11704
Crustaceans			
Penaeid prawns	175	214741	375797
Non-penaeid prawns	6	173942	10437
Lobsters	320	2611	8355
Crabs	16	34276	5484
Stomatopods	7	72600	5082
Cephalopods	70	107005	74904
Miscellaneous	13	91902	11947
Total		2668484	944577

Fish/shrimp seed is an important input for aquaculture. Now almost the entire fish seed comes from hatcheries. Presently there are about 1130 hatcheries with production capacity of 60 million spawn. Investment on fish hatcheries is about Rs. 3,400 million (Table 7). Present freshwater fish seed production is about 17000 million fry per annum. Assuming an average price of Rs.100 per 1000 numbers, earnings through fish seed sales work out to Rs. 1,700 million. There are about 175 shrimp hatcheries in India with installed capacity of 8,750 million seed per annum. The total investment on shrimp hatcheries at the rate of Rs.20 million per hatchery of 50 million capacity works out to Rs.3,500 million. Assuming Rs.400 per 1,000 numbers, the returns on shrimp seed work out to Rs.3,000 million per annum for estimated production of 7,500 million seeds. There are about 20 freshwater prawn hatcheries in India, with estimated investment of Rs. 80 million. The return on freshwater prawn seed of about 100 million is estimated at Rs. 50 million per annum.

TABLE 7. Estimated capital investment on hatcheries (Rs. in millions)

Freshwater fish seed hatcheries (1130 Nos. with capacity of 60 million spawn including brood stock and nursery ponds)	3400
Freshwater prawn seed hatcheries (20 Nos. of 10 million)	80
Brackishwater shrimp seed hatchery (175 Nos. of 50 million)	3500
TOTAL	6980

Inland fish production at present (1997-98) is 2.44 million tonnes contributing about 45% to the total fish production. Of the total inland fish production, about 1 lakh tonne comes from brackishwater shrimp culture. At farm/landing centre prices, earnings from inland fish production work out to about 9,300 crores.

Fish marketing problems

Fish marketing broadly includes all those functions from the point of catching of fish to the point of final consumption. The demand and price of fish are continuously increasing in our domestic and export markets. Fresh fish, once inaccessible to distant locations till a few years ago, is now easily available due to the vast improvements in handling technologies coupled with fast transportation and consequent market penetration. Thus, fish marketing, to a large extent, has been made pragmatic enough to facilitate satisfaction of existing and potential demands. However, the infrastructure for fish marketing in India is still principally oriented towards the export market. The fishermen's share in the consumer's rupee is the best 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 8). Marketing costs including transportation range from 6% to 15% of the consumer's rupee. The wholesalers receive 5% to 32% and the retailers from 14% to 47% of the consumer's rupee for different species/groups of marine fish. In certain production-cum-consuming cities, the role of the middlemen traders has put both fishermen and the consumers to the greatest disadvantage. A new beginning is now being made by the fishermen to group themselves into associations which will take up not only fishing, but also selling the catches directly to the consumer so as to benefit themselves and the consumer by eliminating the middlemen traders.

TABLE 8. Distribution (%) of consumer's rupee for different varieties of marine fish during 1996-97

Groups	Share of			
	Fishermen	Handling & Transportation	Wholesalers	Retailers
Seerfish	68	6	12	14
Pomfrets	60	7	9	24
Barracudas	40	9	30	21
Tunas	45	9	28	18
Sharks	43	10	32	15
Catfishes	56	10	10	24
Mackerel	50	9	11	30
Sardines	33	12	23	32
Ribbon fishes	48	10	12	30
Rays	47	13	22	28
Whitebaits	40	12	28	20
Lizardfishes	35	12	15	38
Goatfishes	57	13	16	14
Threadfins	42	9	20	29
Croakers	48	11	14	27
Silverbellies	30	15	8	47
Big-jawed jumper	55	10	9	26
Mullet	41	9	17	33
Half and full beaks	65	9	10	16
Cephalopods	65	10	5	20

In the internal marketing system, marine fish consumption used to be mostly confined to the coastal and adjoining regions in the past. Currently, about 50% of fish is consumed fresh in and around the producing centres, 43% in the demand centres located up to a distance of 200 km from the coast and only 7% in the centres located beyond 200 km (Sathiadhas *et al.*, 1995). There is enormous scope for improving the distribution process through enhanced private investments in the preservation, processing and transportation sectors of the internal marketing system under the liberalised economic policies. There is vast potential for marketing hygienically processed and packed dried fish in our domestic hinterlands and canned fish in cities and defence establishments. The quantity of about 30% of the total landings which are processed after they become unsuitable for fresh consumption, suggests good scope for market development of value added products for domestic consumption.

There is significant variation in price of inland fish both over seasons and locations. The problems faced by inland fish marketing are more or less similar to those of marine fish marketing. The basic problems include poor infrastructure in terms of transport, ice, cold storage, hygienic assembly centres and fish markets.

Marine products exports from India yielded foreign exchange worth Rs. 4627 crores from the export of marine products during 1998-99. This is an incredible achievement with the fabric of the fishing industry undergoing rapid transformation over the last three decades, contributing substantially to the economic development of the country. However, the success in exports and forex earnings do not appear to be due to the country's competitive export marketing strategy, but mainly due to the ever increasing international demand for marine products. In the process, there are apprehensions that India has become a passive supplier of marine products to foreign traders, under-utilising the potential export markets. So far, India has been mostly supplying frozen seafood, which are reprocessed by the importing countries. As a result, the importing countries realise higher profits than India.

Policy and Management Implications

The traditional fishermen operating in the inshore regions are caught in the low income trap due to diminishing returns. Marginalisation of the artisanal fishing units by motorised and mechanised units creates conflicts among fishermen and warrants immediate attention. There is no scope to increase fishing effort in the inshore waters as it is already overcrowded with various types of fishing units. Hence, it is highly essential to introduce some regulations to keep the level of fishing effort under control especially in our inshore region. The Government regulations alone may not yield the desired results and **responsible fishing** by voluntary reduction of fishing effort and mesh size regulations of various gears by mechanised and non-mechanised fishermen will go a long way in sustained fish production from marine fisheries. The concept of community participation in the management of marine fisheries should be introduced by creating awareness among fishermen and encouraging "co-operative fishing" instead of "competitive fishing" to keep the level of fishing intensity at the optimum level for attaining maximum sustainable production.

The annual discards of cheaper varieties of fish by deep-sea fleets have been considerable over the years and needs immediate attention. The mechanised trawlers are oriented towards multi-day operation now a days for mainly catching exportable varieties and the by catches are mostly discarded in large quantities. These

discards can be better utilised in the internal markets by introducing a suitable transportation system by periodical lifting by carrier boats. Further, there are substantial sick processing plants mainly because these plants are utilised only for export marketing. This excess capacity of sick plants can be diversified for the domestic marketing also, so that the processed fish can be made available in the internal marketing system for all seasons and all places.

The seasonal nature of fishing and the risk and uncertainties associated with fisheries entangle the fishermen in vicious circle of poverty. The alternate employment opportunities are very meagre and opportunity cost of fishermen is almost zero. The pace of economic development and the overall socio-economic status of fishermen are comparatively lower than that of other backward sectors of our economy. The balanced development of the coastal agro-climatic zone with the integration of capture and culture fisheries combined with agriculture, horticulture and animal husbandry is essential for providing productive employment and improving the socio-economic condition of the coastal rural communities.

The comprehensive all India census on marine fishermen, craft and gear was conducted by CMFRI during 1980, which forms the basic data for the country till now. As fishing pressure in coastal waters are increasing day by day, it is essential to monitor the nature and extent of use of craft and gear by the fishermen population of India. Hence the all India census of craft, gear and other socio-economic parameters of fishermen be conducted once in five years by a Central agency like CMFRI or CIFE as recommended by National Commission on Agriculture for providing the much needed information base for planning of fisheries development and coastal zone management.

Currently, there is considerable confusion in the land and water use policies of Government in our coastal regions. There are conflicts on fisheries pertaining to developmental strategies and conservation of resources. Development without endangering the environment and resource degradation is the prime requirement for sustainable production and socio-economic improvement of fishermen. The promotion of eco-friendly coastal aquaculture is vital for generating employment

opportunities and higher income among fishermen in our coastal region. In this context the geographical classification of coastal and adjoining regions, reservoirs and other water bodies indicating the human, material and natural resource potential is essential for planning. In this, context, Remote Sensing (RS) and Geographical Information System (GIS) techniques will be of immense use. Regionwise GIS of different agro-climatic zones including coastal areas should be prepared on priority basis. Since fisheries form the major source of income to vast majority of coastal population, experts from capture and culture fisheries including socio-economics should be associated in the preparation of coastal zone management and development plans and adequately represented in the State and national level Coastal Zone Development Authorities.

Existing lease/licensing system for freshwater and brackishwater aquaculture, reservoirs and rivers need to be studied in depth to evolve proper enactment to increase fish production. For long term development, the lease duration needs to be longer to generate the entrepreneur's interest. As recommended by IIM study on inland fish marketing (IIM, 1985), leasing system for reservoir should include not only the revenue, but also conservation, regulatory and stocking schedules.

The sea food industry in developed countries concentrate on preparation of more amount of processed or ready to eat or ready to cook items. India, so far has been mainly supplying of sea foods which are reprocessed by the importing countries. As a result, the importing countries realise higher profits than India. Hence product diversification such as promotion of live fish trade and value added products should be given top priority in our export marketing strategies. Similarly it is also essential that all the pharmaceutically important marine products should be identified, catalogued, patented and a better utilisation policy evolved.

A cautious fish marketing policy giving parallel importance for domestic and export marketing should be framed in the context of liberalisation of economic policies. Our domestic population should not be totally deprived off the protein rich cheap food due to our excessive emphasis on exports. Marine products that are capable to fetch the highest competitive price in the international market alone should be diverted to exports and the rest should be channelled to our domestic market.

2. **FOOD** With regard to internal fish marketing, there has been no regulation, even in major markets, which usually helps only the middlemen. No proper grading, weighing and quality control are maintained at any level of fish marketing. Most of the existing malpractice in fish marketing can be avoided by introducing regulated marketing system in the lines of the regulated markets of some of the agricultural produce. Further the producers and consumers are not aware of the current price structure of different varieties of fish in various markets of the country. The periodical dissemination of information on prevailing prices of commercially important varieties of fish and prawn in different markets will be much useful to the fishermen, traders and consumers.

Data on inland fish production disaggregated according to different production systems *i.e.* aquaculture freshwater and brackishwater; capture riverine, reservoir, etc. and also for calendar as well as financial year need to be published. Further, the time gap between data collection and publication requires to be reduced, to increase the usability of data for management purposes. The potential fishing zones identified through remote sensing is presently not reaching the fishers in time. These lacunae need to be removed by using the modern communication methods. This will go a long way in increasing economic efficiency of fishing operations. Also, information on various aspects of fisheries need to be made available on-line by a central agency like CIFE/CMFRI.

Data and Technology

The primary data were collected from the modern mechanised, reservoir and traditional crafts or vessels, one year (1985) covering all the seasons. The latter *i.e.* the fishers and labourers working in these crafts.

To facilitate the inland trade, the fishing centres four different markets during

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