Evaluation and Assessment of Economic Losses on Account of Inadequate Post-Harvest Infrastructure Facilities for Fisheries Sector in Gujarat

H. Sharma, M. Swain & S. S. Kalamkar

All India Study Coordinated by
Agro-Economic Research Centre, Department of Economics,
University of Madras, Chennai 600 005, Tamil Nadu

2016

Agro-Economic Research Centre
(Ministry of Agriculture & Farmers Welfare, Govt. of India)
Sardar Patel University
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AERC Report 163

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March 2016

AERC Report 163

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Data Submitted in March 2016.
Report submitted –March 2016.

Citation:
Sharma, H, M. Swain and S. S Kalamkar (2016), "Evaluation and Assessment of Economic Losses on Account of Inadequate Post-Harvest Infrastructure Facilities for Fisheries Sector in Gujarat State", Report No. 163, Agro-Economic Research Centre, Sardar Patel University, Vallabh Vidyanagar, Anand, Gujarat.

Foreword

The fisheries sector is an important player in the overall socio-economic development of our country. During the last six decades of development, from traditional activity in early fifties, it has now transformed into a significant commercial enterprise, contributing to employment generation, food and nutritional security and foreign exchange earnings. The vibrancy of the sector can be visualized by the more than 13 fold increase that India achieved in fish production in just six decades, i.e. from 0.75 million tonnes in 1950-51 to 10.07 million tonnes during 2014-15. This resulted in an unparalleled average annual growth rate of over 5 percent over the years which have placed the country on the forefront of global fish production, only after China. In fact fish output in India doubled during last two decades period (between 1995-96 and 2014-15). Besides meeting the domestic needs, the dependence of over 14.5 million people on fisheries activities for their livelihood and foreign exchange earnings to the tune of US$ 5.51 billion (2014–15) from fish and fisheries products, equaled about 18 percent of the export earnings from the agriculture sector, amply justifies the importance of the sector on the country's economy and in livelihood security.

Marine and inland fisheries and aquaculture constitute the main components of fisheries section in India. Marine fisheries constitute a valuable source of food and employment, and a net contributor to the balance of payment. Marine fisheries have progressively increased by nearly six times during the last five decades period. The country has a long coastline of 8118 km and equally large areas under estuaries, backwaters, lagoons etc., conducive for developing capture as well as culture fisheries. The maximum length of coast line (1912km) is from Andaman and Nicobar Island followed by Gujarat (1600 km). Among states, Gujarat is leading marine fish producer and sharing one fifth of total marine fish produced in India. However, there are clear signals, which suggest that the resources in the inshore waters are being fully exploited, and the scope for increasing production from the present level is limited. The limited supply of sustainable fishery resources dictates that increasing demands for fishery products in the future will not be satisfied by increasing the fish harvest. However, a net increase in production and availability of good quality fish and fishery products can be achieved through an effective post-harvest fishery system that will include adequate and better infrastructure facilities that would prevent loss of the commodity. There are appreciable losses during both harvest and post harvest stages in fisheries.

Thus, though the sector has transformed in terms of its nature and significance, there are challenges yet to be addressed but reducing or if possible, eliminating economic losses of fisheries due to inadequate post-infrastructure (PHI) facilities is one of the most important of them. Being a highly perishable commodity, fish requires proper landing facilities, processing, storage, transport and distribution facilities running through the entire supply chain from capture to consumer. Adequate provisions of such infrastructure may result in the utilization of fish in a cost-effective and efficient way and absence of such required infrastructure facilities result in considerable wastage and losses. As there is limited scope for horizontal expansion to cope with the public food demand, vertical intensification through integration of different farm based enterprises and post-harvest loss reductions could help to meet expected increase in production demand and quality. Therefore, it is important to examine the economic losses on account of inadequate post-harvest infrastructure facilities for the marine fisheries sector. The Ministry of Agriculture and Farmers Welfare, GOI has assigned this task to AERC, Chennai. As a part of all India project (covering Tamil Nadu, Kerala, West Bengal and Gujarat), AERC VVN undertook study for the state of Gujarat.

I would like to congratulate the entire project team for preparing this excellent research report. I hope findings of the study would be useful for academicians, policy makers and researchers.

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Acknowledgements

The study on "*Evaluation and Assessment of Economic Losses on Account of Inadequate Post-Harvest Infrastructure Facilities for Fisheries Sector in Gujarat State*" has been carried out at the Agro-Economic Research Centre, Sardar Patel University, Vallabh Vidyanagar, Anand, Gujarat, as suggested and sponsored by the Directorate of Economic and Statistics, Ministry of Agriculture and Farmers Welfare, Government of India, New Delhi.

We have benefited immensely from various scholars and officials from different government departments while carrying out this study. At the outset, we would like to thank **Dr. Harish Padh**, Vice Chancellor of our University and Chairman, AERC Governing Body as well as **Dr. Mahesh Pathak**, Honorary Advisor of our Centre for their constant encouragement and support for undertaking such research activity at the Centre.

We are grateful to the Madam **Ms. Sangeeta Verma** (Economic and Statistical Adviser) and **Shri P. C. Bodh** (Adviser-AER Division) of Directorate of Economic and Statistics, Ministry of Agriculture and Farmers Welfare, Government of India, New Delhi, for their guidance and necessary support in completion of this study. We are grateful to the coordinator of the study, **Dr. K. Jothi Sivagnanam**, Professor and Director (In-charge), Agro-Economic Research Centre, Department of Economics, University of Madras, Chennai (Tamil Nadu) for providing required support, study framework and necessary inputs for completion of study. We also thank **Dr. R. Srinivasan** (AERC, Chennai) for his constructive comments on draft report.

We are grateful to **Shri M. A. Narmawala,** Commissioner of Fisheries, and staff of Department of Fisheries, Government of Gujarat, Gandhinagar for providing the necessary information and secondary data as well as support to our data collection team. We are also thankful **Shri N. R. Patel**, Deputy Commissioner of Fisheries, GOG for sharing his views on problems and prospects of fishery sector in Gujarat. Special thanks to **Shri D. I. Suthar** (Deputy Commissioner of Fisheries, GOG), **Shri R.B. Vajpayee** (Deputy Director, Porbandar and In-Charge, Veraval) for providing all kinds of assistance during pilot survey at Porbandar and field survey at all three harbors. We also thank Shri **B. D. Chaudhary**, Assistant Director of Fisheries at Commissioner of Fisheries, GOG for providing necessary secondary data. Thanks to **Dr. K. Mohammed Koya**, Scientist-in-Charge**,** ICAR- Central Marine Fisheries Research Institute**,** Regional Centre, Veraval, Gujarat for his support. We also thank Head of all the Departments/Institutions for providing necessary inputs for this study.

The study would not have reached to this stage without the active co-operation of the sample respondents as well as stakeholders, who provided all the required data for the study without any hesitation and expectation. We thank all the **members of fishermen society at various harbors, processors, exporters, wholesalers, retailers, boat owners and fishermen** for providing useful information and support.

We have also received support and encouragements from our colleagues in the Centre while carrying out the study. We would thank Dr. S. R. Bhaiya, FO, CCS for his support. Thanks to Shri. M. R. Ojha, Shri Manish Makwana, Shri T. B. Parihar, Ms. Kalpana Kapadia, Shri N. G. Chauhan and Ms. Rinku Rathod for collecting data from field and other sources. Thanks to Shri Deep K. Patel (Research and Reference Assistant) for arranging printing of this report. The support of staff of accounts section and other staff of the Centre is acknowledged.

Last but not least, we thank all other staff for their direct and indirect support.

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List of Abbreviations

APL		Above Poverty Line
Av.		Average
BPL	-	Below Poverty Line
CAGR		Compound Annual Growth Rate
CCRF		Conduct for Responsible Fisheries
CIFT		Central Institute of Fisheries Technology
CMFRI		Central Marine Fisheries Research Institute
DAHD&F		Department of Animal Husbandry, Dairying and Fisheries
DAT		Distress Alert Transmission
DES		Directorate of Economics and Statistics
DOF		Department of Fisheries
EEZ		Exclusive Economic Zone
EIA		Export Inspection Agency
EU		European Union
F & D Act		Food and Drug Act
FAD		Fish Aggregating Devices
FADA		Fisheries and Aquaculture Development Agency
FAO		Food and Agriculture Organization
FFDA		Fish Farmers Development Agencies
FH		Fishing Harbour/Harbor
FJ		Fishing Jetties
FLC		Fishing Landing Centre
FLC		Fish Landing Centre
FYP		Five Year Plan
FYP		Five Year Plan
GDP		Gross Domestic Product
GFCCA		Gujarat Fisheries Central Co-operative Association
GOG		Government of Gujarat
GOI		Government of India

GR		Government Resolution
GSDP		Gross State Domestic Product
ha		Hectare
HACCP		Hazard Analysis and Critical Control Point
HH/hh		Household
HP		Horse Power
HRD		Human Resource Development
HYV	-	High Yielding Variety
IADP	-	Integrated Agricultural Development Plan
IBE		Indian Beach Estate
ICG		Indian Coast Guard
IFPRI		International Food Policy Research Institute
kg		kilograms
MFRA		Marine Fishing Regulation Act
MFRA		Marine Fishing Regulation Act
MFV		Mechanized Fishing Vessel
MMT/MT		Million Metric Tonnes/Metric Tonnes
MOA		Ministry of Agriculture
MOCI		Ministry of Commerce and Industry
MOD		Ministry of Defense
MOEF		Ministry of Environment and Forests
MOES		Ministry of Earth Sciences
MOFPI		Ministry of Food Processing Industries
MPA		Marine Protected Areas
MPEDA		Marine Products Export Development Authority
mt		Metric Tonnes
NA		Not Available
NCDC		National Cooperative Development Corporation
NFDB		National Fisheries Development Board
NFF		National Fish workers Forum
NM		Nautical Miles
NMSARCA		National Maritime Search & Rescue Coordinating Authority

NSDP		Net State Domestic Product
NSS		National Sample Survey
OAL		Overall Length
OBC		Other Backward Classes
OBM		On Board Motors
PPP	-	Public Private Partnership
Prod	-	Production
Prodvty.	-	Productivity
SAU	-	State Agricultural Universities
SC		Scheduled Caste
SC		Scheduled Caste
SEBC		Socially & Educationally Backward Class
SFB		Seasonal Fishing Ban
SHG	-	Self Help Group
SOFIA		The State of World Fisheries and Aquaculture
ST		Scheduled Tribe
ST		Scheduled Tribe
TE		Triennium Endings
UNCLOS		United Nations Convention on the Law of the Sea
UNDPI		United Nations Department of Public Information
USA		United States of America
UT		Union Territory
WPI	-	Wholesale Price Index
Y		Yield

EXECUTIVE SUMMARY

1. Backdrop

The fisheries sector plays an important role in the Indian economy. It contributes to the national income, exports, food and nutritional security and in employment generation. This sector is also a principal source of livelihood for a large section of economically underprivileged population of the country, especially in the coastal areas. This sector provides livelihood to approximately 14.49 million people in the country. It has been recognized as a powerful income and employment generator as it stimulates growth of a number of subsidiary industries and is a source of cheap and nutritious food besides being a source of foreign exchange earner. The fisheries sector is rarely a strategic sector for national economic development. Although it plays a prominent role in developing States rich fishery resources relative to their populations, it is nonetheless an important economic activity, and very often a strategic one, in many coastal regions of India.

The fisheries and aquaculture in India are vibrant economic activities, and have been one of the fastest growing food production systems during the last three decades. Their significance and contribution towards agricultural (4.75 per cent GDP in 2012-13 at current prices) and national economies (0.83 percent to national GDP in 2012-13 at current prices), livelihood and nutritional security, employment generation (14.49 million people) and foreign exchange earnings (over Rs. 33441 crores in 2014-15) have been enormous though understated so far. Out of the total fish production in India, about 65 percent production is from resources inland and remaining 35 percent from marine sources.

Marine fisheries constitute a valuable source of food and employment and a net contributor to the balance of payment. Marine fisheries have progressively increased by nearly six times during the last five decades period. The estimated marine resources potential of the Indian Exclusive Economic Zone (EEZ) is 4.24 million metric tonnes at the present exploitation rate. The country has a long coastline of 8118 km and equally large areas under estuaries, backwaters, lagoons, etc. conducive for developing capture as well as culture fisheries. With the declaration of the EEZ in 1977, an area of 2.02 million sq km. (comprising of 0.86 million sq. km on the west coast, 0.56 million sq.km on the east coast and 0.60 sq.km around the Andaman & Nicobar Islands) was protected for fisheries. The East Coast covers four states and two Union Territories (West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, Pondicherry and Andaman & Nicobar Islands) and the West Coast covers five states and two Union Territories (Gujarat, Daman & Diu, Maharashtra, Goa, Karnataka, Kerala, and Lakshadweep). The maximum length of coast line (1912 km) is from Andaman & Nicobar Island followed by Gujarat (1600 km). Thus, Gujarat state accounts for about one fifth of length of coast line of our country.

Fish production in India has shown an increasing trend from 0.75 million metric tonnes (MMT) in 1950-51 to reach 10.07 MMT in 2014-15. With a vast production potential, particularly in inland fisheries (mainly reservoirs) and aquaculture has shown in this periods. In case of marine fisheries, production has increased from 0.53 MMT in 1950-51 to 3.44 MMT in 2013-14. The annual growth rate of marine fish production has fluctuated sharply. It increased from 2.32 per cent in 1955-56 to 9.53 per cent in 1960-61 and stood at 25.21 per cent during 1989-90. Growth rate was negative during the 1965-66, 1981-83, 1986-88, 1997-99 and 2003-05. Since 2008-09, growth rate has been positive except during 2012-13.

Among the states, Andhra Pradesh and West Bengal have emerged as the leading producers of inland fish during 2014-15 accounting 26 and 23 percent of total inland production respectively, followed by Bihar (7.0 %). These three states together accounted for more than 55 percent of inland fish production in India in 2013-14. In case of marine fish production, Gujarat has emerged as the leading producer (accounts 20.20 % in total) followed by Kerala (15.17 %), Maharashtra (13.58%), Andhra Pradesh (12.73%) and Tamilnadu (12.55%). Thus these five major states together accounted for about 74 percent of total marine fish production in India. However, there are appreciable losses during both harvest and post-harvest stages in fisheries. It is important to know the nature and causes of losses in fish value.

Though the fishery sector has transformed in terms of its nature and significance, there are challenges yet to be addressed but reducing or if possible, eliminating economic losses of fisheries due to inadequate post-infrastructure (PHI) facilities is one of the most important of them. Being a highly perishable commodity, fish requires proper landing facilities, processing, storage, transport and distribution facilities running through the entire supply chain from capture to consumer. Adequate provisions of such infrastructure may result in the utilization of fish in a cost-effective and efficient way and absence of such required infrastructure facilities result in considerable wastage and losses. As there is limited scope for horizontal expansion to cope with the public food demand, vertical intensification through integration of different farm based enterprises and post-harvest loss reductions could help to meet expected increase in production demand and quality (Kevin, 2006). Thus, post-harvest fish losses are one of the immediate policy concerns as it happens in most of the fish distribution chains in India.

The present study is an attempt to overcome all these challenges in order to evaluate and assess the economic losses due to inadequate post-harvest infrastructure facilities for fisheries sector in Gujarat state, which is an important contributor to marine fishery resources in India.

2. Objective and Methodology of the Study

1) To examine the growth, composition and the contribution of the fisheries sector in Gujarat;
2) To evaluate the availability of the post-harvest infrastructure facilities for marine fisheries sector in the state;
3) To review the Government policies and programs for the provision of post-harvest infrastructure facilities for marine fisheries sector in the state;
4) To evaluate and assess the economic losses on account of inadequate post-harvest infrastructure facilities for fisheries sector in the state; and
5) To arrive at relevant policy implications for development of marine fishery in the state.

The study is based on both primary and secondary data. The secondary data were collected from published sources as well as from the Department of Fisheries, Government of Gujarat. The primary data were collected during month of October 2015 covering three periods spread in the year 2014-15 (October 2014 to September 2015) from three fishing harbours i.e. Veraval, Porbandar and Mangrol of Gujarat. These fishing harbours have been chosen for collecting the infrastructural gap to arrest post-harvest fish losses in Gujarat. From each site, stakeholders involved in the supply chain viz. boat owner (30), fishermen (30), wholesalers (10), retailers (10) and small processors (6) and exporters (6) including the administrators were

interviewed to collect information on the various aspects including fish quality and loss assessment data.

3. Fisheries Development in Gujarat (focus on Marine Fisheries)

Gujarat is the northern most maritime State on the west coast of India situated between 20.6 and 24.42 degrees latitude and 68.10 and 74.28 degrees east longitude. Gujarat has one of the richest fishing grounds in India and the most important commercial varieties of fish (such as Pomfret, Hilsa, Bombay duck, Ribbon fish, Catfish, Rays, Cuttle fish, Shrimps etc.). Thus, Gujarat possesses a vast resource with favourable climates and environment condition for flourishing fish production through aquaculture.

Gujarat is endowed with a wide range of marine and inland aquatic resources. The state has a long coastline extending to 1600 km accounts for 19.70 per cent of the total coastline of the country and about 46 per cent of the western coastline of India. It has a continental shelf area of 0.18 million km^2, Exclusive Economic Zone (EEZ) of 0.214 million km^2, which occupies 32 per cent of the continental shelf area and 10 per cent of the total EEZ of India. The Gujarat coast, including the two Gulfs, is blessed with physical features congenial to the development of fisheries. The major fisheries resources of the state include Elasmobranches, Bombay ducks, Sciaenids, Shrimps, Seer fishes, Tunas, Threadfin Breams, Pomfrets, Catfishes, Lizard fishes, Bull's eyes, Carangids, Anchovies, Ribbon fishes, Croakers, Prawns, Lobsters and Cephalopods. Along the coastline of Gujarat, 851 fishing villages/towns and 286 marine landing centers are located. Gujarat has 123 fish landing centers located in 226 fishing village. About 19 per cent of the landing centers are located in Valsad district followed by 15.45 per cent in Kutch district and 13.82 per cent each in Jamnagar and Junagarh and 8.13 per cent in Surat district. About 55062 fisherman family and 316972 fisher folk population is located in fishing villages.

Over the last five decades, fisheries sector of Gujarat has undergone radical changes. While marine resources of Gujarat are spread mainly in the Arabian sea, the inland waters in the form of rivers, canals, estuaries, ponds, reservoirs, brackish water impoundments, waterlogged areas etc. constitute a bed rock of inland fisheries in the state. The total fish production in the State has increased by almost ten times during last five decades period, i.e. from 0.79 lakh metric tonnes in 1960-61 to 7.93 lakh MT in 2013-14. The state has taken necessary steps in order to achieve the targets fixed for both inland and marine fish production in State. Out of the total production of 7.93 lakh MT in 2013-14, about 88 percent was marine fish while remaining 12 per cent was inland fish production. Thus marine fish dominates the fish production in Gujarat. Gujarat is the third highest fish producer in India (after West Bengal and Andhra Pradesh) and the largest producer of marine fish.

However, Gujarat's share in the total fish production has been fluctuating in volume terms and has come down in value terms in the last decade. The main reason could be the declining fish catch and quality of catch. It is reported that 35 per cent of the catch in the marine sector is low value miscellaneous fish. As mentioned earlier, in total marine fish production in the state, small sciaenid accounts for around 27 per cent followed by Bombay duck (14.30%), ribbon fish (5.63 %), Cuttle fish (3.85%) and catfish (3.6 %) in the year 2012-13.

The data on districtwise marine production in Gujarat during 2004-05 to 2014-15 indicate that Junagadh district contributes the bulk of the marine landings (40.79%), followed by Valsad (13.39%), Porbandar (13.28%), Kutch (10.12 %), Jamnagar

(9.73%), Amreli (7.26%) and Navsari (4.0%). The remaining districts such as Bhavanagar, Rajkot, Surat, Baruch and Kheda accounts for less than one percent share in total. The Saurashtra coast between the Gulf of Kutch and Gulf of Cambay, presents unique oceanographic features and is endowed with a wide variety of highly relished table fishes. An incredible achievement of the state has been made in the foreign exchange earnings through export of fish and fish products.

There are 5 fish harbours existing in the state. They are located in Dholai, Jakhau, Veraval, Mangrol and Porbandar with total fish production capacity of 388000 metric tons and another 5 harbours have been proposed to be established in the state. Junagadh district has two major harbors, viz. Mangrol and Veraval are with the highest fish production capacity of 235000 MT. Out of 14200 fishing crafts, 6500 are in Veraval, 3500 are in Porbandar and 2800 are in Mangrol. As per 2007 Census, the state had 28706 boats; of which 18536 boats were mechanized and 10170 boats were non- mechanized. In the year 2012-13, total 36770 boats were in-operation near Gujarat coast, of these 24612 boats were mechanized and 12158 boats were non- mechanized. During the period from 2000-01 to 2012-13, annual rate of growth of fishing boats was estimated to be 1.88 per cent, while same was 2.86 percent per annum for mechanized boast. However, rate of growth was negative in case of non-mechanized during the same period.

4. Fisheries Policies and Programmes in Gujarat

The state level fisheries management is undertaken mainly through licensing, prohibitions on certain fishing gear, regulations on mesh size and establishment of closed seasons and areas, under the Marine Fishing Regulation Act (MFRA). Zones are demarcated by each State based on distance from the shoreline (from 5 km to 10 km) or on depth. These in-shore zones, where trawling and other forms of mechanized fishing are not permitted, are perhaps the most important space-based fisheries management measure in place. The closed season or 'monsoon fishing ban' is another important 'temporal-spatial' management measure implemented on both the east and west coasts of India for a period of 47 days and 65 days respectively, considered to be the spawning and breeding season.

Central Govt. has drafted a Model Bill pertaining to Fisheries Management in the states and circulated it as an advisory exercise to all the states. Various states such as Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa and Pondicherry landed to the advice and have drawn up their Marine Fishing Regulation Act (MFRA). Gujarat has adopted its Fisheries Act in 2003, which was published in "Gujarat Government Gazette', on the 12th March, 2003. The main objective of the Act is to provide protection, conservation and development of fisheries in inland and territorial waters of the State of Gujarat and for regulation of fishing activities in the State.

The State Government of Gujarat is also implementing various need based programmes like: assistance to the fishing vessels for purchasing electrical equipments, life saving equipments, Distress Alert Transmission (DAT), fishing nets, insulated boxes, solar lights, assistance for fish marketing to women, assistance to artisanal fishermen, training to fishermen and extension services. Fish landing centers are also upgraded by the State Government. Some of the major schemes implemented for development of fishermen in the state are:

(a) Subsidy for acquiring Modern Equipments
(b) Relief to families of the fishermen captured by Pakistani Authority

(c) Motorisation/Mechanization of Traditional Craft/Boats
(d) Safety Measures on Fishing Boats
(e) Processing, Preservation and Marketing
(f) Purchase of Gill Nets for Small and Pagadiya Fishermen
(g) Assistance for Women Self Help Group of Fishing Community
(h) Scheme for having hygienic or portable toilets on fishing boats
(i) Assistance for Training of Schedule Caste Youth Fishermen
(j) Schemes for Fishing Activities in Salty Water
(k) Housing scheme for Fishermen
(l) Scheme for Fish Seeds Growing and Collection
(m) Scheme for Boat/ Fishing Nets
(n) Assistance for Purchase of Plastic kits (boxes) for transporting fish
(o) Assistance for establishing group hatchery for colorful fishes.
(p) Group Accident Insurance Scheme for active fishermen

5. Findings from Primary Survey

5.1 Fishing Activities, Facilities & Constraints faced by Fishermen & Boat Owners

- Among different fishing crafts and fishing gears available with selected respondents, high concentration of motorized crafts/boats was observed. On an average of both categories, per household had 2.08 motorised crafts and 0.23 traditional crafts. The boat owners had more number of both the crafts per household than fishermen, i.e. 3.17 motorized crafts/hh as compared to 1.0 motorized craft/ha with fishermen. Across the harbors, Mangrol respondents had highest number of crafts (3.15) followed by Veraval (2.20) and the lowest was in Porbandar (1.60).
- The type of fishing gears used varied by type of fishing operation and target species. Trawlers and Gill nets were commonly used in family fishing as they were relatively of low cost. On an average, every household (both groups together) had 7.32 trawlers and 2.98 gill netters. Besides every household possessed other gears such as purse seine and cast nut (4.32), deep sea trawlers (0.75) and very few households had long lines tuna, squid jigging and shore seining. Across harbors, the highest number of trawlers per household was observed in Veraval, while Mangrol respondents had the highest number of gill netters and other gears/hh.
- In view of fisheries situation that exists in west coast of India, temporal restrictions, i.e. seasonal closure of fishing is implemented independently by each State government to manage the fishery resources. It is also known as monsoon ban period declared every year during south west monsoon period of 90 days in Gujarat (15th of May to 15th of August). It is due to the fact that fish come closer to the shore and estuary during breeding. During this period, maintenance works of vessels are taken up. Fishing season varies along the coastal belt. Therefore ban period ranges between 30 to 145 days in different coastal states of India. The ban period for fishing also helps somehow in fishery resources management as there are clear signals that resources in the inshore are being fully exploited and the scope for increasing production from the present level is limited.
- The details on seasonwise hourbourwise fishing activities by selected boat owners and fishermen shows that on an average, the fishing days per season were estimated to be 64.9 days, (ranges between 65-69 days in three selected seasons during 2014-15). The highest fishing days were recorded in October-

December period (67.2 days), followed by January-March period (66.8 days) and lowest were in April to September period (60.8 days), which may be due to 90 days fishing ban during this season.

- Every season, around 6-7 trips were made (around 13-14 days per trip) with around 7 persons on board. In case of Porbandar and Veraval, all trips were multi-days fishing (ranges between 6-18 days), while 90 percent of trips of Mangrol respondents were multi-days and remaining 10 percent were a day fishing trips. Across both the groups, more than 95 percent of respondents had used motorized boat for fishing. The use of traditional crafts has been observed in Veraval and Mangrol harbor, while its share in total trips made was hardly 1-2 percent in the both groups. The average number of fishermen on board was 7.5 in case of boat owner, while same was 6.9 people in case of fishermen.
- On an average, around 14 tonnes fish per trip was caught in selected harbors. The maximum fish was landed at Veraval harbor by selected boat owners and fishermen, i.e. 14.65 tonnes/trip and the lowest was in Porbandar (12.23 tonnes/trip). Fish catch depends entirely on the size of the boats, types of fishing gear, types of nets and also the number of times the fishermen go to the sea in a day. Out of total fish landed at harbours, about 85 percent fish was of Grade I and remaining was categorized as low grade (around 15 percent), i.e. Grade II. Across the harbours, the percentage of Grade I fish ranges between 82 to 87 percent.
- It was observed that not only the fish landed per trip was higher in case of boat owner than fishermen but also the percentage of Grade I quality fish was higher. About 15 percent Grade I fish was found higher with boat owner than fisherman. Besides, high percentage of fish was dumped or categorized as waste at fisherman level (4.7%) that of 1.3 percent at boat owner level which must have implication on income of fisherman. The reason for relatively high ratio of low value fish with fishermen than boat man was may be due to inadequate facilities available on board (such as washing facility) and use of dragging for hauling the fish (see, section 5.2.9). However, catch and quality are the function of fishing efforts, type of fishing gear and the nature of the fishing ground. In both cases, fish landed at Porbandar harbor was of relatively low grade quality than other two harbours namely Veraval and Mangrol. The fish used as dry/fish meal was found around 3.6 percent of total fish landed.
- The sale pattern of fish landed indicates that, about 94 percent of total fish was sold, of which around 37 percent each was sold to exporter, around 29 percent to wholesaler and contractor and remaining was sold to retailer. In case of fishermen and boat owner, the percentage of fish sold to total was also around 93 percent and both groups preferred to sell one third of their output to the exporters.
- Across seasons, in case of boat owner, average price per kg of Grade I fish ranges from as high as Rs. 800/- per kg for Pomfret and as low as Rs. 50/kg for prawn/rani, while Grade II fish ranges between Rs. 730/kg for Pomfret to Rs. 40/kg for red fish. In case of fisherman, Grade I fish ranges from Rs. 800/kg for Pomfret to Rs. 40/kg for red fish while for Grade II fish rate ranges from Rs. 600/kg for Pomfret to Rs. 40/kg for prawn. The simple average of price realized for Grade I for all three season by the boat owner was Rs.181/kg, while in case of fisherman, it was Rs. 172/kg. While for Grade II fish, boat owner realized lower price of Rs. 68/kg as compared to Rs. 105/kg realized by fishermen.

- Considering the nutritional significance coupled with stagnating catches in India, it is imperative that losses at all levels should be reduced. There are appreciable losses during both harvest and post-harvest stages in fisheries. The harvest and post-harvest losses has been defined as the quantity of marine fish which is not available or is not fit for human consumption due to physical damage, spoilage or some other reasons. Harvest losses are losses that occur at the time of harvesting and onboard the fishing craft. It is important to know the causes of losses of fish value.
- The economic losses in terms of low market value of fish due to poor post-harvest infrastructure have been estimated to Rs. 18.10 per kg. The rate of fish loss was higher during the period Oct-Dec and was the lowest during April-Sept period. The higher rate of loss was recorded by fisherman (around Rs.19/kg) as compared to boat owner (Rs.16/kg).
- The major reasons for losses at this stage were physical damage during fishing and spoilage due to improper icing, whereas very minimal share was loss due to fish being eaten away by birds. The motorized trawlers followed by gill netters are major causes for fish losses.
- The method of sale adopted and preferred by boat owner and fishermen was sale at pre-agreed price, followed by auction method of sale, sale to contractor and combination of above methods. The timeliness of receipt of money also matters in fishery business, especially for fishermen which are totally dependent on same. It was observed that on an average 50 percent of respondent mentioned that they had received money in advance while corresponding figures for fishermen and boat owner were 61.1 and 40 per cent respectively. Thus, 60 per cent fishermen received money in advance, while remaining amount was received in mix way, i.e. some advance and some after 15 days or so. In case of boat owner, 20 percent respondent received money after a 15 day time.
- The total operational expenditure incurred has been estimated to be Rs. 1.71 lakh/per visit comprised of expenditure on food and water, fuel cost, ice cost, hired labour and other miscellaneous items. There was huge difference in cost incurred by respondents of three selected harbors. The highest cost was incurred by the respondents from Veraval harbor (Rs. 2.24 lakh) while the lowest cost was recorded by respondents from Porbandar harbor (Rs. 1.44 lakh per trip). The high cost per trip at Veraval respondent would be due to longer time taken for fishing (174.1 hours). Around two third of total cost was incurred on fuel only, followed by about one fifth of total cost on hired human labour for fishing activity. Thus, these two costs put together accounted for about 84 percent of total cost. The expenses on food with water and miscellaneous expenditure accounted for around 7 percent each to total cost. The same trend was in case of fishermen and boat owner except ice cost and quantity. The total quantity of ice used by boat owner per trip was 4725 kg as compared to 2767 kg by fisherman.
- The infrastructural facilities available on board play an important role in reducing the post harvest losses. At overall level, fish hold capacity of fishing vessel was 10.7 tonnes/boat, which was almost same in case of both boat owner and fisherman. The average number of ice boxes available were 11.17 having capacity of 480 kg. It is important to note that no fishing boat had insulated box on board. The lifting facilities were available on about 53 percent boats while dragging facility was with remaining ones. The status of fish hold in both categories and at all three harbors was fresh one. The washing and cleaning facility was available on about 83 percent craft, while 17

percent were not having this facility. However, in case of boat owner, all the fishing boats/craft had this facility.

- Further, all selected respondents had on board processing facility. Among the various processing facilities, icing facility was available on all fishing crafts of both fishermen and boat owner, having average capacity of about 10 tones. However, no boat had other processing facilities like freezing facility, canning facility, smoking facility, smoking facility and any other facility on board. The sorting of board facility was available on all the crafts used by fishermen and boat owners. On an average 1.22 hours were spent in sorting/grading of fish on board. Veraval respondents had spent relatively more in grading the fish on board as compared to other two harbor respondents. Thus, icing facility was available on board for all crafts and sorting was done on board by the fishermen and boat owner.
- The details on low value fish indicate that at all three harbors and by both categories, no fish (young fish) was categorized as low value fish, while due to spoilage, about 0.3 tons of fish per trip has been treated as low value. Out of total spoilage, 61.32 percent is classified as by catch which was used for fish meal.
- Fishing harbours are being developed at both major and minor ports. The status of availability and condition of facilities at selected three harbors as mentioned by the respondent fishermen and boat owners shows that at overall level, on average about 72 percent respondents were satisfied with landing platform. Half of the respondents from Veraval harbor were not satisfied with condition of landing platform. The condition of washing and cleaning facilities available at selected harbours was unsatisfactory at Porbandar and Mangrol while same was very poor at Veraval harbor. At the time of survey, we were informed that new facilities creation is in progress in order to improve the prevailing condition at these harbors.
- All the respondents opined that out of three harbours, two harbours namely Porbandar and Veraval harbor had good storage facility, i.e. flake ice plants. It was very unlike to mention here is that more than 60 percent of respondent mentioned that facilities like drinking water, parking facilities, toilet/sanitation facilities, drainage facilities, commutation and approach facilities are unsatisfactory or very poor. It was expected that when the basic infrastructure at sea shore is so poor, facility of solar dryer was not available. Therefore, state government should take necessary steps to create required facilities at sea shore on war footing level.
- The details on distance of facilities away from sea shore indicate that on an average, the facilities like chill plants, cold storage, ice plants and insulated vans are available about 3 kms away from sea shore. These facilities were available relatively closer to Veraval and Mangrol harbor than Porbandar harbor. Flake ice plant facility was much closer to Porbandar harbor than other two harbours. In order to transport the raw fish, availability of insulated van facility was very rarely available in selected three harbors in Gujarat. Mostly trolley was used for transport of raw fish followed by use of ice boxes for same. The grading and sorting of raw fish was done on board by both boat owner and fishermen of all three harbors.
- The respondents were asked to share and rank their suggestions on important post harvest facilities to minimize losses of fishes. At overall level, at overall level, the highest number of respondents (46.7 per cent) ranked I to the facility of having clear landing platform with washing and drainage facilities followed by facility of cold storage/chill plants with in the FH premises (36.7

per cent) and insulated storage boxes on board the fishing vessel (16.7 per cent). The same preference was recorded by the respondents of Veraval and Mangrol. While in case of Porbandar, preference was not same. Porbandar respondents ranked I to the facility of cold storage/chill plants with in the FH premises while facility of cold chain network was ranked as less preferred facility in all three harbours. Same trend was observed in case of fisherman and boat owner.

- It was observed that about 32 percent respondents had incurred loss of 2-5 percent of total sale value, while 25 and 15 percent respondents incurred loss between 5-10 and 10-25 percent of total sale value respectively. Across the harbor, the trend was same, while across category, it was not same. Due to inadequate facilities, about 57 percent fishermen had incurred loss between 5-15 percent (of total sale value), while 37 percent boat owners incurred loss in this range. Thus, fishermen were at more loss than boat owner due to inadequate facilities. Therefore, necessary post harvest facilities need to be created on war footing basis.
- The major problems cited by the fishing households were storm, cyclone, tsunami, high wave, raining, bathing, poor facilities for bathing and drinking water and incidence of skin diseases. The non availability of cold storage facility was major problem under storage category. Non availability of additional subsidy on fuel and inadequate supply of fuel were other problems cited.

5.2 Marketing of Fish and Fish Products

- All the fish landing centres are primary fish markets from where fishes are transported to the wholesale or retail markets. The retail markets are located in major towns and cities in the state. There was a sharp increase in the prices of many of the highly preferred species in the state in recent years owing to the increased demand from both domestic as well as export sectors.
- The technological improvements in the transport and processing of marine fish facilitated fish from distant harbours to reach wholesale and retail markets in the state. However the perishable nature of fish compelled its quick disposal at each point of transaction and has resulted in the involvement of more intermediaries in the marketing channel leading to high marketing costs and margins.
- As there is a big gap between supply and demand, fish marketing or fish business is very profitable. The fish markets and the marketing of fish are generally conducted by fish traders, either individually or as groups, or Fish Traders' Associations or Fishermen's Cooperative Societies. Four levels of markets or marketing systems are observed in the distribution channel of fish trade i.e. fish wholesaler/trader- processer / exporter – retailer- consumer.

Fish Wholesale Markets

- Wholesale fish markets are not well developed throughout the state. Fish landing centres are administered mutually by Fishery Department and fishermen association. Though some of the landing centres are well developed, some lagged behind due to the poor participation of all stakeholders. The wholesale price of Pomfret varied from Rs. 476 per kg in Mangrol to Rs 567/kg in Veraval and Porbandar during Season I (October to December). However, the price of Pomfret has gone up to Rs 637.5 per kg in

Porbandar during Season III (April to September), basically due to poor catches and increase in demand.

- The percentage of losses in fish value due to poor post-harvest infrastructure during Season I and Season II was to the tune of 6-10 per cent in case of 60 per cent of wholesalers in Porbandar harbor. However, during Season III, 6-10 per cent loss was experienced by 40 per cent of wholesalers in same harbor. The higher extent of losses (11-15%) was faced by 20 per cent of wholesalers during Season I and III, whereas such range of losses was not found in Season II in Porbandar harbor. Relatively, the percentage of losses in fish value due to poor post harvest infrastructure to the tune of 11-15 per cent was the highest in Veraval and was lowest in Porbandar. On the other hand, the percentage of losses in fish value in the lower range (to the tune of 1-5 per cent) was more in Porbandar and was the lowest in Veraval harbour.
- The average capacity of wholesale market varied from 48 tons per day in Porbandar to 66 tons per day in Mangrol. About 87 percent wholesale markets have linkage with other markets and consuming centres. Mainly insulated vehicles (80%) were used for transport of fish from the harbor to the wholesale markets.
- Among the types of cold storage facilities availed by wholesalers, freezer boxes were major ones that used by about 73 per cent wholesalers, while remaining 27 per cent had used cold storage facility. About 80 per cent respondents could get regular fish supply and about 87 per cent got the fish of assured quality. About 80 per cent of them had the capacity to hold huge supplies. On an average, 20 people were engaged with a wholesaler. As far as mode of marketing is concerned, open auction method was followed by 80 per cent wholesalers in Porbandar whereas 60 per cent wholesalers in Mangrol resorted to direct sale method of marketing.
- Wholesalers did not face many difficulties in terms of supply, marketing and upkeep of the markets. Only about 27 per cent wholesalers expressed that they faced problem of market storage facilities.

Fish Retail Markets

- The local retail markets for marine fishes catered the need of local people in the cities and nearby areas. However, during the survey, it was found that there were no proper shops/buildings for marketing of fish in retail. The fishes were sold on the roadside without facility of proper roof, electricity, water, drainage, storage room and proper flooring. At some places, small platforms were constructed in the market. There were no proper lavatory and washing facilities in most of the retail markets. The hygienic conditions were also very poor. Fishes were piled up on the floor and sold. Majority of retail fish markets those were visited by the research team are found to be ill-managed and unhygienic. There were no proper handling, washing, cleaning, icing or re-icing of the fishes in the market places.
- The majority of fish retailers were women (90%). The average age of retailers was about 48. Only about 33 per cent of them were literate. The literacy rate of Female retailers was better in Porbandar harbor compared to other places.
- The major sources of purchase of fish by the retailers were the brokers or middle men. About 70 per cent of total fishes were purchased by retailers through the brokers/middlemen. Entire fishes in the retail market were sold to the consumers coming from the nearby areas.

- The percentage of losses in fish value due to poor post-harvest infrastructure during Season I was to the tune of 6-10 per cent in case of 60 per cent of retailers in Porbandar market. However, during Season III, the 6-10 per cent loss was experienced by 30 per cent of retailers in the same harbor. The higher extent of losses (16-20%) was not faced by any retailers during any seasons in Porbandar, however such range of losses was found in other harbors.
- The major facility required by the fish retailers was availability of ice to keep the fish afresh in the market places as well as in their storage boxes. About 93 per cent of selected sample retailers got ice in adequate quantity and about 90 per cent of them could get ice in time and uninterruptedly. On the whole, only about 33 per cent retailers expressed that ice price was more or less stable throughout the year. The average ice price in retail market was around Rs.1.25 per kg.
- The average capacity of the retail market varied from 42 tons per day in Porbandar to 75.5 tons per day in Veraval. All the retailers used non-insulated vehicles for transport of fish from the harbor or wholesale markets and to the retail markets due to lesser distance. Among the types of cold storage facilities availed by retailers, ice boxes were the major ones that used by all the retailers. Also all the retailers could get regular fish supply in assured quality and they had the capacity to hold huge supplies. As far as mode of marketing is concerned, direct sale method was followed by about 97 per cent retailers. Mostly single member had handled the fish selling in retail market.

Fish Consumers

- About 57 per cent respondent buyers were from age group of 20-40 years while about 43 per cent were having age more than 40 years. Occupation-wise, buyers came from all sections, but majority were in service (26.7%) as the selected retail markets were located mainly in urban areas.
- The consumers have purchased the fish four days in a week. Majority of consumers purchased cuttle fish, squid, ribbon fish, jinga and pomfret. The average quantity of purchase was 0.89 kg per visiting day. All the consumers expressed that they used to get desired type and quality of fish since all these markets are located very close to main harbor areas. About 83 percent of the consumers reveal that the average price was reasonable. Across the selected harbors, there were no major variations in the types of purchases made by the consumers.

Fish Processors and Exporters

- Fish is one of the most perishable items among the foodstuff. It cannot be stored in normal temperature overnight. Processing aims at controlling, if not totally arresting the process of spoilage and make the fish available in variety of forms acceptable to the consumers. There are several methods of processing and preservation of fish. The main methods are curing, caning and freezing. Processing channels are crucial for fisheries sector as all fish items mean for export marketing need to pass through these channels.
- The harbor wise capacity and utilization of processing plant shows that the average installed capacity for processing seafood in a sample processor in Gujarat was 57.9 tons per day with utilization capacity varied from 58.3 to 72.4 percent in different seasons. The installed capacity of an average processing plant in Porbandar was 80.3 tons per day which was higher than

that in Veraval (52.8 tons per day) and Mangrol (40.8 tons per day). However, the capacity utilization in processing plant was higher in Veraval as compared to Porbandar and Mangrol. In Veraval, the utilization capacity of plant varied from 71.1 to 82.0 per cent across different seasons; whereas the same in Porbandar and Mangrol varied from 56.7 to 77.9 per cent and from 44.8 to 49.1 per cent, respectively.

- On an average, a selected processor had purchased fish of 2741.7 tons to 3216.7 tons at the rate of Rs. 179.6 to 186.3 per kg for processing in a season. Overall, the processed quantity sold during a season varied from 2504.2 tons to 2900.0 tons; whereas the selling price varied from Rs. 308.3 per kg to Rs. 322.5 per kg. Overall, the economic loss varied from Rs. 29.2 per kg in Season III to Rs. 31.3 per kg during Seasons I and II.
- Overall 66.67 per cent of sample processors purchased the fish from both wholesale market and fishermen and 8.33 percent of them purchased fish from broker/middleman + fisherman. Only 16.67 per cent respondents had purchased fish from fisherman and 8.33 per cent has purchased from wholesale market directly.
- As far as processed fish and fish products sold by the processors is concerned, overall 90.9 per cent of the processors sold the product to exporters; whereas only 9.1 per cent of them sold in domestic market. In Porbandar, 92.0 per cent processors sold their quantity in export market whereas in Veraval and Mangrol, 91.0 per cent and 90.87 per cent fish was sold to export market, respectively.
- The major fishing harbors are important primary trading centres also. The agents of exporters also operated in these centres as the major export oriented items like shrimps, squids, cuttlefish and high value finfishes were landed at these centres. Insulated van and fishes stacked like ice box, thermal box, and insulated box were used by the processors involved in fish trade for transporting fish to distant markets. On the whole, 33.3 per cent processors used insulated vans for transport of raw fish from harbor to distant centers. In Porbandar, all processors used insulated vans, while in other harbors, none of the processor used insulated vans. All the processors in Porbandar used ice box for fish stalking whereas 75 per cent processors in Veraval and 50 per cent processors in Mangrol used ice boxes for the same. Overall, about 83.3 per cent of processors did grading and sorting of fishes in the processing plants; whereas only 16.67 per cent of them relied on on-board sorting of fishes.
- The main task facing these companies/ plants is to comply with various certifying agencies such as EIA (Export Inspection Agency of India), EU (European Union), F&D act of USA, HACCP (Hazard Analysis and Critical Control Point) etc. All the sample processing plants were complied with EIA norms, HACCP norms and were registered with the Marine Products Exports Development Authority (MPEDA). About 58.33 per cent processors were compiled with EU norms and F&D of USA.
- The harbor wise details on value addition by processors indicate that, about 75 per cent of total quantities of fish were used for export as frozen fish and remaining 25 per cent as whole fish plus frozen. Overall 80 to 90 per cent of total processed quantity of fishes were exported to Europe, Japan, US, China, Vietnam, Dubai, Italy and South Korea and 10-20 per cent of total quantity of processed fish products were sold in Delhi, Ahmadabad Jodhpur, Mumbai, Surat, Vadodara, Anand, Pune and other domestic markets. Overall about 75 per cent processed products were ready to cook and eat.

- As opined by the processors, the modernized post-harvest facilities are essential to minimize post-harvest losses of fish and fish products. The data on perceptions of the processors regarding the required improvements in post harvest infrastructures so as to minimize the losses indicate that about 58.3 per cent of processors have revealed first preference to insulated storage boxes on board. They have assigned second preference to clean landing platform with washing and drainage facilities and third preference to cold storage/chill plants facilities.
- Harbourwise analysis reveals that processors in Veraval have attached more importance to insulated storage boxes on board followed by the requirement of cleaner landing platform with washing and drainage facilities in their harbor. Both these facilities are also assigned more importance in other two harbors also. About 75 per cent sample processors in Porbandar and Mangrol have assigned forth preference to cold chain network facility while about 75 per cent of Veraval processors have assigned forth preference to cold storage/chill plants within the fish harvest premises.

6. Policy Suggestions

- The post harvest infrastructure in marine sector in Gujarat seems to have received less attention. It is also true that as the industry has been pre-occupied with the exports, no major initiatives have been made for the development of the domestic market (may be due to less demand). Fish is by and large sold in the most unhygienic conditions and this area needs considerable intervention in the coming period.
- It was observed that the post-harvest fish losses occur at all stages in the fish supply chain from capture to consumer. Huge physical and quality losses were found to occur in supply chain, with economic losses reported to account for around Rs. 18/kg mainly due to poor post-harvest infrastructure. The handling and processing with minimum spoilage is a distant reality and considerable attention needs to be paid on this aspect.
- In governments and development agencies should ensure that changes in post-harvest fisheries-related policy and practices take stock of the loss assessment tools, information generated and experience of the programme. Fish loss assessments should be incorporated into national data collection systems and used regularly to inform policy.
- The fishermen and boat owners should be provided training on proper handling, transport and processing of fishes by the government and cooperative organization.
- Fishing harbours are being developed at both major and minor ports. However, the condition of washing and cleaning facilities available at selected harbours was unsatisfactory at Porbandar and Mangrol while same was very poor at Veraval harbor. Also the facilities like clear landing platform and cold storage/chill plants within the FH premises and availability of insulated storage boxes on board the fishing vessel need to be ensured.
- The retail markets are unhygienic and lack basic facilities that to when more than 90 percent retailers are women. Most of whole fish is sold in the market and there is no processing/value-addition. The retail markets operate in open sky condition and thus in view of less availability of ice, the quality of fish deteriorates very speedily.

- The dredging problem i.e. loading and unloading of fish due to non-navigable depth near sea shore has been faced by fishermen and therefore harbors dredging needs to be carried out regularly.
- It was reported that the prices of fish generally drop down sharply when there is glut in the market mostly during the rainy season (October to December), and therefore marketing and processing activities need to be strengthen by the government. Balancing technical interventions to improve fish quality with the potential increase in selling prices, associated with better quality fish with the demand for cheaper fish by low income consumers, is an important dilemma.
- The fish breeding places need to be protected from encroachment as well as fishing activity should be strictly prohibited during the ban period.
- The dumping of hazardous chemical waste from industries located nearby sea shore (particularly at Veraval and Porbandar) not only affect the fish quality due to polluted water but also results in dying and moving away of good species of fish from the harbor area. That force the fishermen to go far way (till Pakistan border) to catch good fish. Therefore, dumping of industrial waste should be prohibited effectively.
- The harbors like Porbandar and Veraval are overcrowded due to less space in harbor region and large number of boats parked there than its capacity. Because of same, fish catch exceeds the capacity of harbor. Therefore, there is a need of expansion of harbor regions as well as constructions of more number of jetting/landing platforms.
- The limited availability of funds and inadequate staff with fisheries department at harbor level hinder the overall supervision as well as progress in development of infrastructure in harbor region. Therefore, level of administrative and financial autonomy at harbor should be increased with sufficient fund availability so that infrastructure and developmental activities at harbor regions can be stepped up.
- Though it is prohibited by the law, the catching of young fish is still continuing on larger scale which affects the future growth of fish volume and thus fish management in region. Therefore strict monitoring of catching of young fish at harbor level need to be undertaken.

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Chapter I

Introduction

1.1 Introduction

The fisheries sector plays an important role in the Indian economy. It contributes to the national income, exports, food and nutritional security and in employment generation. This sector is also a principal source of livelihood for a large section of economically underprivileged population of the country, especially in the coastal areas. This sector provides livelihood to approximately 14.49 million people in the country. It has been recognized as a powerful income and employment generator as it stimulates growth of a number of subsidiary industries and is a source of cheap and nutritious food besides being a source of foreign exchange earner. The fisheries sector is rarely a strategic sector for national economic development. Although it plays a prominent role in developing States rich fishery resources relative to their populations, it is nonetheless an important economic activity, and very often a strategic one, in many coastal regions of India.

The fisheries sector in India is a very important economic activity and a flourishing sector with varied resources and potentials (FAO, 2014). Starting from a purely traditional activity in early fifties when India commenced with the first Five-Year Plan, fisheries and aquaculture have now transformed into a significant commercial enterprise (GOI, 2011). The vibrancy of the sector can be visualized by more than 13 fold increase India achieved in fish production in last six decades, i.e. fish production increased from 0.75 million tonnes in 1950-51 to 10.07 million tonnes during 2014-15. This resulted in an unparalleled average annual growth rate of over 5 percent over the years which have placed the country on the forefront of global fish production, only after China. In fact, fish output in India doubled during last two decades period, i.e. between 1995-96 and

2014-15. Besides meeting the domestic needs, the dependence of over 14.5 million people on fisheries activities for their livelihood and foreign exchange earnings to the tune of US$ 5.51 billion[1] (2014–15) from fish and fisheries products, equaled about 18 percent of the export earnings from the agriculture sector, amply justifies the importance of the sector on the country's economy and in livelihood security. India is also an important country that produces fish through aquaculture in the world. India is home to more than 10 percent of the global fish diversity. Presently, the country ranks second in the World in total fish production with an annual fish production of about 10.07 million metric tonnes, contributing to about 5.7 per cent of global fish production in 2012.

In India, fisheries and aquaculture are vibrant economic activities, and has been one of the fastest growing food production systems during the last three decades. Their significance and contribution towards agriculture (share 4.75 per cent to GDP in 2012-13 at current prices) and national economy (share 0.83 percent to national GDP in 2012-13 at current prices), livelihood and nutritional security, employment generation (14.49 million people) and foreign exchange earnings (over Rs. 33441 crores in 2014-15) have been enormous though understated so far. Thus, fisheries sector occupies a very important place in socio-economic development of our country. Out of total fish production in India, about 65 percent production is from inland resources and remaining 35 percent from marine sources. The main challenges facing fisheries sector development in country have been in assessment of fishery resources and their potential in terms of fish production, development of sustainable technologies for fin and shell fish culture, yield optimization, harvest and post-harvest operations, landing and berthing facilities for fishing vessels, reducing harvest and post-harvest looses[2], augmenting export of marine

[1] http://pib.nic.in/newsite/PrintRelease.aspx?relid=131762.

[2] The harvest and post-harvest losses has been defined as the quantity of marine fish which is not available or is not fit for human consumption due to physical damage, spoilage or some other reasons. Harvest losses are losses that occur at the time of harvesting and onboard the fishing craft (Srinath, *et al.*, 2007).

products, generating employment and improving welfare and socio-economic status of fishermen.

Nutritional Value of Fish

From nutritional standpoint, fish is one of the most important animal protein foods available in many developing and under-developed countries. In fact, developing countries play a major role in the fishery industry. FAO estimates that in 2006, 79 per cent of fishery production took place in developing countries, and accounted for 49 per cent of world exports of fish and fish products in value terms and 59 per cent in terms of quantity (UNDPI, 2010) and more importantly a large portion of fish catch is consumed domestically. Fish can be regarded as an indispensable food item for large segments of the world's population, where protein needs are great (Pariser *et al.,* 1978). The chemical composition of sea food comes quite close to that of land animals. The principal constituents are water (66-84 per cent), protein (15-24 per cent), lipids (0.1-22 per cent), and mineral substances (0.8-2.0 per cent). Certain mollusks such as mussels have an appreciable content of glycogen (1-3 %). Fish oils, in general, consist predominantly of triglycerly esters of fatty acids and minor proportions of free fatty acids, vitamins, colouring matters, hydrocarbons, sterols, phosphatides, etc. However, fish oils differ remarkably from vegetable oils in containing a great variety of fatty acids. Fish fats as a whole show a higher Vitamin A level than those of most terrestrial animals. This particularly applies to the liver oils. Fish as food, more specifically as a protein donor, is bound to move towards focal position in view of the dwindling milk and meat resources. Apart from quality, fish also constitutes quantitatively a good source of protein. The edible portions of fresh water and estuarine fishes investigated in India contain about 14-25 percent protein. In marine fishes also quantitatively, fish consumption might in a significant measure supplement the low-protein, high-cereal diet consumed in many countries of the world. Fish, including processed fish like fish flour, has been found to improve such

diets. Cereal proteins are rather low in lysine and methionine, in both of which fish protein is relatively rich.

A closer study of diets in various areas of the world has revealed that many diets are deficient in certain vitamins and essential amino acids. Fish, even in small quantities, may make up for these deficiencies. Moreover, in many parts/sections of our globe where severe malnutrition and even hunger are facts, even small variations in the nutritive value of all components of the diet are of interest. It has been estimated that more than one half of the world's population suffers from varying degrees of under-nutrition and malnutrition. While a more precise estimate is not yet possible owing to lack of sufficient data from many parts of the world, there is enough evidence already to justify such a conclusion. In view of the close and direct link between the nutritional status of a population and its health and efficiency, the serious implications of this unsatisfactory situation are obvious. *The State of World Fisheries and Aquaculture* highlights the significant role that fisheries and aquaculture plays in eliminating hunger, promoting health and reducing poverty (FAO, 2014a).

Considering the nutritional significance coupled with stagnating catches in India, it is imperative that losses at all levels should be reduced. There are appreciable losses during both harvest and post-harvest stages in fisheries.

1.2 Fisheries Sector in India

As mentioned earlier, India is the second largest fish prouder in the World, after China. Fishery being one of the promising sectors of agriculture and allied activities in India, a growth target rate of 6 per cent was fixed so as to achieve the overall growth rate of 4.1 per cent for agriculture during the 12th Five Year Plan (2012-2017). The fisheries sector contributed Rs. 78053 crores to the GDP during 2012-13 at current prices (GOI, 2014). This is largely due to a sustained annual growth rate of well over 4 per cent in the fisheries GDP during the last five decades. The

fisheries sector has recorded faster growth as compared to the agriculture sector in all the decades. The growing production of fish suggests that fisheries sector is booming and contributing to the economic growth of the nation.

1.2.1 Current Status of Fish Resources of India

Marine and inland fisheries and aquaculture constitute the main components of fisheries sector in India. Aquaculture is practiced in both fresh and blackish waters.

Marine Fisheries:

Marine fisheries constitute a valuable source of food and employment and a net contributor to the balance of payment. Marine fisheries have progressively increased by nearly six times during the last five decades period. The estimated marine resources potential of the Indian Exclusive Economic Zone (EEZ) is 4.24 million metric tonnes at the present exploitation rate (GOI, 2011). India shares its international coastal borders with two countries, viz. Pakistan in the West and Bangladesh in the East. It is separated from Sri Lanka by a narrow channel connected by the Palk Strait and Gulf of Mannar. The country has a long coastline of 8118 km and equally large areas under estuaries, backwaters, lagoons, etc. conducive for developing capture as well as culture fisheries (see, Table 1.1). With the declaration of the EEZ in 1977, an area of 2.02 million sq km. (comprising of 0.86 million sq. km on the west coast, 0.56 million sq.km on the east coast and 0.60 sq.km around the Andaman & Nicobar Islands) was protected for fisheries. The East Coast covers four states and two Union Territories (West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, Pondicherry and Andaman & Nicobar Islands) and the West Coast covers five states and two Union Territories (Gujarat, Daman & Diu, Maharashtra, Goa, Karnataka, Kerala, and Lakshadweep). The maximum length of coast line (1912 km) is from Andaman & Nicobar Island followed by Gujarat (1600 km) (see, Table 1.2). Thus, Gujarat state accounts for about one fifth of length of coast line of our country.

Table 1.1: Marine Fish Resources of India (2012)

Sr. No.	Particulars	Nos.
1	Length of Coast Line (km)	8118
2	Exclusive Economic Zone (EEZ) million Sq Km	2.02
3	Continental Shelf ('000 sq km)	530
4	Number of Fish Landing Centres	1537
5	No of Fishing Villages	3432
6	No of Fishermen Families	874749
7	Fisher-folk Population	4056213

Source: GOI (2011).

Table 1.2: Statewise Coast Line and Continental Shelf area (2012)

Sr. No.	State	Length of Coast line (Km)	Continental Shelf ('000 sq. km.)
1	Andhra Pradesh (Undivided)	974	33
2	Goa	104	10
3	Gujarat	1600	184
4	Karnataka	300	27
5	Kerala	590	40
6	Maharashtra	720	112
7	Odisha	480	26
8	Tamilnadu	1076	41
9	West Bengal	158	17
10	A& N Island	1912	35
11	Daman & Diu	27	NA
12	Lakshwadeep	132	4
13	Pondicherry	45	1
14	Total	8118	530

Source: GOI (2011).

Inland Fisheries and Aquaculture:

India is the third largest producer of inland fish in the world (after China and Bangladesh). There are three types of inland fisheries *viz*: Riverine, Reservoir, and Tank/Lake/Pond. With a combined length of 45000 km and 20000 sq km of catchment area, the country's riverine resources provide one of the richest fish germplasm of the world. Due to India's extensive water resources (see, Table 1.3), about 65 per cent of fish

production is from inland fisheries. These fresh water resources are divided into major rivers basins namely, Brahmaputra, Ganga, Mahanadi, Godavari, Krishna, Cauvery, Sindhu, Narmada, Tapti and other west flowing small rivers originating from the Western Ghats. The freshwater culture resources in the country comprise 2.41 mha of ponds and tanks. The resources where fish farming can be undertaken include the floodplain lakes and other natural lakes, reservoirs, irrigation canals and paddy fields.

Table1.3: Inland Fisheries Resources of India

Sr. No.	Inland Resources	Nos.
1.	Total inland water bodies (lakh ha)	73.59
2.	Rivers and Canals (kms)	195210
3.	Reservoirs (mha)	2.916
4.	Ponds and Tanks (mha)	2.4
5.	Floodplain lakes and Wetlands (mha)	0.79
6	Brackish Waters (mha)	1.24

Source: GOI (2011).

1.2.2 Growth in Fish Production in India

Fish production in India has shown an increasing trend from 0.75 million metric tonnes (MMT) in 1950-51 to reach 10.07 MMT in 2014-15 as depicted in Table 1.4. With a vast production potential, particularly in inland fisheries (mainly reservoirs) and aquaculture has shown in this periods. In case of marine fisheries, production has increased from 0.53 MMT in 1950-51 to 3.44 MMT in 2013-14. The annual growth rate of marine fish production has fluctuated sharply. It increased from 2.32 per cent in 1955-56 to 9.53 per cent in 1960-61 and stood at 25.21 per cent during 1989-90. Growth rate was negative during the 1965-66, 1981-83, 1986-88, 1997-99 and 2003-05. Since 2008-09, growth rate has been positive except during 2012-13.

Table 1.4: Fish Production in India (1950-51 to 2013-14)

Year	Fish Production ('000 tonnes)			Average Annual Growth Rate (%)		
	Marine	Inland	Total	Marine	Inland	Total
1950-51	534	218	752	-	-	-
1955-56	596	243	839	2.32	2.29	2.31
1960-61	880	280	1160	9.53	3.05	7.65
1965-66	824	507	1331	-1.27	16.21	2.95
1970-71	1086	670	1756	6.36	6.43	6.39
1973-74	1210	748	1958	3.81	3.88	3.83
1978-79	1490	816	2306	4.63	1.82	3.55
1979-80	1492	848	2340	0.13	3.92	1.47
1980-81	1555	887	2442	4.22	4.6	4.36
1981-82	1445	999	2444	-7.07	12.63	0.08
1982-83	1427	940	2367	-1.25	-5.91	-3.15
1983-84	1519	987	2506	6.45	5	5.87
1984-85	1698	1103	2801	11.78	11.75	11.77
1985-86	1716	1160	2876	1.06	5.17	2.68
1986-87	1713	1229	2942	-0.17	5.95	2.29
1987-88	1658	1301	2959	-3.21	5.86	0.58
1988-89	1817	1335	3152	9.59	2.61	6.52
1989-90	2275	1402	3677	25.21	5.02	16.66
1990-91	2300	1536	3836	1.1	9.56	4.32
1991-92	2447	1710	4157	6.39	11.33	8.37
1992-93	2576	1789	4365	5.27	4.62	5
1993-94	2649	1995	4644	2.83	11.51	6.39
1994-95	2692	2097	4789	1.62	5.11	3.12
1995-96	2707	2242	4949	0.56	6.91	3.34
1996-97	2967	2381	5348	9.6	6.2	8.06
1997-98	2950	2438	5388	-0.57	2.39	0.75
1998-99	2696	2602	5298	-8.61	6.73	-1.67
1999-00	2852	2823	5675	5.79	8.49	7.12
2000-01	2811	2845	5656	-1.44	0.78	-0.33
2001-02	2830	3126	5956	0.68	9.88	5.3
2002-03	2990	3210	6200	5.65	2.69	4.1
2003-04	2941	3458	6399	-1.64	7.73	3.21
2004-05	2779	3526	6305	-5.51	1.97	-1.47
2005-06	2816	3756	6572	1.33	6.52	4.23
2006-07	3024	3845	6869	7.39	2.37	4.52
2007-08	2920	4207	7127	-3.44	9.41	3.76
2008-09	2978	4638	7616	1.99	10.24	6.86
2009-10	3104	4894	7998	4.23	5.52	5.02
2010-11	3250	4981	8231	4.7	1.78	2.91
2011-12	3372	5294	8666	3.75	6.28	5.28
2012-13	3321	5719	9040	-1.51	8.03	4.32
2013-14	3443	6136	9579	3.67	7.29	5.96
2014-15 (P)			10069			

Source: GOI (2014), Handbook of Fisheries Statistics.

In the inland sector, the growth has been steady, increasing from 0.218 MMT during 1950-51 to about 6.136 MMT in 2013-14, with an average annual growth rate (on previous year) of 7.29 per cent in 2013-14 against 2.29 per cent in 1955-56. With a vast production potential, particularly in inland fisheries (mainly reservoirs) and aquaculture, the sector has shown an average growth of about 6 per cent over the five year plan periods. The total fish production during 2013-14 registered 9.58 million metric tonnes, with a contribution of 6.14 million metric tonnes from inland sector and 3.44 million metric tonnes from marine sector.

1.2.3 Fish Export Scenario

India is a major supplier of fish in the world. A steady growth in the export of fish and fish products over the period was observed during the study period as shown in Table 1.5. Before 1960, the markets for Indian marine product were largely confined to neighboring countries like Sri Lanka, Myanmar, Singapore, etc. This position continues as long as exports from India were dominated by dried items. When the frozen and canned item increasingly figured in our exports, the sophisticated affluent markets like USA, EU, China and Japan, and other countries became important buyers. Processing units with moderns' machinery for freezing and canning came up at important centers to process and pack for exports. Over the year, the frozen seafood markets for Indian marine products have witnessed a change.

Over the last six decades, the fishery sector has transformed itself from a purely traditional activity into a significant commercial enterprise. Efforts were made to boost the export potential through diversification of products for export. During 2013-14, the volume of fish and fish products exported was 983756 tonnes worth of Rs. 30,213.26 crores as compared to 678436 tonnes worth of Rs. 10,048.53 crores in the year 2009-10. This was due to *L. Vannamei*, an exotic shrimp variety, introduced in the year 2009 along with guidelines framed for coastal aquaculture by the

Department of Animal Husbandry, Dairying and Fisheries, GOI which accounted for nearly Rs 20,000 crores of export in the year 2013-14.

Despite of problems in the world market like depreciation of Euro, weak economic condition in China and devaluation of Yen during last year (2014-15), increase in exports has been achieved. Export of marine products from India reach an all-time high of US$ 5511.12 million during the financial year 2014-15. Marine product exports crossed all previous records in quantity, rupee value and US Dollar ($) terms. Exports aggregated to 1051243 tonnes valued at Rs 33441.61 crore and US$ 5511.12 million. Compared to previous year, seafood exports recorded a growth of 6.86 per cent in quantity, 10.69 per cent in rupee and 10.05 per cent growth in US$ earnings. Frozen shrimp continued to be the major export item in the export basket in terms of quantity and value, accounting for a share of 34.01 per cent in quantity and 67.19 per cent of the total US$ earnings. Shrimp exports during the period increased by 18.60 per cent, 16 per cent and 15.54 per cent in quantity, rupee value and US$ value respectively. However, the unit value realization decreased to 10.38 US$/kg from 10.65 in 2013-14, a negative growth of 2.59 per cent. The US is the largest market for Indian seafood products with a share of 26.46 per cent followed by South East Asia (25.71%), European Union (20.08%), Japan (9.11%), other countries (8.58%), Middle East (6.04%) and China (4.02%).

Fishing efforts are largely confined to the inshore water through artisanal, traditional, mechanized sectors. About 90 per cent of the present production from the marine sector is from within a depth range of up to 50 to 70 meters and remaining 10 per cent from depths extending up to 200 meters. While 93 per cent of the production is contributed by artisanal, mechanized and motorized sector, the remaining 7 per cent is contributed by deep sea fishing fleets confining their operation mainly to the shrimp grounds in the upper East Coast (MPEDA, 2015).

Table 1.5: Yearwise Fish Export from India (1994-95 to 2013-14)

Year	Quantity (Tonnes)	Value (Rs.in crores)	Unit Value (Rs./Tonnes)	Unit Value Index	Annual Growth Rate	
					Quantity	Value
1994-95	307337	3575.3	116331.6	4668.7	26.73	45.28
1995-96	296277	3450.1	116448.5	4673.39	-3.6	-3.5
1996-97	378198	4077.6	107816.5	4326.96	27.65	18.19
1997-98	385818	4649.7	120515.4	4836.6	2.01	14.03
1998-99	302934	4626.87	152735.3	6129.67	-21.48	-0.49
1999-00	343031	5116.67	149160.6	5986.21	13.24	10.59
2000-01	440473	6443.89	146294.8	5871.2	28.41	25.94
2001-02	424470	5957.05	140340.9	5632.25	-3.63	-7.56
2002-03	467297	6881.31	147257.7	5909.84	10.09	15.52
2003-04	412017	6091.95	147856.8	5933.88	-11.83	-11.47
2004-05	461329	6646.55	144074	5782.07	11.97	9.1
2005-06	512163	7245.73	141473.1	5677.69	11.02	9.01
2006-07	612643	8363.52	136515.4	5478.72	19.62	15.43
2007-08	541701	7620.93	140685.2	5646.07	-11.58	-8.88
2008-09	602834	8607.95	142791.4	5730.6	11.29	12.95
2009-10	678436	10048.53	148113.2	5944.17	12.54	16.74
2010-11	813091	12901.46	158671.8	6367.92	19.85	28.39
2011-12	862021	16597.23	192538.6	7727.08	6.02	28.65
2012-13	928215	18856.26	203145.4	8152.76	7.68	13.61
2013-14	983756	30213.26	307121.5	12325.6	5.98	60.23
2014-15						

Sources: http://www.mpeda.com.

1.3 Statewise Fish Production in India

Fishing is a diverse industry in India. Table 1.6 presents statewise total fish production in India and Table 1.7 present share of each state in inland and marine fishery production during the year 2014-15. It can be seen from the Table 1.6 that the united state of Andhra Pradesh dominates in national fish production basket with having highest share of 19.5 percent, followed by West Bengal (16 percent) and Gujarat (8 percent). The states like Tamilnadu, Karnataka and Kerala accounted for around 6 percent each in total fish production of the country during the

corresponding year. These six states put together accounted for more than 62 percent of total fish production of the country in TE 2014-15.

Table 1.6: Statewise Fish Production in India (TE 2014-15)

States/UTs	State-wise Fish Production in India 2014-15 ('000 tonnes)			% to total 2014-15
	2012-13	2013-14	2014-15	
A & Nicobar Islands	36.62	36.95	37.18	0.37
Andhra Pradesh	1808.08	2018.42	1964.43	**19.50**
Arunachal Pradesh	3.71	3.63	4	0.04
Assam	254.27	266.7	282.7	2.81
Bihar	400.14	432.3	479.8	4.76
Chandigarh	0.05	0.11	0.12	0.00
Chhattisgarh	255.61	284.96	314.16	3.12
Dadra & Nagar Haveli	0.05	0.05	0	0.00
Daman and Diu	19.01	19.86	28.77	0.29
Delhi	0.69	0.88	0.67	0.01
Goa	77.88	114.06	117.85	1.17
Gujarat	788.49	798.49	809.93	**8.04**
Haryana	111.48	105.58	111.2	1.10
Himachal Pradesh	8.56	9.83	10.74	0.11
Jammu and Kashmir	19.95	20	20.3	0.20
Jharkhand	96.6	104.82	106.43	1.06
Karnataka	525.57	555.31	613.24	**6.09**
Kerala	679.74	708.65	632.26	**6.28**
Lakshadweep	12.37	18.72	13.19	0.13
Madhya Pradesh	85.17	96.26	109.12	1.08
Maharashtra	586.37	602.68	548.75	5.45
Manipur	24.5	28.54	30.5	0.30
Meghalaya	5.42	5.75	5.89	0.06
Mizoram	5.43	5.94	6.39	0.06
Nagaland	7.13	7.47	7.84	0.08
Odisha	410.14	413.79	439.86	4.37
Puducherry	41.07	42.08	73.5	0.73
Punjab	99.13	104.02	114.77	1.14
Rajasthan	55.16	35.1	46.31	0.46
Sikkim	0.49	0.42	0.44	0.00
Tamil Nadu	620.4	624.3	697.61	**6.93**
Telangana			265.38	2.63
Tripura	57.46	61.95	63.56	0.63
Uttar Pradesh	449.75	464.48	494.26	4.91
Uttarakhand	3.85	3.89	3.94	0.04
West Bengal	1490.02	1580.65	1617.32	**16.06**
Deep Sea Fishing	-	-	-	
India	9040.36	9576.64	10072.4	100.0

Source: www.indianstat.com

Table 1.7: Statewise Inland and Marine Fish Production in India (2013-14)

States/UTs	Production (in ' 000 Tonnes)			Share in total production (%)		
	Marine	Inland	**Total**	Marine	Inland	**Total**
A and Nicobar Islands	36.75	0.2	36.95	1.07	0.00	0.38
Andhra Pradesh	438.25	1580.17	2018.42	12.73	25.75	20.68
Arunachal Pradesh	0	0.55	0.55	0.00	0.01	0.01
Assam	0	266.7	266.7	0.00	4.35	2.73
Bihar	0	432.3	432.3	0.00	7.05	4.43
Chandigarh	0	0.11	0.11	0.00	0.00	0.00
Chhattisgarh	0	284.96	284.96	0.00	4.64	2.92
Dadra and Nagar Haveli	0	0.05	0.05	0.00	0.00	0.00
Daman and Diu	18.78	0.23	19.01	0.55	0.00	0.19
Delhi	0	0.88	0.88	0.00	0.01	0.01
Goa	109.57	4.49	114.06	3.18	0.07	1.17
Gujarat	695.58	97.84	793.42	**20.20**	1.59	8.13
Haryana	0	116.9	116.9	0.00	1.91	1.20
Himachal Pradesh	0	9.83	9.83	0.00	0.16	0.10
Jammu and Kashmir	0	19.98	19.98	0.00	0.33	0.20
Jharkhand	0	104.82	104.82	0.00	1.71	1.07
Karnataka	357.36	197.95	555.31	10.38	3.23	5.69
Kerala	522.31	186.34	708.65	15.17	3.04	7.26
Lakshadweep	18.72	0	18.72	0.54	0.00	0.19
Madhya Pradesh	0	96.26	96.26	0.00	1.57	0.99
Maharashtra	467.46	135.22	602.68	13.58	2.20	6.18
Manipur	0	28.54	28.54	0.00	0.47	0.29
Meghalaya	0	5.75	5.75	0.00	0.09	0.06
Mizoram	0	5.94	5.94	0.00	0.10	0.06
Nagaland	0	7.47	7.47	0.00	0.12	0.08
Odisha	120.02	293.77	413.79	3.49	4.79	4.24
Puducherry	37.81	4.27	42.08	1.10	0.07	0.43
Punjab	0	104.02	104.02	0.00	1.70	1.07
Rajasthan	0	35.1	35.1	0.00	0.57	0.36
Sikkim	0	0.42	0.42	0.00	0.01	0.00
Tamil Nadu	432.27	192.03	624.3	12.55	3.13	6.40
Telangana	0	0	0	0.00	0.00	0.00
Tripura	0	61.95	61.95	0.00	1.01	0.63
Uttar Pradesh	0	464.48	464.48	0.00	7.57	4.76
Uttarakhand	0	3.89	3.89	0.00	0.06	0.04
West Bengal	188.24	1392.41	1580.65	5.47	22.69	16.20
India	3443.12	6135.79	9578.91	100.00	100.00	98.16

Source: www.indianstat.com

As mentioned earlier, out of total fish production in India, about 65 percent production accounts inland and remaining 35 percent accounts marine fish. Across the states, Andhra Pradesh and West Bengal have emerged as the leading producers of inland fish during 2014-15 accounting 26 and 23 percent of total inland production respectively, followed by Bihar (7.0 %). These three states together accounted for more than 55 percent of inland fish production in India in 2013-14. In case of marine fish production, Gujarat has emerged as the leading producer (accounts 20.20 % in total) followed by Kerala (15.17 %), Maharashtra (13.58%), Andhra (12.73%) and Tamilnadu (12.55%). Thus these five major states together accounted for about 74 percent of total marine fish production in India. Thus, among states, Gujarat is leading marine fish producer and sharing one fifth of total marine fish produced in India.

However, as mentioned earlier, there are appreciable losses during both harvest and post-harvest stages in fisheries. It is important to know the causes of losses of fish value.

1.4 Post Harvest Losses in Marine Fisheries

In India, fish is the major source of protein for over one-third of the population especially for the rural poor in coastal areas. About 35 per cent of Indian population is fish eaters and the per capita consumption is 9.8 kg whereas the recommended intake is 13 kg (Srinath et al., 2008; GOI, 2011). The marine fish production has also been stagnating over recent years (CMFRI, 2004). As per FAO, the post harvest loss in world fisheries is 10 per cent. According to an analysis by Associated Chambers of Commerce and Industry of India (Assocham[3]), the post harvest fish wastage leads to annual losses worth over Rs 15,000 crore in India's marine and inland fisheries sector. The poor post-harvest fish handling infrastructure in major maritime states in India leads to wastage of about 25 per cent of the total fisheries resources. Considering the nutritional

[3]http://articles.economictimes.indiatimes.com/2013-01-28/news/36596238_1_marine-products-fish-stocks-assocham

significance coupled with stagnating catches in India, it is imperative that losses at all levels should be reduced.

Post-harvest is defined as the period which begins when the food item is separated from its growth medium. Fish is one of the most perishable food items, yet fish serve as an excellent animal protein source in developing countries. There is a demand/interest in fish utilization, i.e. the use of formerly discarded species of fish as waste and the opening up of markets, both domestic and foreign for fish caught in developing countries. The right to harvest national resources carries with it the responsibility on the part of the government, fishermen, processors and distributors to maximize its utilization. The reduction of fish losses can help alleviate shortages of other protein foods. Implied in the increased utilization is the need for reduction of losses due to poor landing and sanitation throughout the distribution chain.

Post-harvest Food Loss (PHL) in general is defined as the measurable qualitative and quantitative loss along the supply chain, starting at the time of harvest till its consumption or other end uses (De Lucia and Assennato, 1994; Hodges, Buzby and Bennett, 2011). In the case of fisheries, PHLs can occur either due to waste or due to inadvertent losses along the way. Harvest and Post Harvest losses has been defined as the quantity of marine fish which is not available or is not fit for human consumption due to physical damage, spoilage or some other reasons (Ames et al.,1991). There are appreciable losses during both harvest and post harvest stages in fisheries. Harvest losses are losses that occur at the time of harvesting and onboard the fishing craft.

The limited supply of sustainable fishery resources dictates that increasing demands for fishery products will not be satisfied by merely increasing the fish harvest. However, a net increase in production and availability of good quality fish and fishery products can be achieved through an effective post-harvest fishery system that will include adequate and better infrastructure facilities which would prevent loss of the commodity. Demersal trawl catches often comprise many different

species and sizes of fish and shell fish, which have to be divided into several categories and stored apart from each other. Among the main post-harvest losses are the large catches of small fish taken by shrimp trawlers from tropical waters (IDRC, 1982, Bello and Pigott, 1980). Tropical fish have a shorter shelf life than cold or temperate water species when stored under their equivalents ambient conditions since the bacterial and chemical reactions responsible for spoilage will proceed faster at the higher temperatures. In tropical climates (25-40^{0}C), fish may spoil before they have been removed from the net (Lima dos, Santos, 1981) and almost certainly within 24 hours of capture (Disney, 1976).

The way of handling of fish on board and preparation exercise influence fish quality. If the fish are handled carefully and stored in ice, a doubling of the rigor mortis period is possible to obtain. Washing can considerably reduce the load on the fish. It is clear that the flora of fish immediately after icing in hold will almost certainly differ both qualitatively and quantitatively from that of the newly caught, ungutted, uniced fish. During the journey from the fishing grounds to the home ports, further alterations occur as spoilage proceeds, their extent depending on such factors as the time taken to reach port and the temperature history of the fish in the hold.

Handling of fresh fish, in the broad sense, covers the entire post-harvest operations in marketing, including chilling, transportation and retailing. The ultimate objective is the utilization of the commodity in the most profitable manner, giving maximum benefits to the producer and the consumer. The final quality of the product is roughly a function of the total time temperature course of fish from the time it is caught till it reaches the consumer's kitchen. The temperature dependence varies for different products. Canned and dried products are the least sensitive to temperature induced deterioration, even though this is a significant factor. The market share of fresh fish has not dropped in recent years. On the contrary, it is concluded from market analysis that it can considerably increase if satisfactory quality is available. Keeping quality and

acceptability of fish depend to a large extent on their ante-mortem activity. Excess struggling before death as in the case of fish caught in the gill nets adversely affects their quality.

Fresh fish undergoes quick spoilage if adequate cautions are not taken while fishing, storage on fishing craft, icing, transport and marketing. Any injury inflicted on the fish surface during handling gives free access to spoilage bacteria into the flesh. The skin of the fish is a natural barrier which prevents entry of micro organisms into the interior and when once that gets bruised, spoilage rate is accelerated. A hundred-fold increase in bacterial load is observed in bruised fishes compared to physically sound ones at different stages of preservation in crushed ice. Further all surfaces like boat deck, fish holds, fish baskets, tubs, trucks and shovels with which the fish come in contact should be hygienically maintained. Mud, slime, blood, etc. which happen to get deposited on these surfaces during fishing, handling and transporting stages provide ideal grounds for bacterial proliferation, unless they are promptly and scrupulously cleaned after each operation.

About two-third of the total landed fish in India is consumed in the fresh condition and the remaining is utilized for preservation by other methods. It is interesting to note that fishes caught from inland sources are almost entirely diverted to the fresh fish market, none of the long-term preservation techniques being employed for them.

The task of building a sensible model for the technology of post-harvest handling of fish involves the linking namely, resource, commodity, environment, infrastructure and market. Partly due to conservatism and mostly due to lack of indigenous research data, the tendency has been to adopt and superimpose the Western model (which is essentially a temperate or cold zone model) on a tropical situation. However, it is necessary to look at local conditions while building indigenous post-harvest technologies for marine fishery in India.

Reports of various international institutions and funding agencies indicate that, within the entire post-harvest food system, losses in the

small-scale fisheries sector are among the highest for all the food commodities. The post-harvest field with its emphasis on handling, processing, distribution and marketing is a complex series of events that is challenging to the policymaking body/administration. Moreover, post-harvest fishery losses play an important role in maintaining or increasing the domestic supply of fresh fish or fishery products that can be purchased by middle and larger income level family.

Though the sector has transformed in terms of its nature and significance, there are challenges yet to be addressed but reducing or if possible, eliminating economic losses of fisheries due to inadequate post-infrastructure (PHI) facilities is one of the most important of them. Being a highly perishable commodity, fish requires proper landing facilities, processing, storage, transport and distribution facilities running through the entire supply chain from capture to consumer. Adequate provisions of such infrastructure may result in the utilization of fish in a cost-effective and efficient way and absence of such required infrastructure facilities result in considerable wastage and losses. As there is limited scope for horizontal expansion to cope with the public food demand, vertical intensification through integration of different farm based enterprises and post-harvest loss reductions could help to meet expected increase in production demand and quality. Reduction in poverty and malnutrition would be a major expected benefit of such integration and post-harvest loss reduction. Thus, post-harvest losses are one of the immediate policy concerns as it happens in most of the fish distribution chains in India.

There is no well established method to evaluate and assess the economic losses (looses in value) on account of inadequate post-harvest infrastructure facilities for fisheries sector in India**.** Attempts have been made to develop methodologies to assess losses of fish at different stages especially at post harvest level (FAO 1981; Wood, 1986; Ward, 1996; Ward & Jeffries, 2000). However, very few systematic attempts have been made

in India to assess quantitatively, the post harvest loss in marine fisheries (Srinath et al., 2008).

The losses are varied in nature depending on the different stages of the supply chain from capture to consumer. The primary losses are physical loss, quality loss and market force losses. Quantifying the post-harvest losses is the real challenge that lies before the planner. The first difficulty is the multiplicity of the fisheries and fishes, seasons, fishing gear and methods. Further, the fish landing centres are innumerable, diverse, and dispersed throughout India and in some cases inaccessible. The complexity gets added by the diversity involved in the fish distribution system which is fragmented and sometimes long and the products are also diverse enough. Then, the stakeholders are also varied in terms of their skill, socio-economic factors, and traditions. These diversities and the associated complexities make the tracking of the supply/value/commodity chain a real challenge and hence estimating the post-harvest losses has to reckon with all these difficulties.

The present study is an attempt to evaluate and assess the economic losses due to inadequate post-harvest infrastructure facilities for fisheries sector in Gujarat state, which is an important contributor to marine fishery resources in India.

1.5 Rationale of the Study

If fishermen can sell their fish, in the natural wet form to consumers within a few hours of catching, little post-harvest technology is needed. However, this is seldom the case, and fish has always to be preserved in some way, viz. iced, frozen or cured until it reaches the consumer in distant places. The call for new technology arises from the financial and material post-harvest losses and related problems. The major factors that affect the nutritive value of fish products depend on the way fish is handled, processed or preserved, stored, transported and marketed. The fish is exposed to stress from the time it is caught to

landing onshore by the fishing vessel. Moreover, the time lag in transport of fish from the processing/wholesale markets to the consumers' table is very crucial for that determines the quality of fish supplied. The way in which the fish is handled while transporting – it is stored or whether the vehicle is inadequate or protected from the atmospheric temperature-plays a vital role in ensuring the quality of fish that serves the consumers' table. The dictum should be to ensure the quality and thereby enhance the intrinsic value of the fish and eventually offer remunerative prices for the fishers (i.e. producers). Poor storage is subjecting fish to different kinds of degradation. These losses can be avoided by providing adequate post-harvest infrastructure facilities. There is a need to estimate these losses due to inadequate infrastructure facilities at various harbours in largest marine fish producing state like Gujarat. So that we can estimate the benefits to be accrued from development of post harvest infrastructures in Gujarat.

1.6 Objective of the Study

The overall aim of the study was to examine the economic losses on account of inadequate post-harvest infrastructure facilities for the marine fisheries sector in Gujarat, India. The specific objectives of the study are:

1) To examine the growth, composition and the contribution of the fisheries sector in Gujarat state;
2) To evaluate the availability of the post-harvest infrastructure facilities for marine fisheries sector in the state;
3) To review the Government policies and programs for the provision of post-harvest infrastructure facilities for marine fisheries sector in the state;
4) To evaluate and assess the economic losses on account of inadequate post-harvest infrastructure facilities for fisheries sector in the state; and
5) To arrive at relevant policy implications for development of marine fishery in the state.

1.7 Data and Methodology

The study is based on both primary and secondary data. The secondary data on growth, species composition, catch disposition, the market and processing infrastructure at state level were collected from the publication of Commissionerate of Fisheries, Government of Gujarat, Gandhinagar.

The present study was conducted at three fishing harbours i.e. Veraval, Porbandar and Mangrol fishing harbours of Gujarat state of India (see, Fig 1.1). These fishing harbours have been chosen for collecting the infrastructural gap to arrest post-harvest fish losses in Gujarat. From each site, stakeholders involved in the supply chain viz. fishers, wholesalers, traders, retailers and small processors and exporters including the administrators were interviewed to collect information on the various aspects including fish quality and loss assessment data. The detailed data on major fish landing and distribution channels in the State as a whole as well as the post-harvest losses (economic losses) at primary level were collected. The major fish varieties in the respective sites were gathered through the detailed discussions with the stakeholders. In the present study, the economic losses in marine fisheries have been defined as the losses (in value term- quality and quantity) of marine fish due to physical damage, spoilage or some other reasons, mainly because of inadequate post harvest infrastructure.

The necessary primary data were collected from the respondents by administering a pre-tested and well structured questionnaire. The primary data were collected during month of October 2015 covering immediate three periods spread in the year 2014-15 (October 2014 to September 2015). General observations, interviews/interactions with stakeholders with special focus on those who are involved in fishing, handling, trading, transport, processing, and marketing also resorted to elicit information about the availability and the gap in post-harvest information which influence the fishery losses and help in addressing the objectives spelled out above. This also evolved in accessing the efficiencies/shortcomings of

the existing practices which make a pointer towards post-harvest fishery losses.

Figure 1.1: Selected Fishing Harbours in Gujarat state

The study was structured in such way that the stakeholders who are involved in the entire supply chain of fish holders were interviewed to arrive at losses at different levels and to assess the problems faced at different levels. For identifying infrastructural gap at each stage of the activity, the following four groups were addressed to infer information about the gap that exists in the post-harvest scenario of the fisheries sector in the state. They are:

- Those who utilize or interact with the fishing harbours, fish landing centres and fishing jetties. These are the Centres/places from where fish caught commence their journey on shore to consuming centres.
- The market (both wholesale and retail), and the consumers
- The processing plants, where the fish gets a transformation (physical) before being taken to the consumers/export markets.
- Fishery officials

It is therefore questionnaires were structured and canvass to address the following four broad categories, which have direct linkage with the post-harvest activities concerning the fishery sector.

Category 1 – Fishing Harbours/Fishing jetties/Fish landing centres

From these centres, we interviewed the stakeholders, namely, fishing crew members/wage earners-fishermen, fishing harbor management authorities/owners (may be official or fishers as the case may be) and fishery officials in charge of these centres. The primary objective was to elucidate information on the existing practices of fish handling (onboard and onshore), fishing seasons, fishing trips, fish landings (including species landed), the nearest markets to which the fish is transported, the storage facilities available within and outside the fishing harbours, any surplus quantum that is processed/value added, etc.

Category 2 – Fish markets (Wholesale and Retail markets)

The target audience was the wholesalers, retailers and processors. The consumers who interact with the retailers was roped into infer information on the quality of the product they carry for consumption.

Category 3 – Fish Processing Centres

The target audience was the major fish processing units who were incidentally also exporters, small processors and people who were involved in fish trade including dry fish traders.

Category 4 –Fishery Officials

The senior officials and the Officials directly involved in marine fisheries and development were also interviewed.

Table 1.8: Number of Selected Sample Stakeholders

Fishing Harbours	**Sample Size**			
	Category - 1 FH/FJ/FLC	**Category – 2** Fish Market	**Category – 3** Fish Processing Centre	**Category – 4** Fishery Officials
Veraval Porbandar Mangrol	A* $20 \times 3 = 60$	Wholesaler $5 \times 3 = 15$ Retailer $10 \times 3 = 30$ Consumer $10 \times 3 = 30$	Exporter $2 \times 3 = 6$ Small Scale/local Processor $2 \times 3 = 6$	$2 \times 3 = 6$
Total	**60**	**75**	**12**	**6**

Note: A* - Fish Boat owners/crew = $10 \times 3 = 30$; Fishermen to haul the catches $10 \times 3 = 30$

Table 1.8 presents the number of stakeholders under each of the above four categories were contacted and interacted through the structured questionnaire as well as group discussion was conducted. The information were mostly sought through in personal conversation with the target groups, while some of the vital information was obtained through observations as this method was more a workable option when dealing with fishers.

1.8 Limitations of the Study

The study is based on both primary and secondary sources of data and hence the accuracy of results depends on the accuracy with which the data were generated. The study on post-harvest fishery losses is complicated by the individual characteristics of species, seasonal factors, handling, storage, processing, and transportation characteristics. As in the case of the processing, the technological properties of individual fish species need to take into account when deciding how they will be handled, processed and marketed. These posed the major constraints to assess post-harvest fish losses.

1.9 Organization of Report

The present study report is divided into six chapters including this introductory chapter. Fisheries development with special reference to marine fisheries in Gujarat has been presented in Chapter II. The Chapter III presents a review of fisheries policy and post-harvest infrastructure development in Gujarat. The secondary data and literature have been used for the study presented in both the chapters. The Chapter IV provides details on status and problems of post-harvest infrastructure in Gujarat. Incidences of post-harvest fishery losses and their causes have been assessed in Chapter V and the last chapter presents the summary of findings of the study and some policy implications.

The next chapter presents the fisheries development in Gujarat with focus on marine fish.

Chapter II

Fisheries Development in Gujarat:
Special reference to Marine Fisheries

2.1 Introduction

Gujarat is the northern most maritime State on the west coast of India situated between 20.6 and 24.42 degrees latitude and 68.10 and 74.28 degrees east longitude. The present political province of Gujarat is bounded by the Arabian Sea in the west, Pakistan in the north and northwest, Rajasthan in the northeast, Madhya Pradesh in the east and Maharashtra in the south and southeast. The geographical area of the State is 196024 sq. km and the population was 6.03 million in 2011 with population density of 308 persons per sq. km. The effective literacy percentage was 79.31 per cent, having male literacy rate of 87.23 per cent and same was 70.73 per cent in case of females. The State is presently divided into 33 revenue districts of which 15 are coastal districts (Kutch, Rajkot, Jamnagar, Porbandar, Gir Somnath, Devbhomi Dwarka, Junagadh, Amreli, Bhavnagar, Kheda, Anand, Bharuch, Surat Navsari and Valsad). Gujarat has one of the richest fishing grounds in India and the most important commercial varieties of fish (such as Pomfret, Hilsa, Bombay duck, Ribbon fish, Catfish, Rays, Cuttle fish, Shrimps etc.). Thus, Gujarat possesses a vast resource with favourable climates and environment condition for flourishing fish production through aquaculture.

2.2 Physical Features

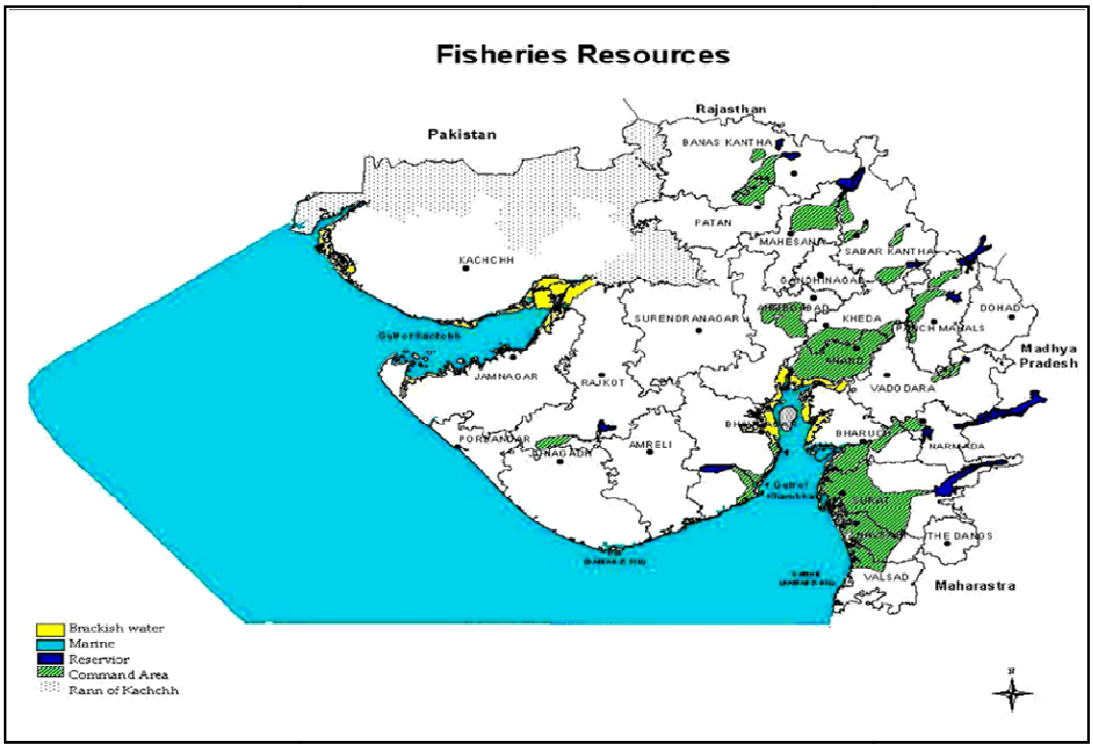
The State has three distinct geographical regions namely the peninsular Saurashtra, desert and marshy Kutch and the main land of the south, central and north Gujarat. Two extensive Gulfs, the Gulf of Khambat and the Gulf of Kutch, are the characteristic of coastal Gujarat. The coast line of Gujarat is 1600 kms long and salt marshes, sand-belts and gravel patches mark the topography. The southern coast of the Gulf

of Kutch is characterized by innumerable coral reefs tidal mudflats and coral islands. The area of the continental shelf of Gujarat is estimated at 184000 sq km and it is 34.71 per cent of the total shelf area of India. The maximum width of the continental shelf is 191 miles due west off Umbergoan (Valsad district) and minimum width is 58 miles between Madhavpur and Miyani (Porbandar district). The Rann of Kutch is a vast expanse of tidal mud flats flaked with saline efflorescence. The climate of the state is extreme. The temperature varies between 2˚ C to 9˚ C in winter and goes up to 41^{0}C to 46^{O}C in summer. The only source of rain for the state is the South West monsoon.

2.3 Fisheries Resources in Gujarat

Gujarat is endowed with a wide range of marine and inland aquatic resources. The state has a long coastline extending to 1600 km accounts for 19.70 per cent of the total coastline of country and about 46 per cent of the western coastline of India. It has a continental shelf area of 0.18 million km^{2}, Exclusive Economic Zone (EEZ) of 0.214 million km^{2}, which occupies 32 per cent of the continental shelf area and 10 per cent of the total EEZ of India. The Gujarat coast, including the two Gulfs, is blessed with physical features congenial to the development of fisheries (Fig. 2.1). The major fisheries resources of the state include Elasmobranches, Bombay ducks, Sciaenids, Shrimps, Seer fishes, Tunas, Threadfin Breams, Pomfrets, Catfishes, Lizard fishes, Bull's eyes, Carangids, Anchovies, Ribbon fishes, Croakers, Prawns, Lobsters and Cephalopods. Along the coastline of Gujarat, 851 fishing villages/towns and 286 marine landing centers are located. Gujarat has 123 fish landing centers located in 226 fishing village (Table 2.1). About 19 per cent of the landing centers are located in Valsad district followed by 15.45 per cent in Kutch district and 13.82 per cent each in Jamnagar and Junagarh and 8.13 per cent in Surat district. About 55062 fisherman family and 316972 fisher folk population is located in fishing villages.

Figure 2.1: Fisheries Resources in Gujarat State



Source: https://cof.gujarat.gov.in/Images/commissioneroffisheries/pdf/Fisheries-Glance-12-13.pdf

Table 2.1: Districtwise Fishery Resource Status in Gujarat (2012-13)

District	App. Length of coast line (kms)		Number of landing centers		Number of fishery villages		No. of fisherman family		Fisher Folk Population	
Valsad	63	(3.9)	23	(18.7)	25	(11.1)	10673	(19.4)	55851	(17.6)
Navsari	27	(1.7)	9	(7.3)	11	(4.9)	5364	(9.7)	24748	(7.8)
Surat	83	(5.2)	10	(8.1)	19	(8.4)	2252	(4.1)	11863	(3.7)
Bharuch	127	(7.9)	9	(7.3)	19	(8.4)	1273	(2.3)	6419	(2.0)
Anand	51	(3.2)	1	(0.8)	1	(0.4)	312	(0.6)	1694	(0.5)
Rajkot	26	(1.6)	1	(0.8)	1	(0.4)	140	(0.3)	870	(0.3)
Kachchh	406	(25.4)	19	(15.4)	65	(28.8)	4122	(7.5)	19694	(6.2)
Jamnagar	342	(21.4)	17	(13.8)	26	(11.5)	5982	(10.9)	40900	(12.9)
Bhavnagar	152	(9.5)	9	(7.3)	23	(10.2)	1351	(2.5)	6862	(2.2)
Porbandar	105	(6.6)	5	(4.1)	23	(10.2)	6048	(11.0)	32639	(10.3)
Junagadh	156	(9.8)	17	(13.8)	6	(2.7)	14704	(26.7)	88274	(27.8)
Amreli	62	(3.9)	3	(2.4)	7	(3.1)	2841	(5.2)	27158	(8.6)
Total	1600	(100.0)	123	(100.0)	226	(100.0)	55062	(100.0)	316972	(100.0)

Note: The figures in parentheses are the percentage of respective total.
Source: GOG (2013), Gujarat Fisheries Statistics 2012-13.

2.3.1 Fishermen Population

The details on fishermen population in Gujarat is presented in Table 2.2. As per the Census 2007, the total fishermen population in Gujarat state was 558691, of which 48.32 per cent were female. The fishermen population is spreads over 260 villages in 15 districts. About 218270 people were engaged in occupations related to fishing like, marketing of fish, making repairing of nets, curing- processing of fish etc. There were 218270 active fishermen of which 64.29 per cent were engaged in marine sector and 35.71 per cent were engaged in inland sector. There were 73.04 per cent of total active fishermen engaged in fishing activity. The remaining were engaged in activities like marketing (16.67%), net making (9.93%), hatchery (0.22%), Ornamental fishing (0.05%) and others activities (0.09). For districtwise details, please see, Annexure I-A.

Table 2.2: Fishermen Population in Gujarat State (2012-13)

Sr. No.	Item	Units- No.	Percent
1.	*Fishermen house*	103072	100.00
	a) Marine Sector	57013	55.31
	b) Inland Sector	46059	44.69
2.	*Fishermen Population*	558691	100.00
	a) Male	288758	51.68
	b) Female	269933	48.32
	c) Marine sector	327706	58.66
	d) Inland sector	230985	41.34
3.	*Literacy*		
	a) Male	132574	57.01
	b) Female	99979	42.99
4.	*Percentage of Active Fishermen*	218270	100.00
	a) Marine sector	140327	64.29
	b) Inland sector	77943	35.71
5.	*Percentage of Active Fishermen*		
	a) Actual fishing	159435	73.04
	b) Marketing	36376	16.67
	c) Net making	21670	9.93
	d) Hatchery	483	0.22
	e) Ornamental Fishing	102	0.05
	f) Others	204	0.09

Source: GOG (2013).

2.3.2 Coast line of Gujarat State

Fifteen out of thirty three revenue districts of the state are coastal and support the maritime fisheries activities and districts like Junagadh, Amreli, Jamnagar, Valsad and Kutch are the leading in such activities. The districtwise length of coastline has been presented in Table 2.3. It may be noted that Kutch accounted for the maximum of 25.38 per cent of state's costal line followed by Jamnagar (21.38 %), Junagadh (9.75 %), Bhavnagar (9.50 %) and Bharuch (7.94 %) district.

Table 2.3: Districtwise Length of Coastal Line of Gujarat State (2012-13)

Sr. No.	Name of district	Length of coastline (in km.)	Percentage with total
1.	Valsad	63	3.94
2.	Navsari	27	1.69
3.	Surat	83	5.19
4.	Bharuch	127	7.94
5.	Anand	51	3.19
6.	Rajkot	26	1.63
7.	Bhavnagar	152	9.50
8.	Kutch	406	25.38
9.	Jamnagar	342	21.38
10.	Porbandar	105	6.56
11.	Junagadh	156	9.75
12.	Amreli	62	3.88
	Total length	1600	100.00

Source: GOG (2013).

2.4 Fish Production in Gujarat

Over the last five decades, fisheries sector of Gujarat has undergone radical changes. While marine resources of Gujarat are spread mainly in the Arabian sea, the inland waters in the form of rivers, canals, estuaries, ponds, reservoirs, brackish water impoundments, waterlogged areas etc.

constitute a bed rock of inland fisheries in the state. The total fish production in the State has increased by almost ten times during last five decades period, i.e. from 0.79 lakh metric tonnes in 1960-61 to 7.93 lakh MT in 2013-14 (see, Table 2.4). The state has taken necessary steps in order to achieve the targets fixed for both inland and marine fish production in State (see, Annexure I-B). Out of the total production of 7.93 lakh MT in 2013-14, about 88 percent was marine fish while remaining 12 per cent was inland fish production. Thus marine dominate the fish production in Gujarat. As seen earlier, Gujarat is the third highest fish producer in India (after West Bengal and Andhra Pradesh) and the largest producer of marine fish. Gujarat's share in the total fish production has been fluctuating in volume terms and has come down in value terms in the last decade. The main reason could be the declining fish catch and quality of catch. It is reported that 35 per cent of the catch in the marine sector is low value miscellaneous fish. As mentioned earlier, in total marine fish production in the state, small sciaenid accounts for around 27 per cent followed by Bombay duck (14.30%), ribbon fish (5.63 %), Cuttlefish (3.85%) and catfish (3.6 %) in the year 2012-13 [see, Annexure I-C (I-III)].

The districtwise marine production in Gujarat during 2004-05 to 2014-15 is presented in Table 2.5. It can be seen from the table that Junagadh district contributes the bulk of the marine landings (40.79%), followed by Valsad (13.39%), Porbandar (13.28%), Kutch (10.12 %), Jamnagar (9.73%), Amreli (7.26%) and Navsari (4.0%). The remaining districts such as Bhavanagar, Rajkot, Surat, Baruch and Kheda accounts for less than one percent share in total. The Saurashtra coast between the Gulf of Kutch and Gulf of Cambay, presents unique oceanographic features and is endowed with a wide variety of highly relished table fishes. An incredible achievement of the state has been made in the foreign exchange earnings through export of fish and fish products. The details on districtwise specieswise marine fish production for the year 2012-13 are presented in Annexure I-D.

Table 2.4: Marine and Inland Fish Production in Gujarat

Years	Fish Production (in tonnes)			Value (Rs. in Crore)
	Marine	Inland	Total	
1960-61	79412	NA	79412	1.76
1970-71	151190	NA	151190	7.81
1971-72	147023	14167	161190	7.81
1975-76	208300	12695	220995	NA
1980-81	218872	17331	236203	67.52
1985-86	306577	24172	330749	186.28
1986-87	315942	24451	340393	208.95
1987-88	327560	22551	350111	228.96
1988-89	414075	22315	436390	273.15
1989-90	432364	27146	459510	293.85
1990-91	500462	45687	546149	410.39
1991-92	530017	39870	569887	518.02
1992-93	609103	51154	660257	689.01
1993-94	619836	65019	684855	821.42
1994-95	645261	70100	715361	1010.18
1995-96	598351	60158	658509	959.33
1996-97	660068	65278	725346	1111.31
1997-98	702355	70450	772805	1266.10
1998-99	551660	80068	631728	1195.24
1999-00	670951	70328	741279	1452.92
2000-01	620474	40590	661065	1374.10
2001-02	650829	50774	701603	1683.40
2002-03	743638	34267	777905	1889.36
2003-04	609136	45436	654572	1688.15
2004-05	584951	50628	635579	1701.10
2005-06	663884	69936	733820	2435.46
2006-07	676762	76821	753583	2559.75
2007-08	680848	78780	759628	2845.01
2008-09	683855	82047	765902	3063.23
2009-10	687445	84071	771516	3493.74
2010-11	688930	85972	774902	4151.05
2011-12	692488	91231	783719	4604.80
2012-13	693560	94930	788490	5130.68
2013-14	695580	97835	793415	5295.70

Source: www.indianstat.com

Table 2.5: Districtwise Marine Fish Production in Gujarat

District	Marine Fish Production in Gujarat ('000 metric tonnes)											% share in total 2014-15	CAGR (2004-05 to 2014-15)
	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15		
Valsad	78.6	79.1	57.7	41.5	35.2	81.4	87.5	87.6	88.5	92.9	92.8	13.29	1.52
Navsari	33.6	34.7	30.0	15.5	8.7	11.3	19.4	20.2	26.6	28.6	28.4	4.06	-1.52
Surat	8.7	11.2	10.4	9.5	3.5	4.5	2.5	3.2	3.2	3.5	3.5	0.50	-7.91
Bharuch	1.5	1.6	3.8	6.4	6.9	6.1	5.8	6.4	4.8	4.0	3.5	0.49	7.87
Anand	2.6	3.0	2.3	0.3	0.4	0.5	0.3	0.5	0.4	0.3	0.3	0.04	-18.65
Rajkot	1.9	1.5	2.7	2.3	1.0	1.0	1.1	1.0	0.5	0.6	0.2	0.03	-17.46
Kachchh	64.7	62.4	59.4	58.7	53.3	60.4	73.0	72.9	72.8	70.3	70.7	10.12	0.81
Jamnagar	45.9	66.5	65.2	59.2	62.6	88.3	67.5	67.1	67.8	68.1	68.0	9.73	3.63
Amreli	59.3	66.8	77.8	161.5	200.8	101.9	60.7	60.6	57.6	50.6	50.7	7.26	-1.41
Junagadh	233.3	281.5	300.8	259.8	250.8	265.0	280.2	280.9	278.1	283.0	284.9	40.79	1.83
Porbandar	49.9	51.0	60.4	61.6	56.4	63.4	88.6	89.6	90.8	91.5	92.8	13.28	5.80
Bhavnagar	5.0	4.6	6.3	4.6	4.4	3.6	2.2	2.6	2.4	2.1	2.8	0.39	-5.16
Total	585.0	663.9	676.8	680.8	683.9	687.4	688.9	692.5	693.6	695.6	698.5	100.0	

Source: GOG (2015), Fishery Statistics 2014-15, Commissioner of Fisheries, Government of Gujarat, Gandhinagar.

2.5 Post Harvest Infrastructures for Marine Fishing in Gujarat:

The major post-harvest infrastructures required for marine fishing are ice plants, cold storages, freezing plants, frozen storage, pulveriser machine and fish meal plants etc. It can be seen from Tables 2.6a and 2.6b that ice plants and cold storages are the major kinds of post harvest infrastructures available in required number in most of the coastal districts of Gujarat. The presence of other infrastructures is very less in various districts of the state.

Ice Plants:

Ice is essential to preserve fish at the time of catch for process. There are total 518 ice plants operating in coastal districts with total capacity of 9384.73 MT per day (Table 2.6a). Junagadh district has 109 ice plants, the highest in the state having capacity to produce 3246 MT of ice per day. Junagadh district contributes about 46.65 per cent to the total ice production of the state.

Cold Storages:

There are 273 cold storages operating in Gujarat with total capacity of 24150 tons. Junagadh district with 92 cold storages has 24.49 capacity of the state. There are 82 cold storages in Porbandar district having 2990 metric tonnes of capacity and Kheda district has only 4 cold storages plants with a capacity of 5415 metric tonnes. Ahmedabad district has 32 cold storages but all of the cold storages do not store fish.

Freezing Plants:

There are 95 freezing Plants operating in Gujarat with total capacity of 3257 M. tons. Out of the 95 plants, 76 plants are located in Junagarh district and 12 Porbandar district, with the capacity 2426 metric tonnes and 692 metric tonnes respectively.

Frozen Storage

There are 90 frozen storages operating in Gujarat with total capacity of 41112 metric tonnes. Junagadh district with 71 frozen storages has 67.59 per cent capacity of the state. There are 12 frozen storages in Porbandar district having 10764 metric tonnes of capacity while Jamnagar district has only 5 cold storages plants with a capacity of 1500 metric tonnes.

Pulveriser and Fish Meal Plants:

There are 62 pulverizers plant in the Gujarat state. The total installed capacity is 979 M. tones per day, of these plants 54 plants are located in Junagadh district with the capacity 804 M.T. per day followed by Porbandar district (7 plant) and Amreli (1 plant).

Boat Building Yard and Net Making Plants:

The boat building yards are located in Junagadh, Ahmedabad and Navsari having capacity to produce 752 boats, 472 boats and 185 boats in a year respectively.

Table 2.6a: Districtwise Infrastructure Facilities for Marine Fishing in Gujarat

Sr. No	Districts	Ice Factory		Cold Storage		Freezing Plants		Frozen Storage	
		No	Capacity	No	Capacity	No	Capacity	No	Capacity
1	Valsad	14	212	0	0	0	0	0	0
2	Navsari	8	115	0	0	1	20	1	560
3	The Dangs	0	0	0	0	0	0	0	0
4	Surat	41	560	5	430	1	35	1	500
5	Tapi	5	50	0	0	0	0	0	0
6	Bharuch	8	127	0	0	0	0	0	0
7	Narmada	1	15	0	0	0	0	0	0
8	Vadodara	27	398	10	168	0	0	0	0
9	Panchmahal	20	139	4	25	0	0	0	0
10	Dahod	6	63	1	10	0	0	0	0
11	Anand	11	67.23	11	5113	0	0	0	0
12	Kheda	3	33	4	5415	0	0	0	0
13	Ahmedabad	20	0	32	0	0	0	0	0
14	Gandhinagar	10	150	2	1800	0	0	0	0
15	Mehsana	14	180	1	10	0	0	0	0
16	Patan	0	0	0	0	0	0	0	0
17	Sabarkantha	9	94.5	0	0	0	0	0	0
18	Banaskantha	2	34	0	0	0	0	0	0
19	Surendranagar	14	92	14	100	0	0	0	0
20	Rajkot	58	850	0	0	0	0	0	0
21	Bhavnagar	14	20	0	0	0	0	0	0
22	Kutch	13	124	2	110	0	0	0	0
23	Jamnagar	25	747	11	2000	5	87	5	1500
24	Porbandar	82	1968	82	2990	12	692	12	10764
25	Junagadh	109	3246	92	5914	76	2423	71	27788
26	Amreli	4	100	2	65	0	0	0	0
Total		518	9384.73	273	24150	95	3257	90	41112

Source: GOG (2015).

Table 2.6b: Districtwise Infrastructure Facilities for Marine Fishing in Gujarat

Sr. No	Districts	Fish pulverser		Boat Building Yard		Fish meal Plant		Net Making Plant		Service Station
		No	Capacity	No	Capacity	No	Capacity	No	Capacity	
1	Valsad	0	0	0	0	0	0	0	0	1
2	Navsari	0	0	3	185	0	0	0	0	0
3	The Dangs	0	0	0	0	0	0	0	0	0
4	Surat	0	0	0	0	0	0	1	0.25	
5	Tapi	0	0	0	0	0	0	0	0	0
6	Bharuch	0	0	0	0	0	0	0	0	0
7	Narmada	0	0	0	0	0	0	0	0	0
8	Vadodara	0	0	0	0	0	0	0	0	0
9	Panchmahal	0	0	0	0	0	0	0	0	0
10	Dahod	0	0	0	0	0	0	1	0.45	0
11	Anand	0	0	0	0	0	0	0	0	0
12	Kheda	0	0	0	0	0	0	0	0	0
13	Ahmedabad	0	0	1	472	0	0	1	0.4	0
14	Gandhinagar	0	0	0	0	0	0	0	0	0
15	Mehsana	0	0	0	0	0	0	0	0	0
16	Patan	0	0	0	0	0	0	0	0	0
17	Sabarkantha	0	0	0	0	0	0	0	0	0
18	Banaskantha	0	0	0	0	0	0	0	0	0
19	Surendranagar	0	0	0	0	0	0	0	0	0
20	Rajkot	0	0	0	0	0	0	0	0	0
21	Bhavnagar	0	0	0	0	0	0	1	0.15	0
22	Kutch	0	0	0	0	0	0	0	0	15
23	Jamnagar	0	0	0	0	0	0	0	0	0
24	Porbandar	7	125	0	0	1	40	7	3.79	27
25	Junagadh	54	804	47	752	1	10	0	0	97
26	Amreli	1	50	0	0	0	0	0	0	0
Total		62	979	51	1409	2	50	11	5.04	140

Source: GOG (2015).

Fish Meal Plants:

There are two fish meal plants in the state, with a capacity of 50 M. tones per day, one of the plants are located in Junagadh district and

other one is located in Porbandar district.

Net Making Plants and service station

There are 11 net making plants having a capacity of 5.040 M. tones per day and 140 service stations for repair and maintenance of the boats. Out of 140 service stations, 97 are located in Junagadh, 27 are located in Porbandar, 15 are located in Kutch and only one located in Valsad district.

2.6 Fish Catch Disposition

In Gujarat, the share of marketing of fresh fish in total fish disposition was 31.15 percent in 2014, followed by frozen fish (22.07 percent) and curing (18.71 %). Among various fish catch disposition activities, relatively significant share of 20.07 per cent has been recorded in reduction activity (Table 2.7). Therefore, modern facilities set up for processing was mainly aimed at export market.

Table 2.7: Year-wise Fish Catch Disposition in Gujarat

Year	Fish Catch Disposition in Gujarat (Prod. in MT)				
	Marketing Fresh	Frozen	Curing	Reduction	Total
2005	228587	161733	137370	206129	733819
2006	234429	166354	141120	211680	753583
2007	236544	167588	142152	213344	759628
2008	238498	168973	143327	215104	765902
2009	240347	170313	144478	216378	771516
2010	241302	171060	145013	217527	774902
2011	244128	172967	146634	219990	783719
2012	245615	174020	147526	221329	788490
2013	248731	176227	149398	224137	798493
2014	252294	178752	151538	227348	809932
% share in total	31.15	22.07	18.71	28.07	100.00
Increase in 2014 over 2005 (%)	10.37	10.52	10.31	10.29	10.37

Source: GOG (2015).

2.7 Fishing Harbours in Gujarat

There are 5 fish harbours existing in the state. They are located in Dholai, Jakhau, Veraval, Mangrol and Porbandar with total fish production capacity of 388000 metric tons and another 5 harbours have been proposed to be established in the state (Table 2.8). Junagadh district has two major harbors, viz. Mangrol and Veraval harbours are with the highest fish production capacity of 235000 MT. Out of 14200 fishing crafts, 6500 are in Veraval, 3500 are in Porbandar and 2800 are in Mangrol.

Table 2.8: District wise major fish harbours and their capacity (2014)

District	No. of Harbours	Name of Harbours	Fish Production Capacity (Harbour-wise)	No .of Fish Landing centres	No. of Fishing crafts
Valsad	-	-	-	-	-
Navsari	1	Dholai	15000	10	400
Surat	-	-	-	-	-
Bharuch	-	-	-	-	-
Anand	-	-	-	-	-
Rajkot	-	-	-	-	-
Kachchh	1	Jakhau	53000	10	1000
Jamnagar	-	-	-	-	-
Amreli	-	-	-	-	-
Junagadh	2	Veraval, Mangrol	235000	12	6500, 2800
Porbandar	1	Porbandar	85000	10	3500
Bhavnagar	-	-	-	-	-
Gujarat	5		388000	42	14200

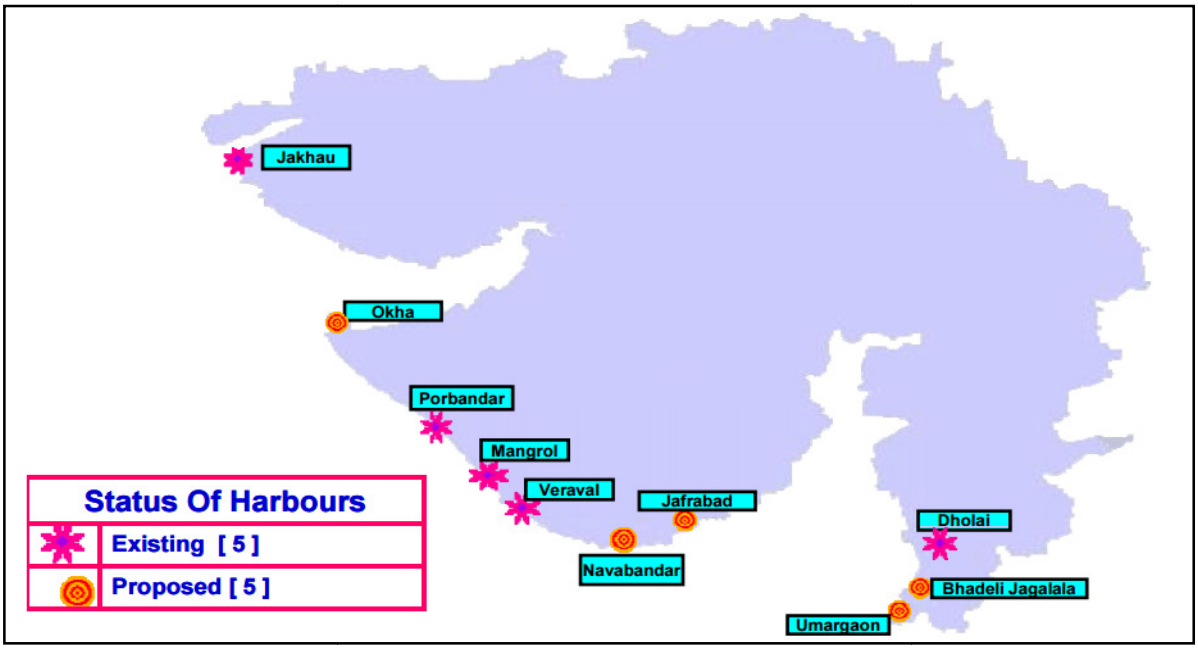
Source: GOG (2015).

2.8 Fishing Fleets in Gujarat

The majority of the fishermen of the state were artisanal fishing population, who inhabited a string of small hamlets along the shore, continued to fish much in the same manner as they did before. They use the traditional crafts of the state consist of the dugout canoes, Pleank build Lodhiya, Machhavas, Wahans etc. were used. These crafts were used only for inshore fishing, up to 5 km. from coast and 20 m. depth. Effort to motorize the traditional crafts began in 1953 at Jaleshwar village (Veraval) of the state. The state of Saurashtra

received some low H.P. OBMs and IBEs under the Technical Cooperation Mission (TCM) aid from the U.S.A. The first OBMs introduced were of 3 HP only. Subsequently from 1961 to 1966 introduction of higher HP OBMs was very intensive with an average rate of addition of about 98 boats per year. OBMs hardly received any policy support in any other states.

Figure 2.2: Status of Harbour in Gujarat state



Based on the growing evidence on the contributing of OBMs both in increasing production and improving the income and living standard of the poor section of the fishermen, the Seventh Plan laid major emphasis on motorization of the traditional crafts. Motorization of Traditional Craft, a production oriented scheme was introduced during 7th FYP Plan with the objective of (i) technological upgradation of traditional fishing sector, (ii) to help the fishermen to reduce their physical strain and (iii) to extend the range of their fishing operation primarily to increase the quantum of fish catch, income and thereby to uplift their socio-economic status.

As per 2007 Census, the state had 28706 boats; of which 18536 boats were mechanized and 10170 boats were non- mechanized. In the

year 2012-13, total 36770 boats were in-operation near Gujarat coast, of these 24612 boats were mechanized and 12158 boats were non-mechanized (Table 2.9). During the period from 2000-01 to 2012-13, annual rate of growth of fishing boats was estimated to be 1.88 per cent, while same was 2.86 percent per annum for mechanized boast. However, rate of growth was negative in case of non-mechanized during the same period. The details on districtwise mechanized and non-mechanized boats of Gujarat is given in Annexure I-E (I-III). Junagarh district accounts for highest number of fishing boats (28.62 %) followed by Porbandar (13.69%) and Jamnagar (8.72%) in the year 2012-13.

Table 2.9: Details on Availability of Fishing Boats in Gujarat (2000-01 to 2012-13)

Sr. No	Year	Mech. Fishing Boats	Non-Mech. Fishing Boats	Total Nos. of Boats	Trawler	Gillneter	Fiber Glass	Wooden Canoes Obm	Others Dollneter	% Annual Growth Rate		
										Mech.	Non-Mech.	Total
1	2000-01	18536	10170	28706	6948	3375	5162	1813	1238			
2	2001-02	19092	10414	29506	7029	3007	5584	1807	1665	3.00	2.40	2.79
3	2002-03	19668	10430	30098	7163	3031	6004	1805	1665	3.02	0.15	2.01
4	2003-04	18635	12365	31000	7402	3082	6390	263	1498	-5.25	18.55	3.00
5	2004-05	18369	11784	30153	7045	2319	6822	56	2127	-1.43	-4.70	-2.73
6	2005-06	19165	11905	31070	7090	2315	7566	56	2138	4.33	1.03	3.04
7	2006-07	20359	11011	31370	7189	2316	8650	56	2148	6.23	-7.51	0.96
8	2007-08	21569	10917	32486	7438	2352	9548	56	2175	5.94	-0.85	3.56
9	2008-09	22373	12109	34482	7434	2049	10381	59	2450	3.73	10.92	6.14
10	2009-10	22564	12141	34705	7409	2053	10572	83	2447	0.85	0.26	0.65
11	2010-11	22986	12164	35150	7419	2067	10999	83	2418	1.87	0.19	1.28
12	2011-12	23927	12163	36090	7470	2109	11857	83	2408	4.09	-0.01	2.67
13	2012-13	24612	12158	36770	7620	2062	12439	83	2408	2.86	-0.04	1.88

Source: GOG (2015).

2.9 Consumption of Fish in Gujarat

Fish does not play a substantial role in the food security of Gujarat, as local consumption of fish has been believed to be very low. But, of late, the consumption seems to have gone up as reported by the office of the Commissionarate of Fisheries, Gujarat State, Gandhinagar. The total consumption of fish in the state has been fluctuating although it has registered a decline as compared to level recorded in 2002-03 (Table 2.10). The domestic consumption of fish in State is in the form of fresh fish or dry fish. Dry edible fish in Gujarat is mostly consumed in the tribal pockets and urban centres like Ahmedabad, Baroda, Surat and in smaller towns in the hinter land. A major part of the dry edible fish is transported out of the State to the Mumbai, from where it is dispatched to various centres, even to the North Eastern States and Southern States of the country. During the year 2012-13, the total fish landing in Gujarat was of about 788490 metric tonnes (mt), of which 498769 mt. (i.e. 63.26 per cent) went for consumption within the state and 36.74 per cent were used for foreign and interstate export.

Table 2.10: Distribution Pattern of Fish Products in Gujarat state

Year	Total Production in MT	State Consumption	Consumption % to total	Market Outside State (Incl. Foreign Export)	Export % to total
2000-01	661064	415770	62.89	245293	37.11
2001-02	701603	538570	76.76	163033	23.24
2002-03	777905	609621	78.37	168284	21.63
2003-04	654572	483694	73.89	170878	26.11
2004-05	635579	462189	72.72	173390	27.28
2005-06	733820	570856	77.79	162964	22.21
2006-07	753583	502864	66.73	250719	33.27
2007-08	759628	547137	72.03	212491	27.97
2008-09	765902	552597	72.15	213306	27.85
2009-10	771516	548308	71.07	223208	28.93
2010-11	774902	522416	67.42	252486	32.58
2011-12	783719	531791	67.85	251928	32.15
2012-13	788490	498769	63.26	289721	36.74

Source: GOG (2013).

2.10 Exports of Marine Products from Gujarat

Marine products used to be exported from Gujarat coasts, even before organized efforts were made in this direction under the aegis of the Govt. agencies. Sun dried and salt cured Bombay duck, shark fins, golden anchovy, and air bladder of jew fish, thread fin, etc. were the major products of export in the earlier days, to Sri Lanka, Singapore, Malaysia, etc. Exports started picking up with the beginning of trawling in the Gujarat coast. With the landing of exportable varieties of fish and shrimp, freezing plants were set up in Veraval and Porbandar in the early '70s. In the initial days the exports were through the Bombay port. By 1972-73, direct export of fish began from the Gujarat coasts, through Veraval, Porbandar, Kandla and Okha Ports. A steady growth in the export of fish and fish products over the period was observed during the study period as shown in Table 2.11.

Table 2.11: Fish and Fish Products Export from India & Gujarat (2000-01 to 2012-2013)

[Qty.in.mt & value in crore Rs.]
[Average Price Realization]

Sr. No	Year	India			Gujarat			State's Share in India	
		Qty.	Value	Unit Value Rs/Kg	Qty.	Value	Unit Value Rs/Kg	Qty. %	Value %
1	2000-01	440473	6443.89	146.29	124159	615.65	49.59	28.19	9.55
2	2001-02	424470	5957.05	140.34	132175	625.72	47.34	31.14	10.50
3	2002-03	467297	6881.31	147.26	134047	760.36	56.72	28.69	11.05
4	2003-04	412017	6091.95	147.86	108386	614.41	56.69	26.31	10.09
5	2004-05	461329	6646.69	144.08	119951	704.59	58.74	26.00	10.60
6	2005-06	512164	7245.3	141.46	136485	934.88	68.50	26.65	12.90
7	2006-07	612641	8363.53	136.52	188166	1264.61	67.21	30.71	15.12
8	2007-08	541701	7620.92	140.68	150727	1141.97	75.76	27.82	14.98
9	2008-09	602835	8607.94	142.79	164725	1485.72	90.19	27.33	17.26
10	2009-10	678436	10048.53	148.11	183870	1838.75	100.0	27.10	18.30
11	2010-11	807063	12825.96	158.92	198297	2156.2	108.75	24.57	16.81
12	2011-12	862021	16597.23	192.54	196850	2533.99	128.73	22.84	15.27
13	2012-13	928216	18856.28	203.15	242057	2929.61	121.03	26.08	15.54

Source: www.mpeda.com (The Marine Products Export Development Authority, Kochi, India)

During 2000-01, the volume of fish and fish products exported was 1.24 Lakh MT worth Rs. 615.65 crores which increased to 2.42 lakh tonnes worth Rs. 2929.61 crores in the year 2012-13. In India, the total fish export during 2012-13 was 9.28 Lakh MT worth of Rs.18856.28 crore, in which Gujarat state share was about 26.08 percent in total quantity and 15.54 per cent in total value of the export.

Major Fish Items of Export

The export basket of marine products from Gujarat has undergone substantial changes. Dried fish was the prominent item of export during the fifties and sixties but in seventies, it gave way to frozen and canned products. Due to introduction of new deep sea fishing vessels and modification of the existing trawlers to suit deep sea fishing, a large quantity of fish became available for export. These frozen fish items had greater demand in the South East Asia countries as well as in the USA. Due to the introduction of scientific shrimp farming, the export of frozen value added shrimp is continuing as the major foreign exchange earner among marine product. The major fish item-wise export from Gujarat could be seen from Tables 2.11a and 2.11b. The export mainly consist of frozen fish verities (61.29 %) followed by frozen squid (10.24 %), frozen cuttle fish (8.52 %), frozen shrimp (2.45 %), dried item (1.43 %) and other item (16.04 %) during 2012-13. Frozen fish continued to be the major export value item accounting for 53.06 per cent of the total value earnings. Frozen fish exports during the study period increased by 58 per cent in quantity and 362 per cent in rupee value.

Frozen squid has retained its position as the principal export item in quantity terms and the second largest export item in value terms, accounted for a share of about 93 per cent in quantity and 356 per cent in value. Frozen Cuttlefish recorded a growth of 423.97 per cent in rupee value and 100 per cent in quantity terms. Export of dried item showed an increase of 373 per cent in rupee value and 200 per cent in quantity. Frozen Shrimp also showed a growth of 147 per cent in terms of rupee

value and 48 per cent of the total quantity during the period from 2001-02 to 2012-13. The total export item showed an increase of 336 per cent in value and 83 per cent in quantity these during period.

Table 2.12a: Export of Marine Frozen Fish and Fish Products from Gujarat (2001-02 to 2012-2013)

Year	Export of Marine Frozen Fish and Fish Products from Gujarat							
	Frozen Shrimp		Frozen Fish		Frozen Cuttle Fish		Frozen Squid	
	Q.	V.	Q.	V.	Q.	V.	Q.	V.
2001-02	4006	61.71	93596	336.18	10298	69.89	12841	78.73
2002-03	2192	44.34	88785	377.46	15061	118.52	15211	119.47
2003-04	3542	58.81	64340	268.42	13011	99.12	14435	102.88
2004-05	3180	56.25	78710	365.95	11267	86.37	13983	105.3
2005-06	3837	60.72	78738	407.94	16538	141.56	21121	203.21
2006-07	3977	65.72	129867	666.73	18511	196.14	16584	158.69
2007-08	3761.54	60.4	99903.43	568.6	11631.6	143.5	11838.7	106.79
2008-09	4305	77.79	96903	705.84	16052	188.21	20080	174.23
2009-10	4583	84.35	104329	873.77	18496	215.94	23165	191.96
2010-11	4147	80.46	114533	1067.06	19141	301.73	23209	224.1
2011-12	4538	132.75	135409	1465.7	16416	365.29	18675	251.56
2012-13	5931	152.27	148364	1554.31	20627	366.2	24797	358.97
Guj % 2012-13	2.45	5.2	61.29	53.06	8.52	12.5	10.24	12.25

Source: www.mpeda.com (The Marine Products Export Development Authority, Kochi, India)

Table 2.12b: Export of other and total Marine Fish and Fish Products from Gujarat (2001-02 to 2012-2013)

Year	Export of other and total Marine Fish and Fish Products from Gujarat									
	Dried Items		Live Items		Chilled Items		Other Items		Grand Total	
	Q.	V.	Q.	V.	Q.	V.	Q.	V.	Q.	V.
2001-02	1153	6.65	0	0	0	0	10281	72.56	132175	625.72
2002-03	1583	11.4	0	0	0	0	11215	89.17	134047	760.36
2003-04	1131	9.18	0	0	28	0.27	11899	75.73	108386	614.41
2004-05	1014	6.52	0	0	0	0	11797	84.2	119951	704.59
2005-06	1114	8.81	0	0	11	0.23	15126	112.41	136485	934.88
2006-07	2592	42.62	0	0	22	0.26	16613	134.45	188166	1264.61
2007-08	4295.88	75.29	0	0	7.84	0.16	19288.01	187.23	150727	1141.97
2008-09	5619	103.88	1	0.02	1	0.01	21764	235.74	164725	1485.72
2009-10	6887	216.08	3	0.04	90	4.57	26316	252.04	183869	1838.75
2010-11	5443	154.46	0	0	225	4.79	31599	323.6	198297	2156.2
2011-12	2948	93.83	0	0	221	5.44	18643	219.42	196850	2533.99
2012-13	3459	31.45	0	0	44	1.37	38835	465.04	242057	2929.61
Guj % 2012-13	1.43	1.07	0	0	0.02	0.05	16.04	15.87	99.99	100

Source: www.mpeda.com (The Marine Products Export Development Authority, Kochi, India)

Major Export Markets

It could be seen from Tables 2.13a and 2.13b that South East Asia was the largest buyer of Gujarat marine products with 46.38 per cent share in volume and 44.10 per cent share in value in 2012-13. The next highest buyer was European Union with 21.78 per cent share in value followed by China 16.22 per cent during the corresponding year. Export to South East Asia recorded an annual growth of 4.21 per cent per cent in volume and 22.73 per cent in value terms. This was mainly due to the increased export of Frozen Shrimp, Frozen Fish and Chilled items. Exports to European Union registered an annual growth of 8.39 per cent in quantity and 8.11 per cent in value and this was mainly due to increased export of Frozen Shrimp and cephalopods.

Table 2.13a: Country-wise Foreign Export of Marine Fish Products from Gujarat since 2001-02 to 2007-08

(Q.= Quantity in MT, V.= Value in Rupees Crores)

Country		Country-wise Foreign Export of Marine Fish Products from Gujarat						
		2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
Japan	Q.	7179	3492	4574	4790	6697	8503	9982
	V.	62.85	75.42	39.05	44	52.99	77.98	92.59
USA	Q.	4021	3773	3738	4993	6424	7484	5426
	V.	27.93	30.96	26.94	39.25	64.61	67.74	60.91
European Union	Q.	15936	21844	19142	20706	30208	28284	24871
	V.	127.82	188.06	163.92	182.28	298.21	309.09	269.55
China	Q.	86168	88957	63443	68004	68199	108881	77942
	V.	301.83	373.89	268.83	301.57	345.64	554.69	484.4
South East Asia	Q.	11795	7412	11224	14195	14453	16727	11499
	V.	58.77	54.05	68.04	78.91	85.42	113.27	78.81
Middle East	Q.	3650	2932	3799	3929	5138	7030	7355
	V.	28.09	22.15	33.22	36.3	51.71	74.57	75.97
Others	Q.	3426	2637	2466	3334	5366	11257	13652
	V.	18.43	15.83	14.41	222.28	36.3	67.27	79.74
Gujarat total	Q.	132175	131047	108386	119951	136485	188166	150727
	V.	625.72	760.36	614.41	904.59	934.88	1264.6	1142

Source: www.mpeda.com (The Marine Products Export Development Authority, Kochi, India)

Table 2.13b: Country-wise Foreign Export of Marine Fish Products from Gujarat since 2008-09 to 2012-13

Country	Country-wise Foreign Export of Marine Fish Products from Gujarat							
	Q. V.	2008-09	2009-10	2010-11	2011-12	2012-13	% Share in 2012-13	CAGR (2001-02 to 2012-13)
Japan	Q.	9590	11056	12220	12094	19196	7.93	9.35
	V.	122.16	111.87	131.72	140.18	233.04	7.95	12.65
USA	Q.	5300	5131	4344	2231	3707	1.53	-0.74
	V.	63.94	62.04	58.31	40.46	67.76	2.31	8.39
European Union	Q.	29819	38489	38778	25390	37576	15.52	8.11
	V.	344.1	422.79	499.72	456.64	638.07	21.78	15.74
China	Q.	76047	75157	71426	41902	46960	19.4	-5.37
	V.	549.59	724.51	763.7	502.7	475.07	16.22	4.21
South East Asia	Q.	22788	32168	50361	100646	112259	46.38	22.73
	V.	210.55	331.45	508.75	1219.5	1292	44.1	32.44
Middle East	Q.	6726	6922	7640	5125	3836	1.58	0.45
	V.	85	79.95	93.64	82.24	72.7	2.48	9.03
Others	Q.	14455	14946	13528	9462	18523	7.65	16.58
	V.	110.38	106.14	100.36	92.27	151.02	5.15	21.07
Gujarat total	Q.	164725	183869	198297	196850	242057	100	5.65
	V.	1485.7	1838.8	2156.2	2534	2929.6	100	15.07

Notes: Q means quantity in MT and V stands for value in Rupees Crores, CAGR stands for compound annual growth rate.
Source: www.mpeda.com *(*The Marine Products Export Development Authority, Kochi, India)

Japan continued to be one of the major buyers of our marine product with an annual growth of 9.35 per cent in volume and 12.65 per cent in value during a period of 2001-02 to 2012-13. China was one of the leading markets for fish items like Ribbon fish, Crocker etc. Exports to China showed a drastic decline by a CAGR of 5.37 per cent in quantities from Gujarat during the period from 2001-02 to 2012-13. The marine products exports have strengthened Gujarat's presence in South East Asia.

2.11 Exports of Marine Products from Gujarat

The table 2.13 shows the presence of 21 Fish Farmers Development Agencies (FFDA) spread over 22 district of state. A good number of these FFDAs were distributed in Gujarat state in which only Anand district

where large water bodies are expected to contribute to increase in fish production through aquaculture. The FFDAs in the state were designed to work as catalyst for promoting real investment in infrastructure for aquaculture development. Table 2.13 also reveals that the total water area brought under aquaculture as about 258 hectares with none of farmers having got training but only 28 persons benefited from the scheme.

Table 2.14: District wise Achievement of fish Farmers Development agencies till 2014-15

District	No. of FFDA	Water area Covered (in Ha)	Fish farmers trained (in Nos)	No. of beneficiaries	Any Other Characteristics of FFDA
Valsad	1	0	0	0	0
Navsari	1	0	0	0	0
Surat	1	0	0	0	0
Bharuch	1	0	0	0	0
Anand	1	258	0	28	0
Rajkot	1	0	0	0	0
Kachchh	1	0	0	0	0
Jamnagar	1	0	0	0	0
Amreli	1	0	0	0	0
Junagadh	1	0	0	0	0
Ahmedabad	1	0	0	0	0
Bhavnagar	1	0	0	0	0
Mahesana	1	0	0	0	0
Palanapur	1	0	0	0	0
Vadodara	1	0	0	0	0
Nadiyad	1	0	0	0	0
Rajpipla	1	0	0	0	0
Godhra	1	0	0	0	0
Dahod	1	0	0	0	0
Surendranagar	1	0	0	0	0
Himmatnagar	1	0	0	0	0
Gujarat	21	258	0	28	0

Source: GOG (2013).

2.12 Financing Fishery Development in Gujarat

The financial achievements under each of the mentioned minor head of development fisheries during the period from 2006-07 to 2012-13 are presented in Table 2.15. The expenditure (% against the release outlay) during this period was incurred between 75 to 99 percent with an overall expenditure of around 94 percent. For most of the head, the utilization has been above 90 percent, barring the head on 'Direction & Administration and 'Welfare Scheme for Fishermen', where the utilization has been low.

Table 2.15a: Annual Plan Outlays and Expenditure since 2006-2007 to 2009-10

Sr. No	Head Of Development	Annual Plan							
		2006-07		2007-08		2008-09		2009-10	
		Outlay	Exp	Outlay	Exp	Outlay	Exp	Outlay	Exp
1	2	3	4	5	6	7	8	9	10
1	Direction & Adm.	16.9	16.62	20.4	19.16	34	50.04	154.2	661.6
2	Inland Fisheries	380.5	396.2	350	295.3	529	523.3	1272	1212
3	Brackish water Fisheries	300	299.8	500	13.02	90	63.25	250	207.4
4	Marine Fisheries	235	361.6	1015	1515	3120	3269	3977	2812
5	Processing Preservation	5	3.74	1	0	50	50	0.01	10
6	Extension & Training	160	18.65	120	61.45	70	69.26	47	42.38
7	Fisheries Co-operative	5.6	3.75	5.6	35.79	40	25	25	23.33
8	other Expenditure	108	43.73	108	48	276	51	0	0
9	Research & Education	0	0	0	0	0	0	0	0
10	Boarder Area Devp. Programme	0	0	0	0	0	0	0	0
11	Tribal Area Sub Plan	238	337	260	259.2	671	668.7	120	120
12	Special Component Plan	119	84.97	120	63.98	120	55.3	0	0
13	Welfare Scheme For Fishermen	0	0	0	0		0	155	51.57
14	Earmarked for I.T	0	0	0	0	0	0	0	
	Total Fisheries	1568	1566	2500	2311	5000	4825	6000	5140

Source: GOG (2013).

Table 2.15b: Annual Plan Outlays and Expenditure since 2006-2007 to 2009-10

Sr. No	Head of Development	Annual Plan						% Exp. of Outlay 2012-13
		2010-11		2011-12		2012-13		
		Outlay	Exp	Outlay	Exp	Outlay	Exp	
1	2	11	12	13	14	15	16	17
1	Direction & Adm.	96	21.95	75	0	158.4	72.48	45.76
2	Inland Fisheries	1520	1515	1378	1364	1601	1539	96.14
3	Brackish water Fisheries	152.3	152.6	322	318.7	470	469.7	99.93
4	Marine Fisheries	3935	1816	2695	2118	4485	4471	99.69
5	Processing Preservation	400	381.8	400	239.1	250	232.1	92.86
6	Extension & Training	115	114.9	425	363.6	216	164.3	76.04
7	Fisheries Co-operative	26	24.99	52	24.99	33	31.65	95.91
8	Other Expenditure	0	0	163.2	99.3	257	115.1	44.77
9	Research & Education	0	0	0	0	0	0	0
10	Boarder Area Devp. Programme	0	0	0	0	0	0	0
11	Tribal Area Sub Plan	120	120	120	120	120	80.48	67.07
12	Special Component Plan	0	0	0	0	0	0	0
13	Welfare Scheme For Fishermen	156	59.27	0	0	50	20.65	41.3
14	Earmarked for I.T	180	59	100	0	60	59.99	99.98
	Total Fisheries	6700	4265	5730	4648	7700	7256	94.23

Source: GOG (2013).

The Fisheries Division of the Department of Animal Husbandry, Dairying and Fisheries (DAHD&F), Ministry of Agriculture has implemented 17 Central Sector/Centrally Sponsored Schemes during the Ninth Five-Year Plan period (1997–2002). During the Tenth Plan (2002–2007), based on the discussions of the Working Group on Fisheries set up for the Tenth Plan with the Planning Commission and the DAHD&F, the 17 ongoing schemes were converged into seven major schemes. The objective of merging these schemes was to have a comprehensive and focused approach for fisheries development in the country. Subsequently, during the Eleventh Plan period (2007–2012), the scheme on 'Training and

Extension', which was operated as a separate scheme up to the end of Tenth Plan, was included as a component under the 'National Scheme on Welfare of Fishermen'. Thus during the Eleventh Plan, five schemes, including the scheme on National Fisheries Development Board (NFDB) were implemented.

Table 2.16: Funds Released by National Fisheries Development Board (NFDB) in Gujarat (2007-2008 to 2013-2014-upto 07.02.2014)

(Rs. in lakh)

Name of Activities	Fund Released during 11th Plan					Fund Released During 12th Plan
	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Intensive Aquaculture in Ponds & Tanks	2.09	-	-	-	0	-
Seaweed Cultivation	0.7	-	-	-	0	2.02
Infrastructure for Post harvest processing	-	-	-	776	776	246.23
Domestic Marketing	-	-	-	69.77	0	-
Other Activities	-	-	-	0.47	0	6.54
Human Resources Development	-	-	-	-	0.79	-
Total	2.79	0	0	846.23	776.79	254.79

Source: Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, Govt. of India.

The most of the national fishery policies include the following objectives:-

a) To increase income and employment within the fishery sector;
b) To improve the levels of national nutrition, especially the availability of fish protein;
c) To maintain maximum utilization of fishery sector;
d) To increase foreign exchange earnings; and
e) To reduce inequities in the distribution of income and food supplies within the fishing community.

2.13 Constraints

The fishing industry is the most outstanding part of the financial growth and development of Gujarat as it has the largest coastal line in India. Gujarat has a vibrant potentiality fishery development. More ever, Gujarat is well known to be heterogeneous with respect to inland water resource. The people residing along the coastal belt of the state, the rivers lakes and reservoirs have been found traditionally engaged in fishing for the immemorial time but due to vegetarian food habits, religious restrains the domestic demand of fish is very low, compared to other states. As a result, major part of fish and fishery products produced in the state goes out either to other states or to foreign country.

Fish catch fluctuations are a severe handicap for the economic returns of the fishing fleet and the fish industry in almost every kind of fishery. The major causes of these fluctuations included: (1) migration of the fish and changes in their accessibility at various times of the day and of the year; (2) variations in the sizes of the fish population; and (3) differences in the intensity of fishing. There is frequently an inter-relationship between the availability vis-à-vis the abundance of the fish and the intensity of fishing. In view of the large protein needs of the human race, the greatest possible yield should be sought.

The next chapter reviews the fisheries policies in Gujarat.

Chapter III

Review of Fisheries Policies in Gujarat

3.1 Fisheries Regulation and Policies

The control and regulation of fishing and fisheries within territorial waters is the exclusive province of the state, whereas beyond the territorial waters, it is the exclusive domain of the Union[1] (Government of India). The Ministry of Agriculture and Farmers Welfare, Government of India as per the allocated rules of fisheries, helps the coastal states and Union Territories in development of fisheries within the territorial waters, besides attending to the requirements of the sector in the Exclusive Economic Zone EEZ (Fig 3.1). The Ministry of Agriculture (Department of Animal Husbandry, Dairying and Fisheries- DAHD&F), within the purview of its allocated business, helps the coastal States/UTs in development of fisheries within the territorial waters, besides attending to the requirements of the sector in the EEZ. Therefore, management of fishery exploitation in the EEZ requires close coordination between the Union and the States (GOI, 2011).

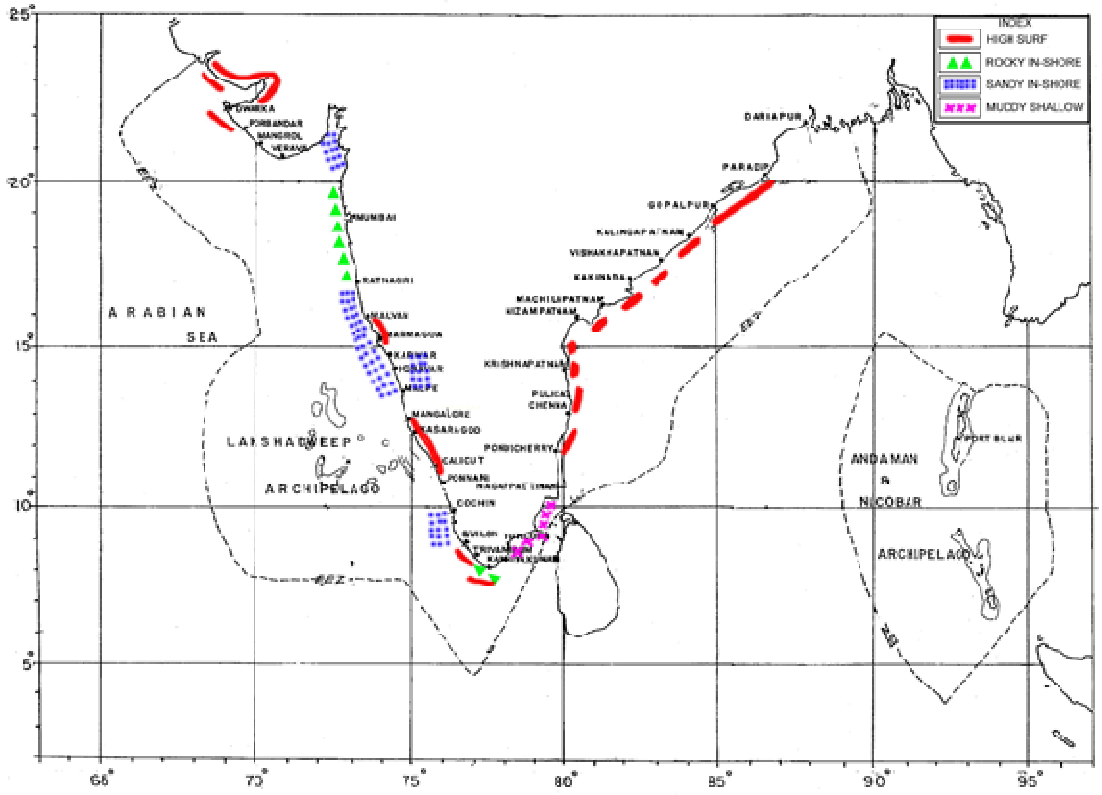
3.1.1 Role of Central Government:

The Ministry of Agriculture (Department of Animal Husbandry, Dairying and Fisheries-DAHD&F) which is responsible for fisheries development and management in the country formulates developmental strategies for the sector and issues policy guidelines for fisheries development and management. It also provides technical and financial assistance for the purpose to various States/UTs. The financial assistance is over and above the budgetary support provided to the States by the Planning Commission. Other Central Ministries/Departments like the Ministry of Commerce and Industry (MOCI), Ministry of Earth Sciences

[1] Entry 57 of List 1 of Seventh Schedule of the Constitution of India specifies *Fishing and Fisheries beyond Territorial Waters* as Union Subject, whereas Entry 21 of List II speaks of Fisheries as a State Subject.

(MOES), Ministry of Food Processing Industries (MOFPI), Ministry of Environment and Forests (MOEF) play important role in various aspect of fisheries resources management. At the national level, the Ministry of Defense (MOD) through the Indian Coast Guard (ICG) is also associated with the management of fisheries in the EEZ.

Fig. 3.1: India's Coastal Features



For conservation and effective management of fishery resources and also for sea safety reasons, the fisheries legislation[2]/legal frameworks/

[2] For sustainable development of the marine resources, India amended its constitution in 1976. The Indian Parliament enacted the Territorial Sea, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Acts in 1976, pursuant to which a 200 nautical mile EEZ was established. Since then, India has also enacted a number of other laws and regulations, including the Marine Products Export Development Authority Act, 1972; the Indian Coast Guard Act, 1978, the Maritime Zones of India (Regulation of Fishing by Foreign Vessels), Act, 1981 and the related Rules of August, 1982, the Environment Protection Act, 1986, etc. The other Central legislation, which has important bearing on the fisheries sector include the Merchant Shipping Act, 1956 and the Wildlife Protection Act, 1972. However, there is still no law to regulate the wholly Indian-owned fishing vessels operating in the EEZ (GOI, 2011).

Marine Fishing Policy 2004[3]/office memorandum[4] has been provided by the GOI from time to time to all the States and Union Territories of India.

The main objective of the policy is to ensure sustainable development of marine fisheries with due concern for ecological integrity and biodiversity. The policy calls for adopting fisheries management regimes such as registration of fishing vessels, observation of closed fishing seasons, prescription of destructive fishing methods, implementation of mesh-size regulations, reduction of by-catch and discards and establishing an effective monitoring, control and surveillance mechanism. The guidelines specifically call for compliance with Code of Conduct for Responsible Fisheries (CCRF[5]) and other international rules and regulations in the management of fish stocks. Besides these, a uniform fishing holiday is declared every year in the EEZ along east and west coasts. A national committee has also been constituted to effectively implement the provisions of the 1995 CCRF[6].

Fisheries development and planning is undertaken through the Five-Year Plans (FYP) formulated by the government since 1951. The initial Five-Year Plans, starting from the 1950s, focused more on the 'development' of the sector, and on increasing production, while it was only in the Ninth and Tenth FYP period that the need for conservation and management was explicitly recognized. Besides these, several conservation measures have been initiated by the Ministry of Environment and Forests (MOEF), especially towards safeguarding against trade in endangered species (such as sea turtle, sea cucumbers, sea horse, and several species of mollusks), protection of certain habitats such as coral reefs, mangroves

[3] Comprehensive Marine Fishing Policy document which seeks a focused endeavour from the coastal States and the Central Departments with full appreciation of the international conventions in force for conservation, management and sustainable utilization of our invaluable marine wealth, without losing its relevance to the food and livelihood security of the coastal communities which totally depend on this (see, Annexure II).
[4] Order of even No. dated 03.02.2016 issued by Government regarding implementation of a uniform fishing ban in the Indian Exclusive Economic Zone (EEZ) beyond territorial water for conservation and effective management of fishery resources and also for sea safety reasons (see, Annexure III).
[5] http://www.fao.org/docrep/005/v9878e/v9878e00.htm
[6] http://indianfisheries.icsf.net/en/page

and breeding grounds of turtles, by designating protected areas (such as national parks and sanctuaries). The DAHD&F is implementing the various Schemes[7] to promote fisheries in the country. The Central Schemes for development of fisheries Sector are:

1. Implementation of Centrally Sponsored Scheme on Development of Inland Fisheries and Aquaculture in states/UTs during 2015-16.
2. Continuation of Centrally Sponsored Scheme on Development of Marine fisheries, Infrastructure and Post Harvest Operations as Central Sector Scheme.
3. Implementation of Central Sector Scheme "National Scheme of Welfare of Fishermen" in states/UT during 2015-16.

International Fishery Management Statutes and Regulations

In view of the prospective changes in the International law of the Seas at the UNCLOS[8] (United Nations Convention on the Law of the Sea)-III, the Indian Parliament extended the constitutional recognition to the new concept of an Exclusive Economic Zone (EEZ) in May 1976, and enacted the Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zone Act (1977) with effect from January, 1977. As a result, territorial waters up to 12 nautical miles were vested with the exclusive jurisdiction of the states, while the rights for management and exploitation of the EEZ were exclusively with the Central Government.

In November 1981, the Maritime Zones of India (Regulation of Fishing by Foreign Vessels Act (1981) came into force. It laid down conditions, under which foreign fishing vessels could operate in Indian Maritime Zones, clearly prohibiting fishing in territorial waters. The Deep Sea Fishing Policy (1991) adopted during this period, however, it was scrapped later. The Indian Coast Guard had been established in 1978

[7] See, Annexure IV.

[8] The United Nations Convention on the Law of the Sea (UNCLOS) is the international agreement that resulted from the third United Nations Conference on the Law of the Sea (UNCLOS III), which took place between 1973 and 1982. The convention was opened for signature on 10 December 1982 and entered into force on 16 November 1994 upon deposition of the 60th instrument of ratification.

itself, as a consequence of the Maritime Zones Act and directly dealt with anti poaching activities in the Exclusive Economic Zone of India.

3.1.2 Role of the State Governments:

The State/UT Governments are the principle custodians of fisheries and aquaculture activities in their respective jurisdictions (land as well as the territorial waters). In the marine sector, they are responsible for fisheries development and management with the main objectives of planning and development of infrastructure facilities for landing and berthing of fishing craft, creating suitable marketing facilities, implementation of various fisheries development programmes *viz*., channelizing financial assistance for purchase of fishing implements, implementation of socio-economic programmes and interactions with the Government of India and other agencies for technical and financial assistance. Each State/UT has a Department of Fisheries, which functions as its main implementation agency for fisheries and aquaculture development programmes.

The state level fisheries management is undertaken mainly through licensing, prohibitions on certain fishing gear, regulations on mesh size and establishment of closed seasons and areas, under the Marine Fishing Regulation Act (MFRA). Zones are demarcated by each State based on distance from the shoreline (from 5 km to 10 km) or on depth. These in-shore zones, where trawling and other forms of mechanized fishing are not permitted, are perhaps the most important space-based fisheries management measure in place. The closed season or 'monsoon fishing ban' is another important 'temporal-spatial' management measure implemented on both the east and west coasts of India for a period of 47 days and 65 days respectively, during, what is considered to be the spawning and breeding season.

Besides these, there are several State-specific management measures, such as fishing regulation measures adopted by Orissa to protect the

turtle nesting and breeding grounds, mandatory requirement to use turtle excluder devices.

3.2 Fishing Policies in Gujarat

Fish production from near shore waters (0-50 meter) has reached its optimum yield levels and has been stagnant for some years. To sustain this production and to ensure that the major fisheries do not suffer any irreparable damage, improved management features, based on community participatory approach have to be put in place earliest. Small trawlers may be encouraged to diversity into fishing activities that can be practiced further off-shore, in order to reduce overcrowding in coastal waters and reduce the pressure on the fish stock. The bottom trawls operated from mechanized and motorized craft are being excessively used. The trawl biomass appears to be over exploited so a reduction in the trawl effort is necessary to sustain the trawl fishery. Mechanized vessels below 20m OAL (overall length) require major inputs in their design to not only increase their voyage period but also facilitate preserving the catch in good condition. On-shore infrastructure to support increased exploitation of the resource would need rational investment with technology possibly through foreign collaboration. Some of the adopted policies to take care of above problems are presented here.

a) Deep Sea Fishing Policy

The Ministry of Agriculture, Government of India has drafted the Deep Sea Fishing Policy under which the Government proposes to revive the deep sea fishing operations. The government has been advised to invoke foreign equity and expertise through wet chartered vessels and joint venture to tide over the capital intensive propositions and promulgate strict rules for their fishing areas in the deep sea to avoid any social conflicts. Once Gujarat acquires a deep sea fishing fleet in both Government and private sector, it would fish not only in the Indian EEZ but also beyond in the international waters. In addition, under

contractional managements, the Gujarat Deep Sea Fishing Fleet could operate in the EEZ of other maritime countries bordering the Arabian Sea and elsewhere and generate exportable commodity.

b) Saurashtra and Kutch Fisheries Rules

Saurashtra and Kutch Fisheries rule in 1950 and 1953 respectively were notified and were made operational in the respective regions of the new Gujarat state, till the mid-seventies. Later, due to Court directives, the imposing of royalty and license fee were scrapped. However, the other sections of the Saurashtra and Kutch Fisheries Rules have not been officially scrapped as yet.

c) Conservation of Marine Resources

The Government of Gujarat declared the first Marine National Park (MNP) under the Wild Life (Protection) Act (1972), and the Forests Act (1976). The Marine Part area covers 162.89 km^2 and a marine sanctuary covers 295.03 km^2 in the Gulf of Kutch.

d) Gujarat Fisheries Act 2003

Central government had drafted a Model Bill pertaining to Fisheries Management in the states and circulated it as an advisory exercise to all the states. Various states such as Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa and Pondicherry landed to the advice and have drawn up their Marine Fishing Regulation Act (MFRA). Gujarat has adopted its Fisheries act in 2003. The Gujarat Fisheries Act 2003 was published in "Gujarat Government Gazette', on the 12th March, 2003 (see, Annexure V). The main objective of act is to provide 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 coast line of the State

3.3 Programs and Schemes

The Commissionerate of Fisheries, Govt. of Gujarat is the implementing agency for different state government relief schemes such as given below:

i) Fishing Nets

Different types of fishing nets are produced by the department and that is provided to the fishermen. There are three different types of fishing such as

- Nylon multi filament net
- H.D.P.E. Net
- Nylon mono filament net

ii) Fish Seed

Different types of fresh water fish seeds like spawn, fry, advanced fry, finger lingsana and advanced finger lingsana are available in different sizes.

iii) Marine Engines and Diesel Rates

Sale of diesel for fishing is done by the department at different diesel pumps as Veraval, Madhvad, Rajpara, Navabandar, Jafrabad, Mangrol, Porbandar, Rupel, Aditra, Okha, Salaya, Sachana, Umargam, Dholai And Kosamba.

iv) Fisherman Accident Insurance Scheme

Fishermen Accident Group Insurance Scheme was provided which covers 1,72,359 fishermen. In the case of accident during fishing activity, fishermen will get Rs. 1 lakh by claim.

v) Implementation of Government Projects

Department is the implementing agency for different state government relief schemes like boat/net scheme, Pagadiya tribe trainee kit, aquarium, fish and accessories etc. On purchase of different products fishermen are entitled for relief of up to 50 per cent, 70 per cent and 90 per cent on the price of products. Choosing of the beneficiaries will be done by the concerned fisheries offices.

3.3.1 Various Schemes by Government of Gujarat

Besides Central Government Schemes, the State Government of Gujarat is also implementing various need based programmes like: assistance to the fishing vessels for purchasing electrical equipments, life saving equipments, Distress Alert Transmission (DAT), fishing nets, insulated boxes, solar lights, assistance for fish marketing to women, assistance to artisanal fishermen, training to fishermen and extension services. Fish landing centers are also upgraded by the State Government.

Some of the major schemes implemented for development of fishermen in the state are:

(a) Subsidy for acquiring Modern Equipments
(b) Relief to families of the fishermen captured by Pakistani Authority
(c) Motorisation/Mechanization of Traditional Craft/Boats
(d) Safety Measures on Fishing Boats
(e) Processing, Preservation and Marketing
(f) Purchase of Gill Nets for Small and *Pagadiya* Fishermen
(g) Assistance for Women Self Help Group of Fishing Community
(h) Scheme for having hygienic or portable toilets on fishing boats
(i) Assistance for Training of Schedule Caste Youth Fishermen
(j) Schemes for Fishing Activities in Salty Water
(k) Housing scheme for Fishermen
(l) Scheme for Fish Seeds Growing and Collection
(m) Scheme for Boat/ Fishing Nets
(n) Assistance for Purchase of Plastic kits (boxes) for transporting fish
(o) Assistance for establishing group hatchery for colorful fishes.
(p) Group Accident Insurance Scheme for active fishermen

(a) Subsidy for acquiring Modern Equipments[9]:

- To give warning to fishermen during cyclone and to keep contact with shore during the troubles in the sea while fishing and also to

[9] See, Annexure I (F) for number of farmers covered under GPS facility.

make communication between boats, the modern communication equipments are essential for fishermen.

- The subsidy is given to the fishermen on the purchase of modern equipments like inverter, electric chulha, water pump and CFL lamp. Fishermen are provided assistance up to Rs. 15,000 on the purchase of two batteries for running fishing boats, Inverter, electric chulha, water pump, CFL lamp etc.
- A subsidy of Rs. 3500 on the purchase of Solar Lantern is also given to the fishermen with ARP boats.
- Fishermen are also provided assistance of 50 per cent subsidy towards purchasing life-saving appliances such as life saving jacket, emergency light, lifeboat rings etc. A fisherman is provided 50 per cent subsidy each on purchase of 6 units of life saving jackets costing about Rs 20000, 2 units of lifeboat rings costing about Rs. 10,000 and 2 units of emergency light costing about Rs. 10,000. Thus total assistance of Rs 20000 is given to a fisherman for purchasing life saving appliances.
- Subsidy of *Pagadiya*[10] Fishermen: The pagadiya fishermen from Rajkot, Jamnagar, Surendranagar and Kutch district do not have boats or vehicles. They go for fishing on foot. To improve their life standard, 90 per cent subsidy is provided to fishermen for purchase of bicycle costing about Rs. 3000, net insulated box costing about Rs.1500, weighing scale costing about Rs. 500. Thus a total assistance up to Rs. 7200 is given as subsidy to the *Pagadiya* Fishermen on their purchase of about Rs 8000.

(b) Relief to families of fishermen captured by Pakistani Authority:

- Rs.150/- per day financial assistance is given to family members of the fishermen captured by Pakistani Authorities.

[10] See, Annexure I (G) for details on districtwise number of *Pagadiya* fishermen (2012-13).

- Scheme is sanctioned vide G.R. NO. NVB/132002/4184/T dated 27/8/2003, which is applicable to those fishermen from Gujarat who are apprehended after Dt.1-4-2003.

(c) Motorisation/Mechanization of Traditional Craft/Boats

- The 50 per cent amount of the OBM or Rs. 30,000/- whichever is less is given as subsidy to fishermen who fit the OBM in their traditional boat.
- They are also given maximum assistance/ subsidy up to Rs. 60,000 for purchasing four stroke engine for mechanization of their traditional boats. Both kind of subsidy can be availed once in seven years.

(d) Safety[11] Measures on Fishing Boats

- There is a provision to provide subsidy of 90 per cent (Rs. 15,300) on purchase of Distress Alert Transmitter (DAT[12]) that costs about Rs. 17,000 for facilitating safety of fishermen on fishing boats.

(e) Processing, Preservation and Marketing

Sr. No.	Equipment	Rate of subsidy
1.	Upgradation of cold storage	50 % of the total cost or Rs. 2.5 lakhs, whichever is less.
2.	Upgradation of ice plant	50 % of the total cost or Rs. 5.0 lakhs, whichever is less.
3.	Upgradation of processing plant	50 % of the total cost or Rs. 50.0 lakhs, whichever is less.
4	Purchase of value added machinery	50 % of the total cost or Rs. 1 crore, whichever is less
5	Solar dryer for fish drying	50 percent subsidy (i.e., Rs 75000) is provided for purchase of small solar dryer costing about Rs 1.5 lakhs and; 50 percent subsidy (i.e., Rs 10 lakhs) is given for purchase of big sized solar dryer costing about Rs 20 lakhs
6	Flack ice slurry machine	50 percent of the total cost or Rs. 5 lakhs, whichever is less.
7	Generator set and flash light	50 percent of the total cost or Rs. 20 thousand, whichever is less.
8	Insulated box	50 percent of the total cost or Rs. 7500, whichever is less.

[11] In the interest of National security, it is mandatory to register all the fishing boats online. The registration facility is available in all the maritime Districts of Gujarat State (see, details on online boat registration are given in Annexure I (H). The details on biometric identity card issued in marine sector are given in Annexure I (I).

[12] See, Annexure I (J) for number of farmers covered under DAT facility.

- Under this scheme, fishermen are entitled to get subsidy as mentioned above- New item scheme for Processing Preservation and Marketing is implemented with an object of selling fish in hygienic condition to avail affordable price for it and to make it easily available to people in market.

(f) Purchase of Gill Nets for Small and *Pagadiya* Fishermen

- The Small and Pagadiya Fishermen who make machines on the outskirts are provided Rs 25000 as 25% subsidy for Purchase of Gill Nets of up to 4 inches or more size that costs about Rs1 lakh.

(g) Assistance for Women Self Help Group of Fishing Community

- The Women Self Help Group of Fishing Community are provided 75 per cent subsidy (i.e., Rs 187500 per SHG) on purchase of mechanized trolley that costs about 2.5 lakhs.
- The women fishermen are provided 75 per cent subsidy on Rs 1 lakh (i.e., Rs 75000 per SHG) for development or establishment of marketing infrastructure for retail fish marketing.
- The individual fisherwoman is eligible to get a subsidy of 50 percent (i.e., Rs 5000) of the total cost of purchase of insulated box, non-insulated box, trolley and weighing machine together costing about Rs. 10 thousands.

(h) Scheme for having hygienic or portable toilets on fishing boats

- The fishermen are provided Rs 10000 as for creating hygienic or portable toilets on fishing boats that costs about 15000.

(i) Assistance for Training of Schedule Caste Youth Fishermen

- The schedule caste youth fishermen are given stipend of Rs 125 per day for 10 days short-term training on various fishing activities.

(j) Schemes for Fishing Activities in Salty Water

- Fishermen are provided 25 per cent of the total costs of construction of Shrimp Farming unit as subsidy. They can avail the same up to 2 ha of shrimp farming which costs about 150000/ha.
- Input assistance up to Rs 15,000 per hectare is given as subsidy which is roughly 20 per cent of total input cost per hectare
- Shrimp fishermen are also given stipend of Rs 125 per day for 05 days short-term training on various shrimp farming.

(k) Housing scheme for Fishermen

- Full assistance up to Rs 50,000 per constructing a house by a fisherman will be provided which will be borne by both Central and State Government (50% each by State & Central Government)
- Full assistance up to Rs 30,000 per constructing a public tube well by the fisherman community will be provided which will be borne by both Central and State Government (50% each).
- There is a provision of assistance of Rs 1, 75,000 to construct a community hall for every 50 fishermen families.

(l) Scheme for Fish Seed Growing and Collection

- There are a number of schemes for growing different types of fresh water fish seeds like spawn, fry, advanced fry, fingerling and advanced fingerling in different sizes.

Sr. No.	Programme	Rate of recovery	Rate for growing 1000 fish seeds (Rs)
1	Rs 3.00 lakhs for converting spawn to fry	30%	Rs 70
2	Rs 2.00 lakhs for converting fry to fingerling	35%	Rs 150
3	Rs 5.00 lakhs for converting spawn to fingerling	12%	Rs 180

- There are also some incentives for Fish Seeds Collection as well. A subsidy of 50 per cent is given to the fishermen towards prices of fish seeds collected from ponds and its transportation costs.

(m) Scheme for Boat/ Fishing Nets

- Some assistance/schemes are given to the fishermen **for d**ifferent types of fishing nets/boats. There are three different types of fishing nets such as: Nylon multi filament net, HDPE Net and Nylon mono filament net
- As per the State government norms, 50 per cent subsidy (i.e., Rs 7,500) on the total cost of Boat (Rs 10000) and net (Rs 5000) is given to fishermen.

(n) Assistance for Purchase of Plastic kits (boxes) for transporting fish

- Assistance is also provided for purchase of Plastic kits (boxes) for transporting fish up to 50 per cent of total cost of each plastic box.

(o) Assistance for establishing group hatchery for colorful fishes.

- Out of total expenditure of Rs.1.5 lakh per unit, 50 per cent subsidy is provided by NFDB for establishing group hatchery for colorful fishes and 30 per cent matching grant is provided by the government of Gujarat.
- Moreover, rearing space development could be undertaken with the irrigation department costing about Rs 4 lakh per hectare, which can be used by the fishermen.

(p) Group Accident Insurance Scheme for active fishermen

- The state Government is implementing 50% Centrally Sponsored Scheme Group Accident Insurance Scheme for active fishermen of Co-operative Fisheries Societies of the state.
- Under this scheme Government provides insurance cover of Rs. Rs 2 lakhs against death or permanent total disability and Rs. 1.0 lakh for partial permanent disability and Rs 10000 is reimbursed for medical expenditure, in case of disability treatment.

3.4 Gujarat Fisheries Central Co-operative Association

The cooperative fisheries societies are working in Gujarat for the development of fishery sector in general and development of fishermen in particular. There were total 639 cooperative fishery societies registered, out of which 49 percent societies were Marine fishery cooperatives (see, Annexure I-K). Gujarat Fisheries Central Co-operative Association Limited (GFCCA) is an apex cooperative body of the fishermen cooperatives in the State of Gujarat. It was established in the year 1956 with financial and administrative support of the Government of Gujarat. The head office of GFCCA is in Ahmadabad (https://gfcca.gujarat.gov.in).

The Government of Gujarat has a major shareholding of about Rs.78.85 lakhs, out of the total paid up shareholding of Rs.87.20 lakhs. About 291 primary cooperatives and 2945 individuals are the members of GFCCA in addition to the Government of Gujarat. The objective of GFCCA is to improve the socio-economic condition of the fishermen community in the State. GFCCA is, by far, the main carrier of all governmental and institutional assistance to the fishermen in the State. It is also the major implementing agency of the developmental project mooted by the Government in the fishery field. The main objective of GFCCA includes

- Development and exploitation of fresh water fisheries.
- Marketing of fresh water fish and marine fish in wholesale and in retail through its different outlets and mobile vans.
    - To supply fishing equipment at economical rate.
    - To implementation of Government Schemes & New Project.
- Manufacture and supply of various types of fishing nets and twines.
- Construction and supply of Wooden and Fiberglass Reinforced Plastic (FRP) fishing boats.
- Construction and supply of Wooden and Fiberglass Reinforced Plastic (FRP) fishing boats.
- Construction and supply of tin boats, different size of aquarium and fish, etc.

- Production and distribution of fish seeds - spawn, fry and fingerling - of Indian Major Carps.
- Mechanization of fishing crafts with suitable engines of Ashok Leyland make / Mariner outboard motors.
- Dispensing of high speed diesel to the fishing vessels through operation of 18 consumer pumps at various fishing ports.
- Implementation of developmental projects mooted by the Government in fishery field.
- Implementation of Group Accidental Insurance Scheme to State fishermen.

Schemes of NCDC in the Development of Fisheries:

National Cooperative Development Corporation (NCDC) has been promoting and developing fisheries cooperatives after its Act was amended in 1974 to cover fisheries within its purview. The Corporation has formulated specific schemes and pattern of assistance for enabling the fishery cooperatives to take up activities relating to production, processing, storage, marketing, etc. Assistance is provided to fisheries cooperatives on liberal terms treating the activity as weaker section programme. Assistance to fishery cooperatives is provided for the following purposes:

- Purchase of operational inputs (fishing boats, nets & engines)
- Creation of infrastructure facilities for marketing transport vehicles, ice-plants, cold storages, retail outlets, processing units, etc.
- Development of inland fisheries, seed farms, hatcheries, etc.
- Preparation of feasibility reports.
- Integrated Fisheries Projects (Marine, Inland and Brackish Water

The next chapter presents present status and problems of post-harvest infrastructure in selected harbours in Gujarat.

Chapter IV

Present Status and Problems of Post-Harvest Infrastructure in Selected Harbours in Gujarat

4.1 Introduction

To support the development of fisheries and aquaculture, the state needs essential infrastructure, harvesting activities with well-equipped fishery vessels, shore based facilities, cold chains and transport for marketing linkages up to retail outlets. The intermediary input producing sectors such as seed, feed and equipment and the operational automation would all need the overall support from ancillary industries such as mechanical engineering, refrigeration, electronics etc. In Chapter 2, fisheries development in Gujarat has been discussed where in data on fishing infrastructure available in Gujarat discussed. This chapter presents in detail the present status and problems in post harvest infrastructure available at selected harbours in Gujarat.

4.2 Fishing harbours in Gujarat

Adequate infrastructure is the basic requirement for the development of any sector and fishery in general and marine fisheries in particular is no exception. The important infrastructures in the fisheries sector are the landing and berthing facilities and fishing harbors. Strengthening of infrastructure development at the culture phase and also post-harvest infrastructure such as storage facilities, ice plants, cold chains, roads and transportation etc., as well as effective marketing system in identified aquaculture areas are the key requirements for the development of this sector. This would ensure high profit margins to the producers enabling faster fisheries and aquaculture development. Veraval, Porbandar, Mangrol and Jafarabad are the major fishing harbours in Gujarat out of which Veraval and Mangrol are within Gir Somnath district. Fishers in Gujarat use different kinds of crafts for fishing. For example

non-motorised traditional crafts, motorised (out-board motor: OBM) boats, in-board motor (IBM) boats and small trawlers. Small-scale fishers mostly use traditional boats with out-board motors for fishing (Khakkhar, 2004), however the traditional boats have largely been replaced by fiberglass crafts (Johnson & Sathyapalan, 2006).

Fisheries harbours

A fishing harbour is a place where many things come together– fish, people, and fishing technology. It is a meeting point for buyers, sellers, and service providers. It is a place of encounter between public and private institutions. Moreover, it is a point of convergence between production and trade. There is probably no other structure or facility in fisheries that matches the diversity of stakeholders and activities in a fishing harbour. A fishing harbour offers enormous opportunity for the promotion of responsible fisheries, specifically the reduction of wastes and preservation of fish quality. The conditions prevailing in a fishing harbour may have consequences not only on human and environmental health, but also on fish price and exports. While having the right infrastructure at the right place is very important for the proper functioning of a fishing harbour, how it is managed and maintained are crucial considerations as well. Stakeholders are a vital link to the sustainability of a fishing harbour.

As mentioned earlier, there are 5 fish harbours existing in the Gujarat state. They are located in Dholai, Jakhau, Veraval, Mangrol and Porbandar with total capacity of fish production of 388000 metric tons in the state. Junagarh district have two major harbours, viz. Mangrol and Veraval with highest capacity of fish production of 235000 MT. Out of 14200 fishing crafts, 6500 crafts are in Veraval, 3500 are in Porbandar and 2800 are in Mangrol harbor (Table 4.1).

Table 4.1: Major Fish harbours and their Capacity (2014)

Sr. No.	District	No. of Harbours	Name of Harbours	Fish Production Capacity	No. of Fish Landing centres	No. of Fishing crafts
1	Valsad	-	-	-	-	-
2	Navsari	1	Dholai	15000	10	400
3	Surat	-	-	-	-	-
4	Bharuch	-	-	-	-	-
5	Anand	-	-	-	-	-
6	Rajkot	-	-	-	-	-
7	Kachchh	1	Jakhau	53000	10	1000
8	Jamnagar	-	-	-	-	-
9	Amreli	-	-	-	-	-
10	Junagadh	2	Veraval, Mangrol	235000	12	6500 ,2800
11	Porbandar	1	Porbandar	85000	10	3500
12	Bhavnagar	-	-	-	-	-
	Gujarat	5				

Source: Office of the Commissionerate of Fisheries, GOG.

4.3 Harbour-wise Fishing Infrastructure in Gujarat

The contribution so far made by the fisheries sector towards creation of employment opportunities, supply of protein food, and earning of foreign exchange is sufficient and bears a promise for further exploitation of the enormous resources. It is well known that the fisheries harbours play an important role in the exploitation of the marine wealth of the state. The major processing facilities in the state so far as the fishery sector is concerned are ice and cold storages, freezing/value addition plants and storages, fish meal/pulverising units and fish transport facilities. The facilities presently available are presented in Table 4.2.

Table 4.2: Post-harvest Infrastructure Facilities in Selected harbours

Sr. No.	Particulars	Post harvest Infrastructure Facilities (in Nos.)		
		Porbandar	Veraval	Mangrol
1	Fish Landing Platform	3	2	1
2	Fish Auction Hall	3	2	1
3	Marine Service Station	26	10	1
4	Security Booth	25	10	1
5	Fish Storage	40	60	5
6	Cold Storage/ Chill Plant	40	60	11
7	Processing Centre ,Freezing, Chilling, Curing, Value addition	40	60	4
8	Wholesale Market (Wholesaler)	80	100	25
9	Retail Market (Retailer)	200	250	50
10	Fish Pulverizing Plant	7	12	0
11	Fish meal Plant	1	0	0
12	Net Making Plant	7	2	0
13	Ice Plant	40	60	7
14	Ice Crusher Plant	50	50	7

Sources: Field survey Data

4.3.1 Porbandar

On the western coast of Saurashtra, Gujarat, lies the harbour city of Porbandar. Porbandar is extremely rich in natural resources. There are small scales fishing industries also available. There are fish processing units, *zinga* processing units, cold storage for fish, fishing net industries, mosaic tiles industries, Emery rough/abrasive units, and cement articles manufacturing units as well as auto servicing units situated in the district. Porbandar harbor has the built-in capacity for 300 boats but presently there are around 5000 boats in the harbor. The harbour consists of a landing wharf[1] are paved auction hall. The harbour is provided with proper internal roads and electricity. Fishery Harbour Terminal is having five jetties for fishing. There is a diesel bunk within the harbour premises

[1] It is a structure on the shore of a harbor or on the bank of a river or canal where ships may dock to load and unload cargo or passengers.

operated by the Gujarat State Fisheries Development Corporation. A concrete road links the main market and the harbour.

4.3.2 Veraval

Veraval is one of the important fisheries harbours of Gujarat where fishing activities take place almost throughout the year. Veraval is one of the largest fish landing site of India situated around 35 km east of Mangrol, surrounded by a large chemical factory, a medium scale cement factory, number of small to medium scale industries and fish processing units. It involves port activities like transport, boat manufacture and receive waste from different sources. The fishing is done mostly on traditional boats and trawlers. Veraval also has a large boat making industry. Veraval is home to a large number of fish processing factories in G.I.D.C, which export prime quality seafood to USA, Japan, SE Asia, Gulf and EU Countries. The seafood-industry which was started through government initiative now is in its prime and many importers are attracted towards Veraval from around the globe. Regional research centers of Central Institute of Fisheries Technology (CIFT) and Central Marine Fisheries Research Institute (CMFRI) situated at Veraval have done Yeoman (good/useful) Service in development of fisheries sector in Gujarat. In addition to that, the area, being one of the most developed spot from industrialization point of view is a hot spot for both heavy and small scale chemical industries. The area favors the fish processing industries too due to its proximity to the landing center and easy supply of the raw materials. Veraval harbor has the built-in capacity for 700 boats but presently there are around 5000 boats in the harbor. Veraval is a trademark for fish harbours but there is dusty, unclean and damaged with pot holes prevail in the landing area of the harbour. There is no compound wall surrounding the harbour area. The Veraval harbour is not well connected by roads with markets and most of roads need to be reconstructed.

4.3.3. Mangrol

On the other hand, Mangrol is a small hamlet and important harbour around 50 km west of Veraval with predominantly fisherman population. The local communities which live nearest the coastline mainly depend on the fishing related opportunities and changes from time to time. The capacity of Mangrol harbour is 500 boats but presently there are 1500 boats berthing in the harbour. Another key problem of the Mangrol harbour is silting and sand drifting in harbour channel. The harbour needs a face lift as at Veraval. However, the situation at Mangrol is not as bad as at Veraval. The hard surface of the harbour area and the connecting roads are good. The conditions of break waters are good, providing safe entrance and protection to the harbour basin. The superstructure of auction hall consists of steel trusses which appears in good condition, but do not seem to be maintained with regular painting. The flooring is made of kotah stone. The drains are constructed with concrete.

The fishermen community maintains and manages the operation of the crane. For supply of potable water, overhead tank has been built. Electricity is available at the harbour. Diesel is supplied to the fishing vessels by four diesel bunks/pumps; One operated by Mahavir Fishermen Co-operative Society and other by the Gujarat Fisheries Central Co-operative Association (GFCCA). The state of refueling infrastructure is cause of concern. Near the harbour entrance, there is a temporary shed of 200 m x 50 m serving as a retail fish market. The fisherman community runs this market. A few steps away from harbour entrance is located the local fish market where women fish traders hold auctions and retail marketing. The local market is constructed and managed by the local community (Mangrol Kharva Samaj).

4.4 Problems in Post Harvest Facilities on Selected Sample Harbours

During the discussion with stakeholders and field visit to selected three harbours, it was noted that these harbours have inadequate facilities and due to which these harbours suffer with post harvest losses.

The following are the major problems with harbours.

- Inadequate availability of potable water.
- Poor power supply position.
- Inadequate drainage facilities.
- Inadequate repair facilities for fishing boats.
- Lack of trained labour for pre-processing and processing of fish/Shrimp.
- Lack of HRD facilities for post harvest operations.
- Lack of promotional policies for encouraging private investment.

4.5 Constraints faced by Fishery Officials

The Government officials of State Fisheries Department also face some problems while operating on field. We have discussed with them and observed that marine pollution has been increasing on the coastal belt of Gujarat, largely because of the growth of chemical industry. This has caused, to some extent, the destruction of marine life in the coastal waters of Gujarat. Most of the Stakeholders (fishermen, boat owner, processor) and officers opined that several types of high value fish like *hilsa*[2] that earlier used to come abundantly to the coastal waters of Gujarat have now been disappearing.

[2] Tenualosa ilisha (ilish, hilsa, hilsa herring or hilsa shad) is a species of fish in the herring family (Clupeidae), and a popular food fish in South Asia.

4.6 Fish Markets and their Capacity

The districtwise details on fish markets available and their capacity is presented in Table 4.3. It can be seen from the table that as per 2003 census, there were 37 wholesale fish markets of which no market had processing facility. Thus, there is urgent to create this facility at least at some selected market. Total 2577 and 341 licenses[3] has been issued to retailer and wholesaler respectively

Table 4.3: Districtwise Details of Fish Markets and their Capacity (Census 2007)

Sr. No.	District	No. of Fish Markets (wholesale)	Total Selling Capacity (in tonnes)	No. of Export Centres	No. of Fish Processing Centres
1	Valsad	1	-	0	-
2	Navsari	5	-	0	-
3	Surat	1	-	2	-
4	Bharuch	1	-	0	-
5	Anand	0	-	0	-
6	Rajkot	0	-	0	-
7	Kachchh	7	-	2	-
8	Jamnagar	1	-	0	-
9	Amreli	1	-	0	-
10	Junagadh	5	-	0	-
11	Porbandar	1	-	1	-
12	Bhavnagar	1	-	1	-
13	Tapi	1	-	0	-
14	Narmada	1	-	0	-
15	Panchmahal	3	-	0	-
16	Dahod	2	-	0	-
17	Kheda	2	-	0	-
18	Ahmedabad	3	-	0	-
19	Sabarkantha	1	-	0	-
	Gujarat	37	-	6	-

Source: GOG (2013).

[3] for details on license for retails and wholesaler for the year-2012-13 is presented in Annexure I (L).

Chapter V

Incidences of Post-harvest Losses & its Causes

5.1 Introduction

As mentioned earlier, three harbours of Gujarat namely Porbandar, Veraval and Mangrol were selected for the study. For studying the incidences of post harvest looses and its causes, data were collected from 10 boat owners, 10 fishermen, 5 wholesalers, 10 retailers, 10 consumers, 4 processor/exporters and 2 Government officials. Thus, overall 153 sample respondents were personally interviewed for data collection. This chapter mainly deals with the socio-economic profile of these selected respondents, status of fish production, fishing activities and post-harvest losses and their causes in fisheries sector. It is given based on the analysis of field level survey data collected for three seasons during 2014-15.

5.2 Boat Owner and Fisherman

5.2.1 Socio-Economic Characteristics of Boat Owner and Fisherman

The small scale fisheries sector is mostly the livelihood occupation of group of population within the extreme poverty that leads to a serious social, economic and political issue. Lack of knowledge about socio-economic condition of fishers and fishing communities leads to poor planning and implementation of various fisheries management programs. The socio-economic parameters consist of age, education, family type, family size, religion and caste, house and habitation, training programmes attended, access to basic public service, social participation, communication asset possessed, mass media utilization, and gender plays important role in decision making and its implementation. Education and literacy of fishing community can play a major role in ensuring and sustaining livelihoods (Maddox, 2007). Accessibility to educational institutions and programmes will improve the livelihood of fishermen, by diversifying their income generating activities (FAO, 2006).

Table 5.1a: Socio- Economic Characteristics of Fishermen and Boat Owner

Sr. No.	Particulars	Unit	Socio Economic Characteristic-FM & BO			
			Porbandar (n=20)	Veraval (n=20)	Mangrol (n=20)	Overall (n=60)
A	Age	years	34.10	44.65	43.5	40.75
B	Sex					
	Male	%	100	100	100	100
	Female	%	0	0	0	0
C	Education	years	7.8	7.2	8.1	7.7
	Illiterate	%	15	20	5	13.33
	Primary (1-4)	%	10	10	0	6.67
	Up to SSC (5-9)	%	30	25	50	35.00
	SSC and above (10 and above)	%	45	45	45	45.00
D	Religion					
	Hindu	%	100	80	100	96.67
	Islam	%	0	0	0	0.00
	Christian	%	0	5	0	1.67
	Sikh	%	0	5	0	1.67
E	Social Group					
	SC & ST	%	20	5	5	10.00
	OBC/SEBC	%	65	75	80	73.33
	Other/General	%	15	20	15	16.67
F	Experience in Fishing	years	12.9	21.7	22.7	19.1
G	Family Size	Nos.	7.35	10.50	5.90	7.92
	Male	Nos.	2.55	3.55	2.40	2.83
	Female	Nos.	2.50	3.75	2.20	2.82
	Children	Nos.	2.30	3.20	1.53	2.39
H	Family member in fishing/hh	No.	2.20	2.25	2.20	2.22
	Male	Nos.	2.0	2.25	2.1	2.12
	Female	Nos.	0.2	0	0.1	0.10
	Children	Nos.	0	0	0	0.00
I	Occupation					
	a) Main- *Fishery*	%	100	100	100	100
	b) Subsidiary*	%				
	Cultivator		25.0	5.0	5.0	11.7
	Ag. Labour		5.0	0.0	0.0	1.7
	Non-farm Labour		0.0	5.0	10.0	5.0
	Own Non-Farm business		10.0	10.0	0.0	6.7
	Service		5.0	0.0	10.0	5.0
j	Gross annual income (Rs. lakh)	per year				
	Main		4.12	4.95	5.19	4.75
	Subsidiaries		0.33	0.3	0.19	0.27
K	House Structure					
	Pucca	%	60.0	85.0	60.0	68.3
	Semi-Pucca	%	20.0	10.0	15.0	15.0
	Kuccha	%	20.0	5.0	25.0	16.7
L	Agricultural owned Land	hectare	0.70	0.06	0.20	0.32
M	Ration Card		100	100	100	100
	BPL		20	15	10	15
	APL		80	85	90	85
N	Training					
	Fish handling	%	10	0	10	6.7
	Total days	Nos.	04	0	04	4.0

Notes: % - Figures are percentage to total sample.
Source: Field Survey Data.

Table 5.1b: Socio- Economic Characteristics of Boat Owner

Sr. No.	Particulars	Unit	Socio Economic Characteristic of Boat Owner			
			Porbandar (n=10)	Veraval (n=10)	Mangrol (n=10)	Overall (n=30)
A	Age	years	36.5	44.6	45.1	42.1
B	Sex	%				
	Male	%	100	100	100	100
	Female	%	0	0	0	0
C	Education	years	11.0	10.4	9.6	10.3
	Illiterate	%	0	0	0	0
	Primary (1-4)		0	0	0	0
	Up to SSC (5-9)	%	20	30	40	30
	SSC and above (10 and above)	%	80	70	60	70
D	Religion					
	Hindu	%	100	90	100	96.7
	Islam	%	0	0	0	0
	Christian	%	0	10	0	3.3
	Sikh	%	0	0	0	0
E	Social Group					
	SC & ST	%	0	0	0	0
	OBC/SEBC	%	80	100	90	90
	Other/General	%	20	0	10	10
F	Experience in Fishing	Year	12.9	19.80	21.95	18.18
G	Family Size	Nos.	8.3	10.9	6.4	8.5
	Male	Nos.	2.6	3.7	2.5	2.9
	Female	Nos.	3.0	4.3	2.2	3.2
	Children	Nos.	2.7	2.9	1.7	2.4
H	Family member in fishing/hh	No.	2.8	2.9	2.5	2.2
	Male	Nos.	2.4	2.9	2.3	2.0
	Female	Nos.	0.4	0.0	0.2	0.2
	Children	Nos.	0.0	0.0	0.0	0.0
I	Occupation					
	a) Main- *Fishery*	%	100	100	100	100
	b) Subsidiary*	%				
	Cultivator		10.0	0.0	0.0	3.3
	Ag. Labour		0.0	0.0	0.0	0.0
	Non-farm Labour		0.0	0.0	0.0	0.0
	Own Non-Farm business		20.0	20.0	0.0	13.3
	Service		10.0	0.0	20.0	10.0
j	Gross annual income (Rs. lakh)	per year				
	Main		6.00	7.00	7.50	6.83
	Subsidiaries		0.43	0.50	0.25	0.39
K	House Structure					
	Pucca	%	90	90	70	83.3
	Semi-Pucca	%	10	10	10	10.0
	Kuccha	%	0	0	20	6.7
L	Agricultural owned Land	Hectare	0.7	0.0	0.0	0.23
M	Ration Card		100	100	100	100
	BPL		0	0	0	0
	APL		100	100	100	100
N	Training					
	Fish handling	%	10	0	10	6.7
	Total days	Nos.	06	0	01	4.0

Notes: % - Figures are percentage to total sample.
Source: Field Survey Data.

Table 5.1c: Socio- Economic Characteristics of Fishermen

Sr. No.	Particulars	Unit	Socio Economic Characteristic of Fishermen			
			Porbandar (n=10)	Veraval (n=10)	Mangrol (n=10)	Overall (n=30)
A	Age	years	31.7	44.7	41.9	39.4
B	Sex	%				
	Male	%	100	100	100	100
	Female	%	0	0	0	0
C	Education	Years	4.5	4.0	6.6	5.0
	Illiterate	%	30	40	10	26.67
	Primary (1-4)	%	20	20	0	13.33
	Up to SSC (5-9)	%	40	20	60	40.00
	SSC and above (10 and above)	%	10	20	30	20.0
D	Religion					
	Hindu	%	100	90	100	96.7
	Islam	%	0	0	0	0
	Christian	%	0	0	0	0
	Sikh	%	0	10	0	3.3
E	Social Group					
	SC & ST	%	40	10	10	20.0
	OBC/SEBC	%	50	50	70	56.7
	Other/General	%	10	40	20	23.3
F	Experience in Fishing	Year	12.7	17.9	21.2	17.3
G	Family Size	Nos.	6.4	10.1	5.4	7.3
	Male	Nos.	2.5	3.4	2.3	2.7
	Female	Nos.	2.0	3.2	2.2	2.5
	Children	Nos.	1.9	3.5	0.9	2.1
H	Family member in fishing/hh	No.	1.6	1.6	1.9	1.70
	Male	Nos.	1.6	1.6	1.9	1.70
	Female	Nos.	0.0	0.0	0.0	0.0
	Children	Nos.	0.0	0.0	0.0	0.0
I	Occupation					
	a) Main- *Fishery*	%	100	100	100	100
	b) Subsidiary*	%				
	Cultivator		40.0	10.0	10.0	20.0
	Ag. Labour		10.0	0.0	0.0	3.3
	Non-farm Labour		0.0	10.0	20.0	10.0
	Own Non-Farm business		0.0	0.0	0.0	0.0
	Service		0.0	0.0	0.0	0.0
j	Gross annual income (Rs. lakh)	per year				
	Main		2.24	2.9	2.88	2.67
	Subsidiaries		0.24	0.09	0.13	0.15
K	House Structure					
	Pucca	%	30	80	50	53.3
	Semi-Pucca	%	30	10	20	20.0
	Kuccha	%	40	10	30	26.7
L	Agricultural owned Land	Hectare	0.7	0.12	0.40	0.41
M	Ration Card		100	100	100	100
	BPL		40.0	30.0	20.0	30.0
	APL		60.0	70.0	80.0	70.0
N	Training					
	Fish handling	%	10	0	10	6.7
	Total days	Nos.	01	0	07	4.0

Notes: % - Figures are percentage to total sample.
Source: Field Survey Data.

The socio-economic characteristics of selected fishermen and boat owners are presented in Tables 5.1a to 5.1c. On an average, fishermen and boat owners were about 41 years old with around 19 years of experience in fishing. The fishermen were younger and relatively less experienced than those of boat owners. Though the respondents from Mangrol harbor were relatively younger than Veraval respondents, they were more experienced. All the respondent fishermen and boat owners were male, thus no female generally involved in fishing. In case of education, average age of respondents was 7.7 years. The boat owners were more educated (10.3 years) as compared to its counterpart (5.0 years). The rate of illiteracy was about 27 percent in case of fishermen as compared to no case of illiteracy in boat owners. Illiteracy in fishermen may be due to geographical marginalization (Kurien & Achari, 1998). About 97 percent of respondents in both cases were from Hindu religion and having dominance of social group of SEBC followed by General category. Only in case of fishermen, 20 percent respondents belong to SC & ST category.

The average family size of respondent fishermen was smaller (7.3 persons) as compared to boat owners (8.5 persons), having average of 7.92 members per family together. Veraval harbor respondents family size was the highest one (10.5 persons) followed by Porbandar (7.35 persons) and the lowest was in Mangrol (5.3 persons). The average sex ratio was found around 994 females per 1000 males in selected families. Only 28 percent of total family members were engaged in fishing, comprising of 74.7 percent of total male and 3.6 percent of total females and no children. It was very strange to note that percentage number of family members to total members engaged in fishing was found higher in case of boat owner (32 %) than fishermen (23.3%), that too no woman in fisherman category was involved in fishing. The females from boat owner group were involved in post harvest fishing business, not in fishing.

The main occupation of all respondents was fishing, supported by subsidiary occupation as cultivators/agriculture labour/own nonfarm business/ service. Some of the fishermen from Porbandar harbor had

supporting occupation as cultivator and agriculture labour which is evident from larger size of agricultural land holding (0.70 ha) than Mangrol (0.20 ha) and Veraval (0.06 ha). Non-farm labour, own non-farm business and service occupation was supporting to 5-7 percent respondent families.

In case of dwelling structure, at overall level, 68.3 respondents houses were pucca in nature. About 83 percent boat owners has pucca house as compared to 53.3 percent of fishermen. The average gross annual income of both groups was estimated to be Rs. 4.75 lakh from main occupation and Rs. 0.27 lakh from subsidiary occupation. Across the groups, gross annual income from main source was more than double in case of boat owner (6.83 lakh) than fishermen (2.67 lakh). Same the case in case of subsidiary income as well. All the selected respondents had ration cards, out which 85 percent had APL card and remaining 15 percent had BPL card. However, all the boat owners has APL card, while 70 percent of fishermen had same card. Thus 30 percent of fishermen families were categorized under below poverty line criteria. Hardly 10 percent each of boat owners and fishermen from Porbandar and Mangrol had taken some kind of training of fish handling, having average duration of 4 days or so.

Thus, at overall level, selected boat owners were relatively elder, educated, experienced, with large family size and had double income level than selected fishermen in three selected harbors of Gujarat. As fishermen are generally fully dependent on fishing activity may due to less education and male workers are always on the sea suffers from the inadequate infrastructure facilities in and off the shore. The next section discuss about the fishing crafts and gears with these two groups.

5.2.2 Details of Fishing Crafts (Boats) and Fishing Gears:

The details of different fishing crafts and fishing gears available with selected respondents are presented in Tables 5.2a to 5.2c. It can be seen from these tables that high concentration of motorized crafts/boats was observed with selected respondents. On an average of both

categories, per household had 2.08 motorised crafts and 0.23 traditional crafts. The boat owners had more number of both the crafts per household than fishermen, i.e. 3.17 motorized crafts/hh as compared to 1.0 motorized craft/ha with fishermen. Same was the case with traditional crafts also. Across the harbors, Mangrol respondents had highest number of crafts (3.15) followed by Veraval (2.20) and the lowest was in Porbandar (1.60). The pattern noticed earlier in distribution of crafts with boat owner and fishermen was found same across the harbors.

The type of fishing gear used varies by type of fishing operation and target species. Trawlers and Gill net are commonly used in family fishing as they are considered as relatively low cost gear situated. On an average, every household (both groups together) had 7.32 trawlers and 2.98 gill netters. Besides every household possesses other gears such as purse seine and cast net (4.32), deep sea trawlers (0.75) and very few households had long lines tuna, squid jigging and shore seining. Across harbors, the highest number of trawlers per households was observed in Veraval, while Mangrol respondents had the highest number of gill netters and other gears/hh. The number of trawlers/hh was found highest with boat owners (3.53) as compared to fishermen (1.10), that to both from Mangrol harbor.

Table 5.2a: Number of Fishing Crafts (Boats)/Gears- Boat Owners & Fishermen

Sr. No.	Type of Fishing Crafts	Number of Fishing Crafts/and Gears/HH (BO & FM)			
		Porbandar	Veraval	Mangrol	Overall
A	Fishing Crafts/Boats				
	a) Traditional Crafts/Boats	0.00	0.14	0.55	0.23
	b) Motorized Crafts/Boats	1.60	2.05	2.60	2.08
	c) Mechanized Boats/Boats	0.00	0.00	0.00	0.00
	Total	1.60	2.20	3.15	2.32
B	Fishing Gears/tools				
	a) Trawlers	7.90	8.35	5.70	7.32
	b) Gill netters	0.30	4.30	4.35	2.98
	c) Deep Sea Trawlers	0.55	0.80	0.90	0.75
	d) Long liners for Tuna	0.00	0.00	0.15	0.05
	e) Squid Jigging	0.00	0.00	0.20	0.07
	f) Shore seining	0.00	0.00	0.5	0.17
	g) Others (Purse Seine &Cast nut)	2.70	4.35	5.90	4.32

Note: BO- Boat Owner, FM- Fishermen.
Source: Field Survey Data.

Table 5.2b: Number of Fishing Crafts (Boats)/ Gears with Boat Owners

Sr. No.	Type of Fishing Crafts	Number of Fishing Crafts/and Gears/HH (BO)			
		Porbandar	Veraval	Mangrol	Over all
A	Fishing Crafts (by design)				
	a) Traditional Crafts	0.0	0.30	0.80	0.37
	b) Motorized Crafts	2.20	3.10	4.20	3.17
	c) Mechanized Boats	0.0	0.0	0.0	0.0
	Total	2.20	3.40	5.00	3.53
B	Fishing Vessels (by use)				
	a) Trawlers	5.30	2.90	3.00	3.73
	b) Gill netters	0.20	8.00	8.40	5.53
	c) Deep Sea Trawlers	0.0	0.20	0.60	0.27
	d) Long liners for Tuna	0.0	0.0	0.20	0.07
	e) Squid Jigging	0.0	0.0	0.40	0.13
	f) Shore seining	0.0	0.0	0.80	0.27
	g) Others (Cast nut & Purse Seine)	3.40	5.70	6.80	5.30

Source: Field Survey Data.

Table 5.2c: Number of Fishing Crafts (Boats)/ Gears with Fishermen

Sr. No.	Type of Fishing Crafts	Number of Fishing Crafts/and Gears/HH (FM)			
		Porbandar	Veraval	Mangrol	Over all
A	Fishing Crafts (by design)				
	a) Traditional Crafts	0.00	0.00	0.30	0.10
	b) Motorized Crafts	1.00	1.00	1.00	1.0
	c) Mechanized Boats	0.00	0.00	0.00	0.0
	Total	1.00	1.00	1.30	1.10
B	Fishing Vessels (by use)				
	a) Trawlers	10.50	13.80	8.40	10.90
	b) Gill netters	0.40	0.60	0.30	0.43
	c) Deep Sea Trawlers	1.10	1.40	1.20	1.23
	d) Long liners for Tuna	0.00	0.00	0.10	0.03
	e) Squid Jigging	0.00	0.00	0.00	0.00
	f) Shore seining	0.00	0.00	0.50	0.17
	g) Others (Cast nut & Purse Seine)	2.00	3.00	5.00	3.33

Source: Field Survey Data.

5.2.3 Temporal Fishing Restrictions (Ban Period):

In view of fisheries situation that exists in west coast of India, temporal restrictions, i.e. seasonal closure of fishing is implemented independently by each State government to manage the fishery resources. It is also known as monsoon ban period declared every year during south west monsoon period of 90 days in Gujarat (Table 5.3). Thus, fishing ban

period in selected three horbours is of 90 days each year from 15th of May to 15th of August. It is due to the fact that fish come closer to the shore and estuary during breeding. During this period, maintenance works of vessels are taken up. Fishing season varies along the coastal belt. Therefore ban period ranges between 30 to 145 days in different coastal states of India (Dehadrai and Yadava, 2004). The ban period for fishing also helps somehow in fishery resources management as there are clear signals that resources in the inshore are being fully exploited and the scope for increasing production from the present level is limited.

Table 5.3: Details on Fishing Ban Period in Selected Harbours

Sr. No.	Harbour	Fishing Ban period	
		Ban Period	Length (days)
A	Porbandar	15 May to 15 August	90 days
B	Veraval	15 May to 15 August	90 days
C	Mangrol	15 May to 15 August	90 days

Source: Field Survey Data & Office of Commissionerate of Fisheries, GOG.

5.2.4 Details of Fishing Activities

The marine fisheries involve use of different fishing gears to exploit multi-species. Trawl and purse seine are used by a larger group on a single boat. The details of seasonwise hourbourwise fishing activities by selected boat owners and fishermen are presented in Tables 5.4a to 5.4c. It can be seen from these tables that on an average, the fishing days per season were estimated to be 64.9 days, (ranges between 65-69 days in three selected seasons during 2014-15). The highest fishing days were recorded in October-December (67.2 days), followed by January-March (66.8 days) and lowest were in April to September (60.8 days), which may be due to 90 days fishing ban during this season.

Table 5.4a: Harbourwise and Seasonwise Details of Fishing Activities (ALL)

Sr. No.	Particulars	Unit	Details of Fishing activities- ALL			
			Porbandar	Veraval	Mangrol	Av.
1	Oct - Dec 2014					
A	Fishing days per season	Av no.	66.6	66.4	68.6	67.2
B	Fishing trips in season	Av no.	5.5	4.4	10.3	6.7
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.1	0.1	0.1
	b) Motorized		5.5	4.2	10.2	6.6
	c) Mechanized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	10.0	3.33
	b) Multi Day Fishing		100	100	90.0	96.67
E	Days of fishing per trip	Av no.	12.6	15.1	12.3	13.3
F	Fisherman on-board	Av no.	6.8	8.1	6.9	7.2
2.	Jan to Mar 2015					
A	Fishing days per season	Av no.	63.4	69.2	67.9	66.8
B	Fishing trips in season	Av no.	5.0	4.6	11.0	6.9
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.1	0.1	0.1
	b)Mechanized		5.0	4.5	10.9	6.8
	c)Motorized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	Av no.				
	a) Day fishing		0.0	0.0	10.0	3.33
	b) Multi Day Fishing		100	100	90.0	96.67
E	Days of fishing per trip	Av no.	12.8	15.4	11.7	13.3
F	Fisherman on-board	Av no.	6.6	8.0	6.9	7.2
3.	April to Sep2015	Av no.				
A	Fishing days per season	Av no.	57.6	60.5	64.3	60.8
B	Fishing trips in season	Av no.	4.5	4.0	9.5	6.0
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.1	0.1	0.0
	b)Mechanized		4.5	3.9	9.5	5.9
	c)Motorized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	10.0	3.33
	b) Multi Day Fishing		100	100	90.0	96.67
E	Days of fishing per trip	Av no.	13.3	15.4	12.4	13.7
F	Fisherman on-board	Av no.	6.6	7.9	6.9	7.1
4.	Overall					
A	Fishing days per season	Av no.	62.5	65.3	66.9	64.9
B	Fishing trips in season	Av no.	5.0	4.3	10.2	6.5
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.1	0.1	0.1
	b) Motorized		5.0	4.2	10.2	6.4
	c) Mechanized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%.				
	a) Day fishing		0.0	0.0	10.0	3.33
	b) Multi Day Fishing		100	100	90.0	96.67
E	Days of fishing per trip	Av no.	12.9	15.3	12.1	13.4
F	Fisherman on-board	Av no.	6.7	8.0	6.9	7.2

Source: Field Survey Data.

Table 5.4b: Harbourwise and Seasonwise Details of Fishing Activities (BO)

Sr. No.	Particulars	Unit	Details of Fishing activities- BO			
			Porbandar	Veraval	Mangrol	Av.
1	Oct - Dec 2014					
A	Fishing days per season	Av no.	67.7	70.0	69.5	69.1
B	Fishing trips in season	Av no.	5.5	4.3	4.9	4.9
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.2	0.2	0.1
	b) Motorized		5.5	3.9	4.7	4.7
	c) Mechanized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	0.0	0.0
	b) Multi Day Fishing		100	100	100	100
E	Days of fishing per trip	Av no.	12.7	16.0	14.7	14.5
F	Fisherman on-board	Av no.	6.5	8.3	7.6	7.5
2.	Jan to Mar 2015					
A	Fishing days per season	Av no.	68.7	76.1	69.3	71.4
B	Fishing trips in season	Av no.	5.4	5.0	5.3	5.2
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.2	0.1	0.1
	b)Mechanized		5.4	4.8	5.2	5.1
	c)Motorized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	0.0	0.0
	b) Multi Day Fishing		100	100	100	100
E	Days of fishing per trip	Av no.	12.9	15.6	13.5	14.0
F	Fisherman on-board	Av no.	6.5	8.3	7.6	7.5
3.	April to Sep2015	Av no.				
A	Fishing days per season	Av no.	59.4	69.4	63.5	64.1
B	Fishing trips in season	Av no.	4.6	4.5	4.6	4.6
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.1	0.1	0.1
	b)Mechanized		4.6	4.4	4.5	4.5
	c)Motorized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	0.0	0.0
	b) Multi Day Fishing		100	100	100	100
E	Days of fishing per trip	Av no.	13.2	15.6	14.2	14.3
F	Fisherman on-board	Av no.	6.5	8.3	7.6	7.5
4.	Overall					
A	Fishing days per season	Av no.	65.3	71.8	67.4	68.2
B	Fishing trips in season	Av no.	5.2	4.6	4.9	4.9
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.2	0.1	0.1
	b) Motorized		5.2	4.4	4.8	4.8
	c) Mechanized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	0.0	0.0
	b) Multi Day Fishing		100	100	100	100
E	Days of fishing per trip	Av no.	12.9	15.7	14.1	14.3
F	Fisherman on-board	Av no.	6.5	8.3	7.6	7.5

Source: Field Survey Data.

Table 5.4c: Harbourwise and Seasonwise Details of Fishing Activities (FM)

Sr. No.	Particulars	Unit	Details of Fishing activities- FM			
			Porbandar	Veraval	Mangrol	Av.
1	Oct - Dec 2014					
A	Fishing days per season	Av no.	65.5	62.7	67.6	65.3
B	Fishing trips in season	Av no.	5.4	4.5	15.6	8.5
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.0	0.0	0.0
	b) Motorized		5.4	4.5	15.6	8.5
	c) Mechanized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	20.0	6.67
	b) Multi Day Fishing		100	100	80.0	93.33
E	Days of fishing per trip	Av no.	12.4	14.2	9.9	12.2
F	Fisherman on-board	Av no.	7.0	7.9	6.1	7.0
2.	Jan to Mar 2015					
A	Fishing days per season	Av no.	58.1	62.2	66.4	62.2
B	Fishing trips in season	Av no.	4.6	4.2	16.6	8.5
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.0	0.0	0.0
	b)Mechanized		4.6	4.2	16.6	8.5
	c)Motorized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	20.0	6.67
	b) Multi Day Fishing		100	100	80.0	93.33
E	Days of fishing per trip	Av no.	12.7	15.2	9.9	12.6
F	Fisherman on-board	Av no.	6.7	7.7	6.1	6.8
3.	April to Sep 2015	Av no.				
A	Fishing days per season	Av no.	55.8	51.6	65.1	57.5
B	Fishing trips in season	Av no.	4.3	3.4	14.4	7.4
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.0	0.0	0.0
	b)Mechanized		4.3	3.4	14.4	7.4
	c)Motorized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	20.0	6.67
	b) Multi Day Fishing		100	100	80.0	93.33
E	Days of fishing per trip	Av no.	13.3	15.2	10.6	13.0
F	Fisherman on-board	Av no.	6.7	7.5	6.1	6.8
4.	Overall					
A	Fishing days per season	Av no.	59.8	58.8	66.4	61.7
B	Fishing trips in season	Av no.	4.8	4.0	15.5	8.1
C	Fishing trips by type of fishing craft	Av no.				
	a)Traditional		0.0	0.0	0.0	0.0
	b) Motorized		4.8	4.0	15.5	8.1
	c) Mechanized		0.0	0.0	0.0	0.0
	d)Others		0.0	0.0	0.0	0.0
D	Fishing Vessel	%				
	a) Day fishing		0.0	0.0	20.0	6.67
	b) Multi Day Fishing		100	100	80.0	93.33
E	Days of fishing per trip	Av no.	12.8	14.9	10.1	12.6
F	Fisherman on-board	Av no.	6.8	7.7	6.1	6.9

Source: Field Survey Data.

Every season, around 6-7 trips were made (around 13-14 days per trip) with around 7 persons on board. In case of Porbandar and Veraval, all trips were multiday fishing (ranges between 6-18 days), while 90 percent of trips of Mangrol respondents were multi-days and reaming 10 percent were a day fishing. Across both the groups, more than 95 percent of respondents had used motorized boat for fishing. The use of traditional crafts has been observed in Veraval and Mangrol harbor, while its share in total trips made was hardly 1-2 percent in the both groups.

Further, it can be seen from these tables that number of fishing days as well as days of fishing per trip were recorded more in case of boat owner (68.2 days and 14.3 days respectively) as compared to fishermen (61.7 days and 12.3 days respectively), while number of fishing trips per season were much higher in fishermen (8.1 trips) than boat owner (4.9 trips). The average number of fishermen on board was 7.5 in case of boat owner; while same were 6.9 people in case of fishermen. Thus, fishermen made around 8 trips per season while boat owner could do hardly 5 trips in each season. However, duration of trip was longer in second case.

5.2.5 Details of Fish Caught & Sold

The harbourwise seasonwise details on fish catch and sold is presented in Tables 5.5a to 5.5c. On an average, around 14 tonnes fish per trip was caught in selected harbors. The maximum fish was landed at Veraval harbor by selected boat owners and fishermen, i.e. 14.65 tonnes/trip and the lowest was in Porbandar (12.23 tonnes/trip). Fish catch depends entirely on the size of the boats, types of fishing gear, types of nets and also the number of times the fishermen go to the sea in a day. Out of total fish landed at harbours, about 85 percent fish was of Grade I and remaining was categorized as low grade (around 15 percent), i.e. Grade II. Across the harbours, the percentage of Grade I fish ranges between 82 to 87 percent.

Table 5.5a: Harbourwise & Seasonwise Details of Fish Caught & Sold (ALL)

Sr. No.	Harbour	Details of Fish Caught & Sold (ALL)							
		Porbandar		Veraval		Mangrol		Total	
1.	Oct - Dec 2014	tons	%	tons	%	tons	%	tons	%
A)	Fish landed per trip	4.20	100.0	5.33	100.0	4.31	100.0	4.61	100.0
	a) Grade I (high value)	3.03	72.0	4.05	76.1	3.42	79.4	3.50	75.9
	b) Grade II (low value)	1.18	28.0	1.28	23.9	0.89	20.6	1.11	24.1
B)	Fish Sold	3.94	93.9	4.98	93.6	4.09	94.9	4.34	94.1
	a)Exporter	1.14	28.9	2.69	53.9	0.82	19.9	1.55	35.6
	b)Wholesaler	0.99	25.0	1.39	27.8	1.46	35.5	1.28	29.4
	c)Retailer	0.10	2.6	0.06	1.3	0.30	7.3	0.15	3.5
	d)Contractor	1.72	43.5	0.85	17.1	1.53	37.3	1.36	31.4
C)	Fish waste/fish dumped	0.11	2.7	0.16	2.9	0.06	1.3	0.11	2.3
D)	Fish use to dry/fish meal	0.15	3.5	0.19	3.5	0.16	3.7	0.16	3.6
2.	Jan to Mar 2015								
A)	Fish landed per trip	4.19	100.0	4.62	100.0	4.28	100.0	4.36	100.0
	a) Grade I (high value)	3.10	74.0	3.50	75.8	3.42	79.9	3.34	76.6
	b) Grade II (low value)	1.09	26.0	1.12	24.2	0.86	20.1	1.02	23.4
B)	Fish Sold	3.92	93.6	4.22	91.3	4.04	94.3	4.06	93.0
	a)Exporter	1.57	39.9	2.00	47.4	0.86	21.3	1.47	36.3
	b)Wholesaler	1.00	25.5	1.26	29.8	1.33	32.9	1.20	29.4
	c)Retailer	0.19	4.8	0.19	4.4	0.27	6.6	0.21	5.3
	d)Contractor	1.17	29.7	0.78	18.4	1.59	39.2	1.18	29.0
C)	Fish waste/fish dumped	0.13	3.0	0.17	3.6	0.11	2.6	0.14	3.1
D)	Fish use to dry/fish meal	0.15	3.5	0.23	5.0	0.13	3.0	0.17	3.9
3.	April to Sep2015								
A)	Fish landed per trip	4.19	100.0	4.45	100.0	4.03	100.0	4.22	100.0
	a) Grade I (high value)	3.28	78.3	3.50	78.7	3.26	80.7	3.34	79.2
	b) Grade II (low value)	0.91	21.7	0.95	21.3	0.78	19.3	0.88	20.8
B)	Fish Sold	3.94	94.1	4.12	92.6	3.73	92.4	3.93	93.1
	a)Exporter	1.34	34.0	1.97	47.8	1.25	33.5	1.52	38.7
	b)Wholesaler	1.33	33.6	1.06	25.7	1.08	28.8	1.15	29.4
	c)Retailer	0.09	2.2	0.21	5.1	0.10	2.5	0.13	3.3
	d)Contractor	1.19	30.2	0.88	21.4	1.31	35.1	1.13	28.7
C)	Fish waste/fish dumped	0.09	2.2	0.16	3.6	0.19	4.7	0.15	3.5
D)	Fish use to dry/fish meal	0.15	3.6	0.17	3.8	0.12	2.9	0.15	3.5
4.	Overall								
A)	Fish landed per trip	12.58	100.0	14.39	100.0	12.63	100.0	13.20	100.0
	a) Grade I (high value)	9.40	74.8	11.05	76.8	10.10	80.0	10.18	77.2
	b) Grade II (low value)	3.18	25.2	3.34	23.2	2.53	20.0	3.01	22.8
B)	Fish Sold	11.80	93.9	13.32	92.5	11.86	93.9	12.33	93.4
	a)Exporter	4.05	34.3	6.66	50.0	2.92	24.6	4.54	36.8
	b)Wholesaler	3.31	28.0	3.70	27.8	3.86	32.5	3.62	29.4
	c)Retailer	0.38	3.2	0.46	3.4	0.66	5.6	0.50	4.0
	d)Contractor	4.07	34.5	2.51	18.8	4.42	37.3	3.67	29.7
C)	Fish waste/fish dumped	0.33	2.6	0.48	3.4	0.36	2.9	0.39	3.0
D)	Fish use to dry/fish meal	0.44	3.5	0.59	4.1	0.41	3.2	0.48	3.6

Source: Field Survey Data.

Table 5.5b: Harbourwise & Seasonwise Details of Fish Caught & Sold (BO)

Sr. No.	Harbour	Details of Fish Caught & Sold (FM)							
		Porbandar		Veraval		Mangrol		Total	
1.	Oct - Dec 2014	tons	%	tons	%	tons	%	tons	%
A)	Fish landed per trip	4.20	100.0	5.50	100.0	4.63	100.0	4.78	100.0
	a) Grade I (high value)	3.40	81.0	4.85	88.2	3.80	82.1	4.02	84.1
	b) Grade II (low value)	0.80	19.0	0.65	11.8	0.83	17.9	0.76	15.9
B)	Fish Sold	3.98	94.8	5.17	94.0	4.43	95.6	4.53	94.7
	a)Exporter	0.90	22.6	2.87	55.5	1.23	27.8	1.67	36.8
	b)Wholesaler	1.40	35.2	1.32	25.5	1.65	37.3	1.46	32.2
	c)Retailer	0.15	3.8	0.08	1.5	0.47	10.6	0.23	5.2
	d)Contractor	1.53	38.4	0.90	17.4	1.08	24.3	1.17	25.8
C)	Fish waste/fish dumped	0.03	0.7	0.02	0.4	0.00	0.0	0.02	0.3
D)	Fish use to dry/fish meal	0.19	4.5	0.31	5.6	0.21	4.4	0.24	4.9
2.	Jan to Mar 2015								
A)	Fish landed per trip	3.83	100.0	4.70	100.0	4.57	100.0	4.37	100.0
	a) Grade I (high value)	3.20	83.6	3.95	84.0	3.85	84.2	3.67	84.0
	b) Grade II (low value)	0.63	16.4	0.75	16.0	0.72	15.8	0.70	16.0
B)	Fish Sold	3.54	92.4	4.25	90.4	4.35	95.2	4.05	92.7
	a)Exporter	1.40	39.5	1.95	45.9	0.85	19.5	1.40	34.6
	b)Wholesaler	1.18	33.3	1.36	32.0	1.70	39.1	1.41	34.9
	c)Retailer	0.26	7.3	0.24	5.6	0.40	9.2	0.30	7.4
	d)Contractor	0.70	19.8	0.70	16.5	1.40	32.2	0.93	23.1
C)	Fish waste/fish dumped	0.08	2.1	0.14	3.0	0.06	1.3	0.09	2.1
D)	Fish use to dry/fish meal	0.21	5.5	0.31	6.6	0.16	3.5	0.23	5.2
3.	April to Sep2015								
A)	Fish landed per trip	4.20	100.0	4.45	100.0	4.16	100.0	4.27	100.0
	a) Grade I (high value)	3.50	83.3	3.95	88.8	3.55	85.4	3.67	85.9
	b) Grade II (low value)	0.70	16.7	0.50	11.2	0.61	14.6	0.60	14.1
B)	Fish Sold	3.99	95.0	4.13	92.8	3.94	94.8	4.02	94.2
	a)Exporter	1.16	29.1	1.90	46.0	0.70	17.8	1.25	31.2
	b)Wholesaler	1.45	36.3	1.25	30.3	1.35	34.3	1.35	33.6
	c)Retailer	0.15	3.8	0.33	8.0	0.10	2.5	0.19	4.8
	d)Contractor	1.23	30.8	0.65	15.7	1.79	45.4	1.22	30.4
C)	Fish waste/fish dumped	0.00	0.0	0.10	2.2	0.10	2.4	0.07	1.6
D)	Fish use to dry/fish meal	0.21	5.0	0.22	4.9	0.12	2.8	0.18	4.3
4.	Overall								
A)	Fish landed per trip	12.23	100.0	14.65	100.0	13.36	100.0	13.41	100.0
	a) Grade I (high value)	10.10	82.6	12.75	87.0	11.20	83.9	11.35	84.6
	b) Grade II (low value)	2.13	17.4	1.90	13.0	2.16	16.1	2.06	15.4
B)	Fish Sold	11.51	94.1	13.55	92.5	12.72	95.2	12.59	93.9
	a)Exporter	3.46	30.1	6.72	49.6	2.78	21.9	4.32	34.3
	b)Wholesaler	4.03	35.0	3.93	29.0	4.70	37.0	4.22	33.5
	c)Retailer	0.56	4.9	0.65	4.8	0.97	7.6	0.73	5.8
	d)Contractor	3.46	30.1	2.25	16.6	4.27	33.5	3.33	26.4
C)	Fish waste/fish dumped	0.11	0.9	0.26	1.8	0.16	1.2	0.18	1.3
D)	Fish use to dry/fish meal	0.61	5.0	0.84	5.7	0.48	3.6	0.64	4.8

Source: Field Survey Data.

Table 5.5c: Harbourwise & Seasonwise Details of Fish Caught & Sold (FM)

Sr. No.	Harbour	Details of Fish Caught & Sold (FM)							
		Porbandar		Veraval		Mangrol		Total	
1.	Oct - Dec 2014	tons	%	tons	%	tons	%	tons	%
A)	Fish landed per trip	4.20	100.0	5.15	100.0	4.00	100.0	4.45	100.0
	a) Grade I (high value)	2.65	63.1	3.25	63.1	3.05	76.2	2.98	67.0
	b) Grade II (low value)	1.55	36.9	1.90	36.9	0.95	23.8	1.47	33.0
B)	Fish Sold	3.91	93.0	4.80	93.1	3.76	94.2	4.15	93.4
	a)Exporter	1.38	35.3	2.50	52.1	0.40	10.6	1.43	34.3
	b)Wholesaler	0.57	14.6	1.45	30.2	1.26	33.5	1.09	26.3
	c)Retailer	0.06	1.4	0.05	0.9	0.12	3.3	0.07	1.8
	d)Contractor	1.90	48.7	0.80	16.7	1.98	52.6	1.56	37.5
C)	Fish waste/fish dumped	0.20	4.6	0.29	5.6	0.12	2.9	0.20	4.5
D)	Fish use to dry/fish meal	0.10	2.4	0.07	1.3	0.12	2.9	0.09	2.1
2.	Jan to Mar 2015								
A)	Fish landed per trip	4.55	100.0	4.53	100.0	4.00	100.0	4.36	100.0
	a) Grade I (high value)	3.00	65.9	3.05	67.3	3.00	75.0	3.02	69.2
	b) Grade II (low value)	1.55	34.1	1.48	32.7	1.00	25.0	1.34	30.8
B)	Fish Sold	4.30	94.5	4.18	92.3	3.73	93.4	4.07	93.4
	a)Exporter	1.73	40.2	2.05	49.0	0.87	23.3	1.55	38.1
	b)Wholesaler	0.82	19.1	1.15	27.5	0.96	25.7	0.98	24.0
	c)Retailer	0.12	2.8	0.13	3.1	0.13	3.6	0.13	3.1
	d)Contractor	1.63	37.9	0.85	20.3	1.77	47.4	1.42	34.8
C)	Fish waste/fish dumped	0.17	3.7	0.20	4.3	0.17	4.1	0.18	4.1
D)	Fish use to dry/fish meal	0.08	1.8	0.16	3.4	0.10	2.5	0.11	2.6
3.	April to Sep2015								
A)	Fish landed per trip	4.17	100.0	4.45	100.0	3.91	100.0	4.18	100.0
	a) Grade I (high value)	3.05	73.1	3.05	68.5	2.96	75.7	3.02	72.3
	b) Grade II (low value)	1.12	26.9	1.40	31.5	0.95	24.3	1.16	27.7
B)	Fish Sold	3.89	93.3	4.11	92.4	3.52	89.9	3.84	91.9
	a)Exporter	1.52	39.1	2.04	49.6	1.80	51.2	1.79	46.5
	b)Wholesaler	1.20	30.8	0.87	21.2	0.80	22.8	0.96	24.9
	c)Retailer	0.02	0.5	0.09	2.2	0.09	2.6	0.07	1.7
	d)Contractor	1.15	29.6	1.11	27.0	0.83	23.5	1.03	26.8
C)	Fish waste/fish dumped	0.19	4.4	0.22	4.9	0.28	7.2	0.23	5.5
D)	Fish use to dry/fish meal	0.10	2.3	0.12	2.7	0.12	2.9	0.11	2.6
4.	Overall								
A)	Fish landed per trip	12.92	100.0	14.13	100.0	11.90	100.0	12.98	100.0
	a) Grade I (high value)	8.70	67.3	9.35	66.2	9.00	75.6	9.02	69.4
	b) Grade II (low value)	4.22	32.7	4.78	33.8	2.90	24.4	3.97	30.6
B)	Fish Sold	12.10	93.6	13.09	92.6	11.01	92.5	12.06	92.9
	a)Exporter	4.63	38.3	6.59	50.4	3.07	27.9	4.76	39.5
	b)Wholesaler	2.59	21.4	3.47	26.5	3.02	27.4	3.03	25.1
	c)Retailer	0.20	1.6	0.27	2.0	0.35	3.2	0.27	2.2
	d)Contractor	4.68	38.7	2.76	21.1	4.58	41.6	4.01	33.2
C)	Fish waste/fish dumped	0.55	4.3	0.71	5.0	0.56	4.7	0.61	4.7
D)	Fish use to dry/fish meal	0.28	2.1	0.34	2.4	0.33	2.8	0.32	2.4

Source: Field Survey Data.

It can be observed that not only the fish landed per trip was higher in case of boat owner than fishermen but also the percentage of Grade I quality fish was higher. About 15 percent Grade I fish was found higher with boat owner than fisherman. Besides, high percentage of fish was dumped or categorized as waste at fisherman level (4.7%) that of 1.3 percent at boat owner level which must have implication on income of fisherman. The reason for relatively high ratio of low value fish with fishermen than boat man was may be due to inadequate facilities available on board (such as washing facility) and use of dragging for hauling the fish (see, section 5.2.9). However, catch and quality are the function of fishing efforts, type of fishing gear and the nature of the fishing ground. In the both cases, fish landed at Porbandar harbor was of relatively low grade quality than other two harbours namely Veraval and Mangrol. The fish used as dry/fish meal was found around 3.6 percent of total fish landed.

The sale pattern of fish landed indicates that at overall level, about 94 percent of total fish was sold, of which around 37 percent was sold to exporter, around 29 percent each to wholesaler and contractor and remaining was sold to retailer. In case of fishermen and boat owner, the percentage of fish sold to total was also around 93 percent and both groups preferred to sell one third of their output to the exporter. In fact, generally incidence of post harvest loss when sold to exporters is less, as they provide the ice supply, fish containers and pick up the product at the landing site immediately to ensure minimum time loss in reaching the processing centre. Thus, in case of fisherman, the ratio of Grade I fish is relatively lower than that of boat owner, which must have affected the real income of fisherman.

5.2.6 Specieswise Seasonwise Value of Fish

The specieswise seasonwise value of fish realized on sale by the fisherman and boat owner during 2014-15 are presented in Tables 5.6a and 5.6b. It can be seen from the tables that across seasons, in case of

boat owner, average price per kg of Grade I fish ranges from as high as Rs. 800/- per kg for Pomfret and as low as Rs. 50/kg for prawn/rani, while Grade II fish ranges between Rs. 730/kg for Pomfret to Rs. 40/kg for red fish.

Table 5.6a: Specieswise Value of Fish (BO)

Sr. No.	Harbour	Specieswise Value of Fish (BO) 2014-15– Av. Price Rs./kg					
		Oct - Dec 2014		Jan to Mar 2015		April to Sep2015	
		Grade I	Grade II	Grade I	Grade II	Grade I	Grade II
1	Porbandar						
	Bagga	119	80	116	60	103	60
	Cuttle fish	167.5		171		166.7	
	Makool	164.3		186		160	120
	Mix Fish		64.5		53.8		48.3
	Narsinga	103.3		104.3		102.9	78.3
	Pomfret	800		730		680	
	Prawn	50				100	
	Rani	50		80		90	60
	Squid			105		90	
	Vekhli				60		60
2.	Veraval						
	Bagga	114		113.3	60	101	43.5
	Cuttle fish	180		180		175	
	Makool	152.5	120	140.6		155.6	100
	Mix Fish		41.4		46.4		40.8
	Narsinga	102		92.5	80	87.5	67.5
	Pomfret	543.3		650		750	
	Ranifish	80		65		62.5	45
	Redfish	75		117.5		68.3	
	Surmai	70		80		75	
	Vekhali	100	75	90		80	
	Squid	80					
	Jinga			100	70		
3.	Mangrol						
	Bagga	98.5		99		102	
	Cuttle fish	156.7	120	160		160	
	Makool	158.3		158.6	120	155.7	100
	Mix Fish		44		43		40.8
	Narsinga	96.1	75	96.9	80	94.4	70
	Pomfret	687.5		650		637.5	
	Ranifish	67.5	50	66.3	47.5	57.5	
	Red Fish	85		75	40	80	
	Vekhali		65				
	Simple Av.	179.2	73.5	184.5	63.4	180.6	66.7

Source: Field Survey Data.

Table 5.6b: Specieswise Value of Fish (FM)

Sr. No.	Harbour	Specieswise Value of Fish (FM) 2014-15– Av. Price Rs./kg					
		Oct - Dec 2014		Jan to Mar 2015		April to Sep2015	
		Grade I	Grade II	Grade I	Grade II	Grade I	Grade II
1	Porbandar						
	Bagga	124.5	100	128.3	100	118.9	
	Cuttle Fish	133.3	106.7	160	120	170	
	Makool	138.8		141.7		160	126.7
	Mix Fish		50.8		61.1		61.7
	Narsinga	113.3	80	106.4	85	115.7	80
	Passung	150		150		120	
	Pomfret	616.7	450	712.5		800	600
	Prawn		40		60		75
	Rani	100		90	50	120	80
	Red Fish	90		125		85	
	Squid					90	
2.	Veraval						
	Bagga	119.4		112.8	93.3	125	
	Cuttle fish	185		80			
	Makool	163.1	128.8	167.5	105	168	110
	Mix Fish		45		53.8		54.4
	Narsinga	112.1	76.7	111.3	80	103.3	78.3
	Pomfret	775		637.5	350	820	
	Prawn	120		110			67.5
	Ranifish			80		100	
	Redfish	73.3	38.3	80	55	100	62.5
	Vekhali	80	56.7	80		95	57.5
	Tuna	100	75				
	Squid						60
3.	Mangrol						
	Bagga	114.4	67.5	134.5		122.2	
	Cuttle fish	150	60	200	120	190	110
	Dhoma	80		110	70	100	
	Khagi	50		60			
	Kolmi	100	60	95			
	Makool	155	80	175		180	
	Mix Fish	80	51.3		61	80	52
	Narsinga	93.8	60	104	78.8	108.6	80
	Pomfret	570		675	340	625	450
	Prawn	150		100		136.7	110
	Ranifish		70	95		100	75
	Red Fish	80	62.5	90		40	60
	Squid	60				90	
	Vekhali		70	100		80	
	Tuna						80
	Coacker					75	
	Alva			110			
	Bhungar			110	60		
	Simple Av.	168.2	87.1	168.8	107.9	179.9	120.5

Source: Field Survey Data.

In case of fisherman, Grade I fish ranges from Rs. 800/kg for Pomfret to Rs. 40/kg for red fish while for Grade II fish rate ranges from Rs. 600/kg for Pomfret to Rs. 40/kg for prawn. The simple average of price realized for Grade I for all three seasons by the boat owner was Rs.181/kg, while in case of fisherman, it was Rs. 172/kg. While for Grade II fish, boat owner realized lower price of Rs. 68/kg as compared to Rs. 105/kg realized by fishermen. The fish price is in normal circumstances is related to the demand for the fish, the quality of the fish and the season. (please see, Annexure I (M) for information on districtwise and specieswise marine fish average price in Gujarat). The higher price per kg realized may be due to quality of fish marketed, time and demand for fish in market. Therefore, except good quality fish, other parameters also have effect on price determination, irrespective of seller (boat owner/fisherman).

5.2.7 Causes of Losses in Fish Value

Considering the nutritional significance coupled with stagnating catches in India, it is imperative that losses at all levels should be reduced. There are appreciable losses during both harvest and post-harvest stages in fisheries. The harvest and post-harvest losses has been defined as the quantity of marine fish which is not available or is not fit for human consumption due to physical damage, spoilage or some other reasons. Harvest losses are losses that occur at the time of harvesting and onboard the fishing craft. It is important to know the causes of losses of fish value. It can be seen from Tables 5.7a to 5.7c that on an average, the economic losses in terms of low market value of fish due to poor post-harvest infrastructure has been estimated to Rs. 18.10/kg. The rate of fish loss was higher during the period Oct-Dec and was the lowest during April-Sept period. The higher rate of loss was recorded by fisherman (around Rs.19/kg) as compared to boat owner (Rs.16/kg). The major reasons for losses at this stage were physical damage during fishing and spoilage due to improper icing, whereas very minimal share was loss due to fish being

eaten away by birds. The mechanized trawlers followed by gill netters are major causes for fish losses.

Table 5.7a: Causes of Losses in Fish Value (ALL)

Sr. No.	Particulars	Causes of losses of fish value- ALL															
		Porbandar (n=20)				Veraval (n=20)				Mangrol (n=20)				ALL (n=60)			
		Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.
I	Economic loss in terms of low market rate-Rs./kg due to poor post harvest infrastructure	17.2	15.9	15.3	16.2	21.5	20.7	20.1	20.8	16.5	15.4	15.5	17.2	18.4	17.3	17.0	18.1
II	Causes of Fish Losses (% respondent)																
A)	Type of causes																
a	Physical damage during fishing-1,	40	35	40	38.3	45	45	40	43.3	20	25	40	28.3	35.0	35.0	40.0	36.7
b	Spoilage due to improper icing-2,	20	20	25	21.7	20	15	15	16.7	40	35	25	33.3	26.7	23.3	21.7	23.9
b	Fish eaten by birds-3,	0	0	10	3.3	0	0	0	0.0	0	0	0	0.0	0.0	0.0	3.3	1.1
d	Both-1& 2	40	45	25	36.7	35	40	45	40.0	40	40	35	38.3	38.3	41.7	35.0	38.3
B)	Kind of craft																
a	Trawlers-1,	80	80	75	78.3	80	70	65	71.7	60	55	55	56.7	73.3	68.3	65.0	68.9
b	Gill neters-2,	20	15	10	15.0	5	10	15	10.0	20	15	25	20.0	15.0	13.3	16.7	15.0
c	Deep sea trawlers-3,	0	0	5	1.7	0	0	0	0.0	0	0	0	0.0	0.0	0.0	1.7	0.6
d	Long liner for Tuna-4,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
e	Squid jigging-5,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
f	Shore seining-6	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
g	Both 1& 2	0	5	10	5.0	15	15	15	15.0	15	20	15	16.7	10.0	13.3	13.3	12.2
h	Both 2&3	0	0	0	0.0	0	5	5	3.3	5	10	5	6.7	1.7	5.0	3.3	3.3
C)	Method of sale																
a	Auction-1,	15	20	20	18.3	40	45	35	40.0	25	30	25	26.7	26.7	31.7	26.7	28.3
b	Pre-agreed -2,	35	20	35	30.0	35	30	45	36.7	25	25	40	30.0	31.7	25.0	40.0	32.2
c	Contract 3	20	15	5	13.3	15	15	5	11.7	45	35	35	38.3	26.7	21.7	15.0	21.1
d	Auction + Pre agreed	15	25	25	21.7	5	5	10	6.7	0	10	0	0.0	6.7	10.0	11.7	9.4
e	Pre agreed + Contract	15	20	15	16.7	5	5	5	5.0	5	0	0	5.0	8.3	11.7	6.7	8.9
D)	Receipt of money																
a	In advance-1 ,	50	65	65	1.7	45	40	45	43.3	45	50	50	48.3	46.7	51.7	53.3	50.6
b	On same day-2,	0	0	5	0.0	0	0	0	0.0	0	0	10	3.3	0.0	0.0	5.0	1.7
c	In week time-3	0	0	0	13.3	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
d	In 15 days-4	20	15	5	21.7	25	30	25	26.7	20	5	10	11.7	21.7	16.7	13.3	17.2
e	Both- 1& 4	25	20	20	3.3	15	25	25	8.3	25	20	25	15.0	16.7	16.7	11.7	15.0
f	Both 1& 2	5	0	5	1.7	15	5	5	21.7	10	25	5	21.7	15.0	15.0	16.7	15.6

Source: Field Survey Data.

Table 5.7b: Causes of Losses of Fish Value (BO)

Sr. No.	Particulars	Causes of losses of fish value (BO)															
		Porbandar (n=10)				Veraval (n=10)				Mangrol (n=10)				ALL (n=30)			
		Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.
I	Economic loss in terms of low market rate-Rs./kg due to poor post harvest infrastructure	16.4	15.7	15.5	15.8	17.0	16.5	16.7	16.7	16.6	16.4	16.0	16.3	16.7	16.2	16.1	16.3
II	Causes of Fish Losses (% respondent)																
A)	Type of causes																
a	Physical damage during fishing-1,	50	40	30	40.0	60	60	40	53.3	10	10	20	13.3	40.0	36.7	30.0	35.6
b	Spoilage due to improper icing-2,	0	0	20	6.7	0	0	20	6.7	20	30	30	26.7	6.7	10.0	23.3	13.3
b	Fish eaten by birds-3,	0	0	20	6.7	0	0	0	0.07	0	0	0	0.0	0.0	0.0	6.7	2.2
d	Both-1& 2	50	60	30	46.7	40	40	40	40.0	70	60	50	60.0	53.3	53.3	40.0	48.9
B)	Kind of craft																
a	Trawlers-1,	90	90	60	80.0	70	60	50	60.0	60	50	50	53.3	73.3	66.7	53.3	64.4
b	Gill neters-2,	10	0	10	6.7	0	10	20	10.0	10	10	20	13.3	6.7	6.7	16.7	10.0
c	Deep sea trawlers-3,	0	0	10	3.3	0	0	0	0.0	0	0	0	0.0	0.0	0.0	3.3	1.1
d	Long liner for Tuna-4,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
e	Squid jigging-5,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
f	Shore seining-6	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
g	Both 1& 2	0	10	20	10.0	30	30	30	30.0	20	20	30	23.3	16.7	20.0	26.7	21.1
h	Both 2&3	0	0	0	0.0	0	0	0	0.0	10	20	0	10.0	3.3	6.7	0.0	3.3
C)	Method of sale																
a	Auction-1,	30	40	30	33.3	30	40	20	30.0	30	30	30	30.0	30.0	36.7	26.7	31.1
b	Pre-agreed -2,	30	20	40	30.0	40	20	70	43.3	30	30	50	36.7	33.3	23.3	53.3	36.7
c	Contract 3	20	20	0	13.3	30	30	0	20.0	40	20	20	26.7	30.0	23.3	6.7	20.0
d	Auction + Pre agreed	0	0	20	6.7	0	10	10	6.7	0	0	0	0.0	0.0	3.3	10.0	4.4
e	Pre agreed + Contract	20	20	10	16.7	0	0	0	0.0	0	20	0	6.7	6.7	13.3	3.3	7.8
D)	Receipt of money																
a	In advance-1 ,	20	40	60	40.0	40	40	40	40.0	40	50	30	40.0	33.3	43.3	43.3	40.0
b	On same day-2,	0	0	0	0.0	0	0	0	0.0	0	0	20	6.7	0.0	0.0	6.7	2.2
c	In week time-3	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
d	In 15 days-4	40	30	10	26.7	10	20	20	16.7	30	0	20	16.7	26.7	16.7	16.7	20.0
e	Both- 1& 4	30	30	20	26.7	30	10	10	16.7	0	30	0	10.0	20.0	23.3	10.0	17.8
f	Both 1& 2	10	0	10	6.7	20	30	30	26.7	30	20	30	26.7	20.0	16.7	23.3	20.0

Source: Field Survey Data.

Table 5.7c: Causes of Losses of Fish Value (FM)

Sr. No.	Particulars	Causes of losses of fish value (FM)															
		Porbandar (n=10)				Veraval (n=10)				Mangrol (n=10)				ALL (n=30)			
		Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.
I	Economic loss in terms of low market rate-Rs./kg due to poor post harvest infrastructure	18.0	16.2	15.2	16.5	26.0	25.0	23.5	24.8	16.5	14.5	15.0	15.3	20.2	18.6	17.9	18.9
II	Causes of Fish Losses (% respondent)																
A)	Type of causes																
a	Physical damage during fishing-1,	30	30	50	36.7	30	30	40	33.3	30	40	60	43.3	30.0	33.3	50.0	37.8
b	Spoilage due to improper icing-2,	40	40	30	36.7	40	30	10	26.7	60	40	20	40.0	46.7	36.7	20.0	34.4
b	Fish eaten by birds-3,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
d	Both-1& 2	30	30	20	26.7	30	40	50	40.0	10	20	20	16.7	23.3	30.0	30.0	27.8
B)	Kind of craft																
a	Trawlers-1,	70	70	90	76.7	90	80	80	83.3	60	60	60	60.0	73.3	70.0	76.7	73.3
b	Gill neters-2,	30	30	10	23.3	10	10	10	10.0	30	20	30	26.7	23.3	20.0	16.7	20.0
c	Deep sea trawlers-3,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
d	Long liner for Tuna-4,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
e	Squid jigging-5,	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
f	Shore seining-6	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
g	Both 1& 2	0	0	0	0.0	0	0	0	0.0	10	20	0	10.0	3.3	6.7	0.0	3.3
h	Both 2&3	0	0	0	0.0	0	10	10	6.7	0	0	10	3.3	0.0	3.3	6.7	3.3
C)	Method of sale																
a	Auction-1,	0	0	10	3.3	50	50	50	50.0	20	30	20	23.3	23.3	26.7	26.7	25.6
b	Pre-agreed -2,	40	20	30	30.0	30	40	20	30.0	20	20	30	23.3	30.0	26.7	26.7	27.8
c	Contract 3	20	10	10	13.3	0	0	10	3.3	50	50	50	50.0	23.3	20.0	23.3	22.2
d	Auction + Pre agreed	30	50	30	36.7	10	0	10	6.7	0	0	0	0.0	13.3	16.7	13.3	14.4
e	Pre agreed + Contract	10	20	20	16.7	10	10	10	10.0	10	0	0	3.3	10.0	10.0	10.0	10.0
D)	Receipt of money																
a	In advance-1 ,	80	90	70	80.0	50	40	50	46.7	50	50	70	56.7	60.0	60.0	63.3	61.1
b	On same day-2,	0	0	10	3.3	0	0	0	0.0	0	0	0	0.0	0.0	0.0	3.3	1.1
c	In week time-3	0	0	0	0.0	0	0	0	0.0	0	0	0	0.0	0.0	0.0	0.0	0.0
d	In 15 days-4	0	0	0	0.0	40	40	30	36.7	10	10	0	6.7	16.7	16.7	10.0	14.4
e	Both- 1& 4	20	10	20	16.7	0	0	0	0.0	20	20	20	20.0	13.3	10.0	13.3	12.2
f	Both 1& 2	0	0	0	0.0	10	20	20	16.7	20	20	10	16.7	10.0	13.3	10.0	11.1

Source: Field Survey Data.

The method of sale adopted and preferred by boat owner and fishermen was sale at pre-agreed price, followed by auction method of sale, sale to contractor and combination of above methods. The timeliness of receipt of money also matters in fishery business, especially for fishermen which are totally dependent on same. It was observed that on an average 50 percent of respondent mentioned that they had received money in advance while corresponding figures for fishermen and boat owner were 61.1 and 40 per cent respectively. Thus, 60 per cent fishermen received money in advance, while remaining amount was received in mix way, i.e. some advance and some after 15 days or so. In case of boat owner, 20 percent respondent received money after a 15 days time.

5.2.8 Time and Cost incurred in Fishing Activity

The details on time and cost incurred in fishing activity per trip are presented in Tables 5.8a to 5.8c.

Table 5.8a: Details on Time and Cost incurred in Fishing Activity per trip (ALL)

Sr. No.	Particular	Unit / trip	Time and Cost incurred in Fishing Activity per trip (ALL)			
			Porbandar	Veraval	Mangrol	Overall
1	Fishing nets/gears taken per fishing trip	Av. No.	13.4	16.8	15.1	15.1
2	Distance of the fishing ground from the shore	Nautical miles	88.2	180.9	109.0	126.0
3	Approximate time taken for fishing	hrs.	130.3	174.1	118.5	141.0
4	Approximate time taken for landing/unloading					
	a) Handling by (Machine) Mechanical Device	hrs.	26.0	40.1	28.6	31.6
	b) Handling Manually	hrs.	4.1	2.9	2.7	3.2
5	Quantum of fuel taken on board the vessel (diesel)	Liters	2267.5	3515.0	2282.5	2688.3
6	Fuel utilized per each trip	Liters	1947.5	3110.0	2026.5	2361.3
7	Operational expenses/trip					
	a) Exp. on Food & Water	Rs.	9200	15250	9675	11375
	b) Fuel Cost	Rs.	94064	150213	97880	114052
	c) Hired labour cost	Rs.	24900	38900	26200	30000
	d) Ice cost	Rs.	3900	5650	4625	4725
	i) total quantity	kg	9100	11550	7550	9400
	ii) Rate	Rs./Kg	1.3	1.2	1.3	1.2
	e) Any other expenditure	Rs.	11303	13552	10121	11659
	f) Total Cost	Rs.	143367	223565	148501	171811

Note: 1 Nautical mile= 1.852 km.

Table 5.8b: Details on Time and Cost incurred in Fishing Activity per trip (BO)

Sr. No.	Particular	Unit / trip	Time and Cost incurred in Fishing Activity (BO)			
			Porbandar	Veraval	Mangrol	Overall
1	Fishing nets/gears taken per fishing trip	Av. No.	15.3	18.8	19.1	17.7
2	Distance of the fishing ground from the shore	Nautical miles	78.6	175.5	125.5	126.5
3	Approximate time taken for fishing	hrs.	126.8	167.4	167.2	153.8
4	Approximate time taken for landing/unloading					
	a) Handling by (Machine) Mechanical Device	hrs.	26.3	40.6	32.4	33.1
	b) Handling Manually	hrs.	3.7	2.8	2.7	3.1
5	Quantum of fuel taken on board the vessel (diesel)	Liters	2045.0	3570.0	2750.0	2788.3
6	Fuel utilized per each trip	Liters	1685.0	3140.0	2450.0	2425.0
7	Operational expenses/trip					
	a) Exp. on Food and Water	Rs.	7400	15300	11000	11233
	b) Fuel Cost	Rs.	81386	151662	118335	117128
	c) Hired labour cost	Rs.	24500	38000	28000	30167
	d) Ice cost	Rs.	5000	8200	6850	6683
	i) total quantity	kg	8980	12100	9250	10110
	ii) Rate	Rs./Kg	1.3	1.2	1.4	1.3
	e) Any other expenditure	Rs.	11055	14741	12670	12822
	f) Total Cost	Rs.	129341	227903	176855	178033

Note: 1 Nautical mile= 1.852 km.
Source: Field Survey Data.

It can be seen from these tables that at overall level, about 15 fishing nets/gears were taken during each fishing trip which was made around 126 nautical miles away from the sea shore. The approximate time taken for fishing was around 141 hours while time taken for landing/unloading fish was 31.6 hours by machine and 3.2 hours by manually. The time taken for fishing per trip was higher in case of boat owner (153.8 hours) than fishermen (128.1 hours), while time taken of loading/uploading was less in case of fishermen that of boat owner. On an average 2688 liters of diesel fuel was taken on board/trip, out of which 88 percent fuel was used.

The total operational expenditure incurred has been estimated to be Rs. 1.71 lakh/per visit comprised of expenditure on food and water, fuel

cost, ice cost, hired labour and other miscellaneous items. There was huge difference in cost incurred by respondents of three selected harbors. The highest cost was incurred by the respondents from Veraval harbor (Rs. 2.24 lakh) while the lowest cost was recorded by respondents from Porbandar harbor (Rs. 1.44 lakh per trip). The high cost per trip at Veraval respondent would be due to longer time taken for fishing (174.1 hours). Around two third of total cost was incurred on fuel only, followed by about one fifth of total cost on hired human labour for fishing activity. Thus, these two costs put together accounted for about 84 percent of total cost. The expenses on food with water and miscellaneous expenditure accounted for around 7 percent each to total cost. The same trend can be noticed in case of fishermen and boat owner except ice cost and quantity. The total quantity of ice used by boat owner per trip was 4725 kg as compared to 2767 kg by fisherman.

Table 5.8c: Details on Time and Cost incurred in Fishing Activity per trip (FM)

Sr. No.	Particular	Unit / trip	Time and Cost incurred in Fishing Activity (FM)			
			Porbandar	Veraval	Mangrol	Overall
1	Fishing nets/gears taken per fishing trip	Av. No.	11.4	14.8	11.0	12.4
2	Distance of the fishing ground from the shore	Nautical miles	97.7	186.3	92.5	125.5
3	Approximate time taken for fishing	hrs.	133.8	180.8	69.8	128.1
4	Approximate time taken for landing/unloading					
	a) Handling by (Machine) Mechanical Device	hrs.	25.6	39.6	24.8	30.0
	b) Handling Manually	hrs.	4.5	2.9	2.7	3.4
5	Quantum of fuel taken on board the vessel (diesel)	Liters	2490.0	3460.0	1815.0	2588.3
6	Fuel utilized per each trip	Liters	2210.0	3080.0	1603.0	2297.7
7	Operational expenses/trip					
	a) Exp. on Food and Water	Rs.	11000	15200	8350	11517
	b) Fuel Cost	Rs.	106743	148764	77425	110977
	c) Hired labour cost	Rs.	25300	39800	24400	29833
	d) Ice cost	Rs.	2800	3100	2400	2767
	i) total quantity	kg	9220	11000	5850	8690
	ii) Rate	Rs./Kg	1.3	1.1	1.2	1.2
	e) Any other expenditure	Rs.	11550	12364	7572	10495
	f) Total Cost	Rs.	157393	219228	120147	165589

Note: 1 Nautical mile= 1.852 km.
Source: Field Survey Data.

5.2.9 Infrastructural Facilities Available on Board

The infrastructural facilities available on board play an important role in reducing the post harvest losses. It can be seen from the Tables 5.9a to 5.9c that at overall level, fish hold capacity of fishing vessel was 10.7 tonnes/boat, which was almost same in case of both boat owner and fisherman. The average number of ice boxes available were 11.17 having capacity of 480 kg. It is important to note that no fishing boat had insulated box on board. The lifting facilities were available on about 53 percent boats while dragging facility was with remaining ones.

Table 5.9a: Infrastructural Facilities Available on Board of Fishing Vessel-ALL

Sr. No.	Particular	Infrastructural facilities available (ALL)			
		Porbandar	Veraval	Mangrol	Overall
A	Fish-hold capacity (tons)	10.5	11.8	9.65	10.65
B	Ice boxes (No.)	11.3	11.8	10.4	11.17
C	Capacity in Kg	465	545	430	480
D	Insulated boxes (No.)	0.0	0.0	0.0	0.0
E	Capacity in Kg	0.0	0.0	0.0	0.0
F	Facilities for hauling the fish (%)				
	a) Dragging	45	40	55	46.67
	b) Lifting	55	60	45	53.33
F	Status of Fish hold (%)				
	a) Fresh	100	100	100	100.00
	b) Not Fresh	0	0	0	0.00
	c) Spoiled	0	0	0	0.00
G	Washing/cleaning facilities onboard (%)				
	a) yes	65	95	90	83.33
	b)No	35	5	10	16.67
H	Vessel has on-board processing facility – Yes (%)	100.0	100.0	100.0	100.0
	a) Icing facility	100.0	100.0	100.0	100.0
	Icing capacity (in tons)	9.5	10.65	9.8	9.98
	b) freezing facility	0	0	0	0.00
	c) canning facility	0	0	0	0.00
	d) smoking facility	0	0	0	0.00
	e) other facility	0	0	0	0.00
	c) Mode of disposal of waste fish: sorting on Board (% to total)	100	100	100	100
	d) Duration for sorting/grading of fishes on board (Hrs.)	1.00	1.53	1.14	1.22

Source: Field Survey Data.

Table 5.9b: Infrastructural Facilities Available on Board of Fishing Vessel (BO)

Sr. No.	Particular	Infrastructural facilities available (BO)			
		Porbandar	Veraval	Mangrol	Overall
A	Fish-hold capacity (tons)	9.8	11.7	9.6	10.4
B	Ice boxes (No.)	11.6	11.8	11.4	11.6
C	Capacity in Kg	490	490	540	507
D	Insulated boxes (No.)	0.0	0.0	0.0	0.0
E	Capacity in Kg	0.0	0.0	0.0	0.0
F	Facilities for hauling the fish (%)				
	a) Dragging	60	70	60	63.33
	b) Lifting	40	30	40	36.67
F	Status of Fish hold (%)				
	a) Fresh	100	100	100	100.0
	b) Not Fresh	0.0	0.0	0.0	0.00
	c) Spoiled	0.0	0.0	0.0	0.00
G	Washing/cleaning facilities onboard (%)				
	a) yes	100	100	100	100.00
	b)No	0.00	0.00	0.00	0.00
H	Vessel has on-board processing facility – Yes (%)	100.0	100.0	100.0	100.0
	b) Icing facility	100.0	100.0	100.0	100.0
	Icing capacity (in tons)	10.20	11.60	11.90	11.23
	b) freezing facility	0	0	0	0.00
	c) canning facility	0	0	0	0.00
	d) smoking facility	0	0	0	0.00
	e) other facility	0	0	0	0.00
	c) Mode of disposal of waste fish: sorting on Board (% to total)	100	100	100	100
	d) Duration for sorting/grading of fishes on board (Hrs.)	0.85	1.40	1.25	1.17

Source: Field Survey Data.

The status of fish hold in both categories and at all three harbors was fresh one. The washing and cleaning facility was available on about 83 percent craft, while 17 percent were not having this facility. However, in case of boat owner, all the fishing boats/craft had this facility. Further, it can be seen from the tables that all the selected respondents had on board processing facility. Among the various processing facilities, icing facility was available on all fishing crafts of both fishermen and boat owner,

having average capacity of about 10 tones. However, no boat had other processing facilities like freezing facility, canning facility, smoking facility, smoking facility and any other facility on board. The sorting of board facility was available on all the crafts used by fishermen and boat owners. On an average 1.22 hours were spent in sorting/grading of fish on board. Veraval respondents spent relatively more in grading the fish on board as compared to other two harbor respondents. Thus, icing facility was available on board for all crafts and sorting was done on board by the fishermen and boat owner.

Table 5.9c: Infrastructural Facilities Available on Board of Fishing Vessel (FM)

Sr. No.	Particular	Infrastructural facilities available (FM)			
		Porbandar	Veraval	Mangrol	Overall
A	Fish-hold capacity (tons)	11.2	11.9	9.7	10.9
B	Ice boxes (No.)	11.0	11.8	9.4	10.7
C	Capacity in Kg	440	600	320	453
D	Insulated boxes (No.)	0.0	0.0	0.0	0.0
E	Capacity in Kg	0.0	0.0	0.0	0.0
F	Facilities for hauling the fish (%)				
	a) Dragging	30	10	50	30
	b) Lifting	70	90	50	70
F	Status of Fish hold (%)				
	a) Fresh	100	100	100	100
	b) Not Fresh	0.0	0.0	0.0	0.0
	c) Spoiled	0.0	0.0	0.0	0.0
G	Washing/cleaning facilities onboard (%)				
	a) yes	30	90	80	66.67
	b)No	70	10	20	33.33
H	Vessel has on-board processing facility – Yes (%)	100.0	100.0	100.0	100.0
	c) Icing facility	100	100	100	100
	Icing capacity (in tons)	8.80	9.70	7.70	8.73
	b) freezing facility	0	0	0	0.00
	c) canning facility	0	0	0	0.00
	d) smoking facility	0	0	0	0.00
	e) other facility	0	0	0	0.00
	c) Mode of disposal of waste fish: sorting on Board (% to total)	100	100	100	100
	d) Duration for sorting/grading of fishes on board (Hrs.)	1.15	1.65	1.03	1.28

Source: Field Survey Data.

5.2.10 Details on Low Value Fish[1]

The details on low value fish is presented in Tables 5.10a to 5.10c indicate that at all three harbors and by both categories, no fish (young fish) was categorized as low value fish, while due to spoilage, about 0.3 tons of fish per trip has been treated as low value. Out of total spoilage, 61.32 percent is classified as by catch which was used for fish meal.

Table 5.10a: Details on Low Value of Fish (All)

Sr. No.	Particular	Details on Low Value of Fish/trip-ALL			
		Porbandar	Veraval	Mangrol	Overall
1	Quantity of fish treated as miscellaneous/low value (young fish)	0.0	0.0	0.0	0.0
2	Quantity of fish treated as miscellaneous/low value (**due to spoilage**) in tons	0.31	0.28	0.30	0.30
3	Percentage is classified as by-catch (use for fish meal)	66.95	58.22	58.75	61.32

Source: Field Survey Data.

Table 5.10b: Details on Low Value of Fish (BO)

Sr. No.	Particular	Details on Low Value of Fish/trip- BO			
		Porbandar	Veraval	Mangrol	Overall
1	Quantity of fish treated as miscellaneous/low value (young fish)	0.0	0.0	0.0	0.0
2	Quantity of fish treated as miscellaneous/low value (due to spoilage) in tons	0.26	0.29	0.30	0.28
3	Percentage is classified as by-catch (use for fish meal)	65.22	70.18	61.02	65.43

Source: Field Survey Data.

Table 5.10c: Details on Low Value of Fish (FM)

Sr. No.	Particular	Details on Low Value of Fish/trip- FM			
		Porbandar	Veraval	Mangrol	Overall
1	Quantity of fish treated as miscellaneous/low value (young fish)	0.0	0.0	0.0	0.0
2	Quantity of fish treated as miscellaneous/low value (due to spoilage) in tons	0.36	0.28	0.31	0.32
3	Percentage is classified as by-catch (use for fish meal)	68.06	46.21	56.59	57.83

Source: Field Survey Data.

[1] 'Low value/trash fish' is a loosely used term that describes fish species with various characteristics but they are generally small in size, have low consumer preference and have little or no direct commercial value (http://www.fao.org)..

5.2.11 Facilities on Sea Shore

Fishing harbours are being developed at both major and minor ports. The status of availability and condition of facilities at selected three harbors as mentioned by the respondent fishermen and boat owners presented in Tables 5.11a to 5.11c shows that at overall level, on average about 72 percent respondents were satisfied with landing platform. Half of the respondents from Veraval harbor were not satisfied with condition of landing platform. The condition of washing and cleaning facilities available at selected harbours was unsatisfactory at Porbandar and Mangrol while same was very poor at Veraval harbor. At the time of survey, we were informed that new facilities creation is in progress in order to improve the prevailing condition at these harbors.

Table 5.11a: Facilities on the Sea Shore (All)

Sr. No.	Particular	Facilities on the shore (% to total) ALL-% (n=60)			
		Porbandar	Veraval	Mangrol	Overall
A	Landing platform				
	a) Satisfied	80.00	50.00	85.00	71.67
	b) Unsatisfied	20.00	50.00	15.00	28.33
B	Washing/cleaning facilities available				
	a) satisfactory-1,	10.00	0.00	10.00	6.66
	b) unsatisfactory-2,	70.00	0.00	60.00	43.33
	c) very poor-3	20.00	100.0	30.00	50.00
C	Storage facilities	100.00	100.00	0.00	66.67
	i) Chill plants	0.00	0.00	0.00	0.00
	ii) Cold storage	0.00	0.00	0.00	0.00
	iii) ice plants	0.00	0.00	0.00	0.00
	iv) Flake ice plants	100.00	100.00	0.00	66.67
	v) Insulated vans	0.00	0.00	0.00	0.00
D	Drainage facilities				
	a) Yes	35.00	30.00	45.00	36.67
	b) No	65.00	70.00	55.00	63.33
E	Communication & approach facilities				
	a) Satisfactory	40.00	35.00	45.00	40.00
	b) Unsatisfactory	40.00	45.00	20.00	35.00
	c) Very poor	20.00	20.00	35.00	25.00
F	Drinking water facilities				
	a) Satisfactory	10.00	40.00	30.00	26.67
	b) Unsatisfactory	35.00	25.00	35.00	31.67
	c) Very poor	55.00	35.00	35.00	41.67
G	Parking facilities				
	a) Satisfactory	0.00	0.00	0.00	0.00
	b) Unsatisfactory	5.00	50.00	50.00	35.00
	c) Very poor	95.00	50.00	50.00	65.00
H	Toilet/sanitation facilities				
	a) Satisfactory	15.00	15.00	70.00	33.33
	b) Unsatisfactory	15.00	45.00	40.00	33.33
	c) Very poor	70.00	35.00	30.00	45.00
I	Solar fish dryer	0.00	0.00	0.00	0.00

Table 5.11b: Facilities on the Sea Shore (BO)

Sr. No.	Particular	Facilities on the shore (% to total) BO %			
		Porbandar	Veraval	Mangrol	Overall
A	Landing platform				
	a) Satisfied	100.00	100.00	80.00	6.70
	b) Unsatisfied	0.00	0.00	20.00	93.30
B	Washing/cleaning facilities available				
	a) satisfactory-1,	0.0	0.0	0.0	0.0
	b) unsatisfactory-2,	80.00	0.00	60.00	46.67
	c) very poor-3	20.00	100.00	40.00	53.33
C	Storage facilities	100.00	100.00	0.00	66.67
	i) Chill plants	0.00	0.00	0.00	0.00
	ii) Cold storage	0.00	0.00	0.00	0.00
	iii) ice plants	0.00	0.00	0.00	0.00
	iv) Flake ice plants	100.00	100.00	0.00	66.67
	v) Insulated vans	0.00	0.00	0.00	0.00
D	Drainage facilities				
	a) Yes	50.00	40.00	40.00	43.33
	b) No	50.00	60.00	60.00	56.67
E	Communication & approach facilities				
	a) Satisfactory	20.00	30.00	40.00	30.00
	b) Unsatisfactory	50.00	40.00	20.00	36.67
	c) Very poor	30.00	30.00	40.00	33.33
F	Drinking water facilities				
	a) Satisfactory	0.00	60.00	10.00	35.00
	b) Unsatisfactory	30.00	10.00	40.00	26.67
	c) Very poor	70.00	30.00	50.00	50.00
G	Parking facilities				
	a) Satisfactory	0.00	0.00	0.00	0.00
	b) Unsatisfactory	10.00	60.00	50.00	40.00
	c) Very poor	90.00	40.00	50.00	60.00
H	Toilet/sanitation facilities				
	a) Satisfactory	10.00	30.00	10.00	16.67
	b) Unsatisfactory	20.00	40.00	50.00	36.67
	c) Very poor	70.00	30.00	40.00	46.67
I	Solar fish dryer	0.00	0.00	0.00	0.00

Source: Field Survey Data.

All the respondents opined that out of three harbours, two harbours namely Porbandar and Veraval harbor had support infrastructure, i.e. flake ice plants. It was very unlike to mention here is that more than 60 percent of respondent mentioned that facilities like drinking water, parking facilities, toilet/sanitation facilities, drainage facilities, commutation and approach facilities are unsatisfactory or very poor. It was expected that when the basic infrastructure at sea shore is so poor, facility of solar dryer was not available. Therefore, state government

should take necessary steps to create required facilities at sea shore on war footing level.

Table 5.11c: Facilities on the Sea Shore (FM)

Sr. No.	Particular	Facilities on the shore (% to total) FM-%			
		Porbandar	Veraval	Mangrol	Overall
A	Landing platform				
	a) Satisfied	60.00	0.00	70.00	43.33
	b) Unsatisfied	40.00	100.00	30.00	56.67
B	Washing/cleaning facilities available				
	a) satisfactory-1,	20.00	0.00	20.00	13.33
	b) unsatisfactory-2,	60.00	0.00	60.00	40.00
	c) very poor-3	20.00	100.0	20.00	46.67
C	Storage facilities	100.00	100.00	0.00	66.67
	i) Chill plants	0.00	0.00	0.00	0.00
	ii) Cold storage	0.00	0.00	0.00	0.00
	iii) ice plants	0.00	0.00	0.00	0.00
	iv) Flake ice plants	100.00	100.00	0.00	66.67
	v) Insulated vans	0.00	0.00	0.00	0.00
D	Drainage facilities				
	a) Yes	80.00	80.00	50.00	70.00
	b) No	20.00	20.00	50.00	30.00
E	Communication & approach facilities				
	a) Satisfactory	60.00	40.00	50.00	50.00
	b) Unsatisfactory	30.00	50.00	20.00	33.33
	c) Very poor	10.00	10.00	30.00	16.67
F	Drinking water facilities				
	a) Satisfactory	20.00	20.00	50.00	30.00
	b) Unsatisfactory	40.00	40.00	30.00	36.67
	c) Very poor	40.00	40.00	20.00	33.33
G	Parking facilities				
	a) Satisfactory	0.00	0.00	0.00	0.00
	b) Unsatisfactory	0.00	40.00	50.00	30.00
	c) Very poor	100.00	60.00	50.00	70.00
H	Toilet/sanitation facilities				
	a) Satisfactory	20.00	0.00	30.00	16.67
	b) Unsatisfactory	10.00	50.00	20.00	26.67
	c) Very poor	70.00	50.00	50.00	56.67
I	Solar fish dryer	0.00	0.00	0.00	0.00

Source: Field Survey Data.

5.2.12 Facilities away from Sea Shore

The details on distance of facilities away from sea shore are presented in Tables 5.12a to 5.12c. It can be seen from the tables that on an average, the facilities like chill plants, cold storage, ice plants and insulated vans are available about 3 kms away from sea shore. These

facilities were available relatively closer to Veraval and Mangrol harbor than Porbandar harbor. Flake ice plant facility was much closer to Porbandar harbor than other two harbours.

Table 5.12a: Details on Distance of Facilities away from the Sea Shore (All)

Sr. No.	Particulars	Distance of Facilities away from the Sea Shore (in kms)			
		Porbandar	Veraval	Mangrol	Overall
1	Chill plants	3.85	2.65	2.40	2.97
2	Cold storage	3.85	2.65	3.05	3.18
3	Ice plants	3.80	3.05	2.95	3.27
4	Flake ice plants	0.04	1.68	2.20	1.31
5	Insulated vans	3.80	2.45	2.50	2.92

Source: Field Survey Data.

Table 5.12b: Details on Distance of Facilities away from the Sea Shore (BO)

Sr. No.	Particulars	Distance of Facilities away from the Sea Shore (in kms)- BO			
		Porbandar	Veraval	Mangrol	Overall
1	Chill plants	3.90	2.70	1.90	2.83
2	Cold storage	3.80	2.60	3.10	3.17
3	Ice plants	3.90	3.10	2.90	3.30
4	Flake ice plants	0.00	1.90	2.00	1.30
5	Insulated vans	4.10	2.50	2.40	3.00

Source: Field Survey Data.

Table 5.12cb: Details on Distance of Facilities away from the Sea Shore (FM)

Sr. No.	Particulars	Distance of Facilities away from the Sea Shore (in kms)- FM			
		Porbandar	Veraval	Mangrol	Overall
1	Chill plants	3.80	2.60	2.90	3.10
2	Cold storage	3.90	2.70	3.00	3.20
3	Ice plants	3.70	3.00	3.00	3.23
4	Flake ice plants	0.09	1.45	2.40	1.31
5	Insulated vans	3.50	2.40	2.60	2.83

Source: Field Survey Data.

5.2.13 Transport of Raw Fish

In order to transport the raw fish, availability of insulated van facility was very rarely available in selected three harbors in Gujarat. Mostly trolley was used for transport of raw fish followed by use of ice boxes for same. As seen earlier, grading and sorting of raw fish was done on board by both boat owner and fishermen of all three harbors (Tables 5.13a to 5.13c).

Table 5.13a: Details on Transport of Raw Materials-Fish (ALL)

Sr. No.	Particulars	Details on Transport of raw materials ALL			
		Porbandar	Veraval	Mangrol	Overall
1	Insulated van (%)				
	a) Yes	0	20	15	11.67
	b) No	100	80	85	88.33
2	Fishes stacked (%)	0	0	0	0.00
	i) Ice box	20	20	25	21.67
	ii) Insulated boxes	0	5	5	3.33
	iii) Thermal boxes	0	0	5	1.67
	iv) trolley	80	75	65	73.33
3	Grading/sorting (%)	100	100	100	100.00
	i) On board	100	100	100	100.00
	ii) On landing shore	0	0	0	0

Source: Field Survey Data.

Table 5.13b: Details on Transport of Raw Materials-Fish (BO)

Sr. No.	Particulars	Details on Transport of raw materials BO			
		Porbandar	Veraval	Mangrol	Overall
1	Insulated van				
	a) Yes	0.00	30.00	30.00	20.00
	b) No	100.0	70.00	70.00	80.00
2	Fishes stacked				
	i) Ice box	20.00	0.00	0.00	6.67
	ii) Insulated boxes	0.00	10.00	0.00	3.33
	iii) Thermal boxes	0.00	0.00	0.00	0.00
	iv) trolley	80.00	90.00	100.00	90.00
3	Grading/sorting				
	i) On board	100.00	100.00	100.00	100.00
	ii) On landing shore	0.00	0.00	0.00	0.00

Source: Field Survey Data.

Table 5.13c: Details on Transport of Raw Materials-Fish (FM)

Sr. No.	Particulars	Details on Transport of raw materials FM			
		Porbandar	Veraval	Mangrol	Overall
1	Insulated van				
	a) Yes	0.00	10.00	0.00	3.33
	b) No	100.00	90.00	100.00	97.67
2	Fishes stacked				
	i) Ice box	20.00	40.00	50.00	36.67
	ii) Insulated boxes	0.00	0.00	10.00	3.33
	iii) Thermal boxes	0.00	0.00	10.00	3.33
	iv) trolley	80.00	60.00	30.00	56.67
3	Grading/sorting				
	i) On board	100.00	100.00	100.00	100.00
	ii) On landing shore	0.00	0.00	0.00	0.00

Source: Field Survey Data.

5.2.14 Important Post-Harvest Facilities to minimize losses

The respondents were asked to share and rank their suggestions on important post harvest facilities to minimize losses of fishes. Tables 5.14a to 5.14c present the four suggestions which are ranked from I to IV (most important to less important). It can be seen from the tables that at overall level, the highest number of respondents (46.7 per cent) ranked I to the facility of having clear landing platform with washing and drainage facilities followed by facility of cold storage/chill plants with in the FH premises (36.7 per cent) and insulated storage boxes on board the fishing vessel (16.7 per cent). The same preference was recorded by the respondents of Veraval and Mangrol. While in case of Porbandar, preference was not same. Porbandar respondents ranked I to the facility of cold storage/chill plants with in the FH premises while facility of cold chain network was ranked as less preferred facility in all three harbours. Same trend was observed in case of fisherman and boat owner.

Table 5.14a: Important Post-harvest Facilities to Minimize Losses of Fishes- ALL

Sr No	Particulars	Important Post harvest facilities to minimize losses of fishes-ALL															
		Porbandar				Veraval				Mangrol				Overall			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1	A cleaner landing platform with washing and drainage facilities	35.0	35.0	30.0	0.0	65.0	25.0	10.0	0.0	40.0	30.0	30.0	0.0	46.7	30.0	23.3	0.0
2	Insulated storage boxes on board the fishing vessel	10.0	40.0	50.0	0.0	5.0	35.0	60.0	0.0	35.0	40.0	20.0	5.0	16.7	38.3	43.3	1.7
3	Cold storage/chill plants with in the FH premises	55.0	25.0	20.0	0.0	30.0	40.0	30.0	0.0	25.0	20.0	50.0	5.0	36.7	28.3	33.3	1.7
4	Cold Chain facility network	0.0	0.0	0.0	100	0.0	0.0	0.0	100	0.0	10.0	0.0	90.0	0.0	3.3	0.0	96.7

Note: Rank is given by the respondent (most important to relatively less important- rank I to IV)
Source: Field Survey Data.

Table 5.14b: Important Post-harvest Facilities to Minimize Losses of Fishes - BO

Sr. No.	Particulars	Important Post harvest facilities to minimize losses of fishes-BO															
		Porbandar				Veraval				Mangrol				Overall			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1	A cleaner landing platform with washing and drainage facilities	30.0	40.0	30.0	0.0	80.0	10.0	10.0	0.0	40.0	20.0	40.0	0.0	50.0	23.3	26.7	0.0
2	Insulated storage boxes on board the fishing vessel	10.0	40.0	50.0	0.0	0.0	40.0	60.0	0.0	30.0	30.0	30.0	10.0	13.3	36.7	46.7	3.3
3	Cold storage/chill plants with in the FH premises	60.0	20.0	20.0	0.0	20.0	50.0	30.0	0.0	30.0	30.0	30.0	10.0	36.7	33.3	26.7	3.3
4	Cold Chain facility network	0.0	0.0	0.0	100	0.0	0.0	0.0	100	0.0	20.0	0.0	80.0	0.0	6.7	0.0	93.3

Note: Rank is given by the respondent (most important to relatively less important- rank I to IV)
Source: Field Survey Data.

Table 5.14c: Important Post-harvest Facilities to Minimize Losses of Fishes - FM

Sr. No.	Particulars	Important Post harvest facilities to minimize losses of fishes-FM															
		Porbandar				Veraval				Mangrol				Overall			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1	A cleaner landing platform with washing and drainage facilities	40.0	30.0	30.0	0.0	50.0	40.0	10.0	0.0	40.0	40.0	20.0	0.0	43.3	36.7	20.0	0.0
2	Insulated storage boxes on board the fishing vessel	10.0	40.0	50.0	0.0	10.0	30.0	60.0	0.0	40.0	50.0	10.0	0.0	20.0	40.0	40.0	0.0
3	Cold storage/chill plants with in the FH premises	50.0	30.0	20.0	0.0	40.0	30.0	20.0	0.0	20.0	10.0	70.0	0.0	36.7	23.3	36.7	0.0
4	Cold Chain facility network	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0

Note: Rank is given by the respondent (most important to relatively less important- rank I to IV)
Source: Field Survey Data.

5.2.15 Losses due to Inadequate Post-Harvest Facilities on Shore

An attempt was also made to estimate the losses due to inadequate post harvest facilities at shore. The respondents were asked to range their losses into six categories. Tables 5.15a to 5.15c present the distribution of respondents as per their response to the question on losses due to inadequate post harvest facilities on shore. It was observed that about 32 percent respondents had incurred loss of 2-5 percent of total sale value, while 25 and 15 percent respondents incurred loss between 5-10 and 10-25 percent of total sale value respectively. Across the harbor, the trend was same, while across category, it was not same. Due to inadequate facilities, about 57 percent fishermen had incurred loss between 5-15 percent (of total sale value), while 37 percent boat owners incurred loss in this range. Thus, fishermen were at more loss than boat owner due to inadequate facilities. Therefore, necessary post harvest facilities need to be created on war footing basis.

Table 5.15a: Losses due to Inadequate Post Harvest facilities on Shore

Sr. No.	Particulars	Losses due to Inadequate Post Harvest facilities on Shore (Percentage) ALL			
		Porbandar	Veraval	Mangrol	Overall
1	Less than 1 % of total sale value	10.0	15.0	15.0	13.3
2	1-2 % of total sale value	20.0	10.0	15.0	15.0
3	2-5 % of total sale value	40.0	25.0	30.0	31.7
4	5-10 % of total sale value	20.0	25.0	30.0	25.0
5	10-15 % of total sale value	10.0	20.0	10.0	13.3
6	15-25 % of total sale value	0.0	0.0	0.0	1.7

Source: Field Survey Data.

Table 5.15ba: Losses due to Inadequate Post Harvest facilities on Shore BO

Sr. No.	Particulars	Losses due to Inadequate Post Harvest facilities on Shore (Percentage) BO			
		Porbandar	Veraval	Mangrol	Overall
1	Less than 1 % of total sale value	10.0	15.0	15.0	13.3
2	1-2 % of total sale value	20.0	15.0	15.0	16.7
3	2-5 % of total sale value	40.0	30.0	30.0	33.3
4	5-10 % of total sale value	20.0	30.0	30.0	26.7
5	10-15 % of total sale value	10.0	10.0	10.0	10.0
6	15-25 % of total sale value	0.0	0.0	0.0	0.0

Source: Field Survey Data.

Table 5.15c: Losses due to Inadequate Post Harvest facilities on Shore FM

Sr. No.	Particulars	Losses due to Inadequate Post Harvest facilities on Shore (Percentage) FM			
		Porbandar	Veraval	Mangrol	Overall
1	Less than 1 % of total sale value	0.0	0.0	20.0	6.7
2	1-2 % of total sale value	10.0	10.0	20.0	13.3
3	2-5 % of total sale value	30.0	20.0	20.0	23.3
4	5-10 % of total sale value	40.0	30.0	30.0	33.3
5	10-15 % of total sale value	20.0	40.0	10.0	23.3
6	15-25 % of total sale value	0.0	0.0	0.0	0.0

Source: Field Survey Data.

5.2.16 Awareness about Fish Market

At overall level, average distance of the fish wholesale market from sea shore was 7.5 kms (Table 5.16a). The wholesale market was nearer to Veraval sea shore (3.3. kms) and while in case of Mangrol, it was located 14.3 kms away from sea shore. The boat owner approaches the wholesale market which is 11 kms away from sea shore whereas fishermen prefer wholesale market nearer (4.0 kms) to him (Tables 5.16 b and 5.16c). Therefore duration of transport of landed fish from shore to market was higher in case of boat owner (1.7 hours) than fisherman (0.9 hours, i.e. 54 minutes). The respondents opined that one intermediary exist between fishermen /boat owner and wholesaler/retailer.

Table 5.16a: Awareness about the Fish Market (All)

Sr. No.	Particulars	Awareness about the Fish Market (All)			
		Porbandar	Veraval	Mangrol	Overall
1	Distance of the fish wholesale market from the shore (kms)	5.0	3.3	14.3	7.5
2	Intermediates between fisherman and wholesaler/retailers (Av. numbers)	1.0	1.0	1.4	1.1
3	Duration of transport of landed fish from the shore to the Market (hrs)	1.2	0.9	1.8	1.3

Source: Field Survey Data.

Table 5.16b: Awareness about the Fish Market (BO)

Sr. No.	Particulars	Awareness about the Fish Market (BO)			
		Porbandar	Veraval	Mangrol	Overall
1	Distance of the fish wholesale market from the shore (kms)	5.0	3.0	25.0	11.0
2	Intermediates between fisherman and wholesaler/retailers (Av. numbers)	1.0	1.0	1.2	1.1
3	Duration of transport of landed fish from the shore to the Market (hrs)	1.2	1.0	2.9	1.7

Source: Field Survey Data.

Table 5.16c: Awareness about the Fish Market (FM)

Sr. No.	Particulars	Awareness about the Fish Market (FM)			
		Porbandar	Veraval	Mangrol	Overall
1	Distance of the fish wholesale market from the shore (kms)	5.0	3.5	3.6	4.0
2	Intermediates between fisherman and wholesaler/retailers (Av. numbers)	1.0	1.0	1.5	1.2
3	Duration of transport of landed fish from the shore to the Market (hrs)	1.2	0.8	0.8	0.9

Source: Field Survey Data.

5.2.17 Problems faced

The problems faced by the boat owners and fishermen are presented in Table 5.17. The major harvesting problems cited by the respondent were storm, cyclone, tsunami, high wave, raining, poor facilities for bathing and drinking water and incidence of skin disease. The non availability of cold storage facility was major problem under storage category. Non availability of additional subsidy on fuel, inadequate supply of fuel were another problems cited by the respondents.

Table 5.17: Problems Faced by Boat Owners and Fishermen (%)

Sr. No.	BO/ FM	Problems	Problems (%respondents to total) Porbandar	Veraval	Mangrol	Total
A		Harvesting				
	BO	Cyclone, net break, rope break, raining	20.0	30.0	30.0	26.7
		High quality fish are not available in last 5-6 years	0.0	0.0	10.0	3.3
		Lack medical facility	10.0	0.0	0.0	3.3
		Not having high speed boat, i.e. time consuming, more diesel consumption , cant took more quantity of fish	10.0	20.0	0.0	10.0
		No Problem	50.0	40.0	10.0	33.3
		Parking of boat is major problem	10.0	0.0	20.0	10.0
		Training & demonstration needed	0.0	10.0	30.0	13.3
	FM	Accident, medical problem (heart attack), wound etc, to get medical facility is difficulty ,cyclone, communication problem	40.0	10.0	0.0	16.7
		Availability of fish is away therefore distance of fishing increase	10.0	0.0	10.0	6.7
		Net break, rope break, cyclone	0.0	20.0	10.0	10.0
		No Problem	30.0	10.0	60.0	33.3
		Parking facility is not proper, (1400 boat available and capacity for only 175 boat)	0.0	20.0	10.0	10.0
		Strom, cyclone, raining, bathing, drinking water, skin disease, tsunami, high wave	20.0	40.0	10.0	23.3
B		Cold Storage				
		Cold storage facility is not available	40.0	40.0	20.0	33.3
	BO	No Problem	60.0	60.0	80.0	66.7
	FM	Cold storage facilities is not available	60.0	50.0	40.0	50.0
		No Problem	40.0	50.0	60.0	50.0
C		Marketing				
	BO	Marketing facility is poor	10.0	30.0	30.0	23.3
		No Problem	40.0	70.0	60.0	56.7
		Price fluctuation	50.0	0.0	10.0	20.0
	FM	Low prices of fish	20.0	0.0	0.0	6.7
		Transport facility is bad due to not proper road.	0.0	20.0	0.0	6.7
		No Problem	60.0	60.0	100.0	73.3
		Pre-contract with wholesaler should be there	10.0	0.0	0.0	3.3
		Price fluctuation	10.0	10.0	0.0	6.7
		Washroom, water, drinking water is major problem	0.0	10.0	0.0	3.3
D		Ice Availability				
	BO	Ice availability problem during peak season	40.0	40.0	30.0	36.7
		No Problem	60.0	60.0	70.0	63.3
	FM	High rate of ice in summer season	30.0	10.0	30.0	23.3
		No Problem	70.0	90.0	70.0	76.7
E		Fuel Availability				
	BO	Irregular subsidy	20.0	20.0	0.0	13.3
		No Problem	70.0	60.0	80.0	70.0
		Shortage of diesel	10.0	20.0	20.0	16.7
	FM	No Problem	60.0	70.0	60.0	63.3
		Some time purchase in black	20.0	30.0	20.0	23.3
		Subsidy is not available	20.0	0.0	20.0	13.3
F		Any other suggestions				
	BO	Diesel subsidy, storage facility is needed	0.0	0.0	20.0	6.7
		Make harbour hygiene	10.0	0.0	0.0	3.3
		Parking problem due to high tide	10.0	10.0	10.0	10.0
		Rules & regulation and advertisement is needed	0.0	10.0	10.0	6.7
	FM	Want platform, subsidy	10.0	20.0	20.0	16.7

Source: Field Survey Data.

5.3 Marketing of Fish and Fish Products

All the fish landing centres are primary fish markets from where fishes are transported to the wholesale or retail markets. The retail markets are located in major towns and cities in the state. There was a sharp increase in the prices[2] of many of the highly preferred species in the state in recent years owing to the increased demand from both domestic as well as export sectors. The technological improvements in the transport and processing of marine fish facilitated movement of fish from distant harbours to wholesale and retail markets in the state. However, the perishable nature of fish compelled its quick disposal at each point of transaction and has resulted in the involvement of more intermediaries in the marketing channel leading to high marketing costs and margins.

During field survey, it was reported that there is a big gap between supply and demand, therefore fish marketing or fish business is very profitable. The fish markets and the marketing of fish are generally controlled/ conducted by fish traders, either individually or as groups, or Fish Traders' Associations or as Fishermen's Cooperative Societies. Four levels of markets or marketing systems are observed in the distribution channel of fish trade i.e. fish wholesaler/trader-processer/exporter–retailer - consumer.

5.3.1 Wholesaler

5.3.1.1 Season-wise Fish Purchases by Wholesaler

Wholesale fish markets are not well developed throughout the state. Fish landing centres are administered mutually by Fishery Department and fishermen association. Though some of the landing centres are well developed, some lagged behind due to the poor participation of all stakeholders. The major species of seawater fish normally caught by fishermen in three major harbors (Porbandar, Veraval and Mangrol) of Gujarat are croaker, cuttle fish, perches pomfret, prawn/shrimp, rani fish,

[2] see, Annexure I (N &O).

ribbon fish and squid. The major species of fish found and purchased in Porbandar harbor during 2014-15 were ribbon fish, Cuttle fish, pomfret and perches. Some major species found in Veraval and Mangrol harbors were ribbon fish, pomfret, cuttle fish and prawn (Tables 5.18, 5.19 and 5.20). The highly valuable fishes in the wholesale markets were pomfret and cuttle fish which are mostly traded by selected sample wholesalers. The prices of fish vary considerably depending on species, fish sizes, fish condition and market demand.

Table 5.18: Season-wise Details of Fish Purchases by Porbandar Wholesaler

Sr. No.	Species	Season-wise detail of fish purchases- Porbandar (n=5)			
		No. of wholesalers (WS)	Total Quantity of fish Purchase (tonnes/WS)	Rate of Fish Purchase (Rs./ Kg)	Selling prices (Rs./ Kg)
I	October to December 2014				
	Croaker	2	200	72.5	95
	Cuttle fish	4	1220	81.25	102.5
	Perches	1	600	80	100
	Pomfret	3	680	500	566.67
	Prawn/Shrimp	2	155	74	96
	Rani fish	1	15	50	75
	Ribbon fish	5	1340	66	91
	Squid	3	320	60	90
II	January to March 2015				
	Croaker	1	100	60	80
	Cuttle fish	3	900	80	105
	Perches	4	310	65	77.5
	Pomfret	3	720	533.3	561.66
	Prawn	2	430	114	136
	Rani fish	1	25	45	55
	Ribbon fish	4	1050	72.5	91.25
	Squid	1	100	70	90
III	April to September 2015				
	Croaker	2	220	77.5	107.5
	Cuttle fish	4	800	92.5	107.5
	Perches	1	300	80	90
	Pomfret	2	580	685	637.5
	Prawn	2	100	78	100
	Rani fish	1	50	100	120
	Ribbon fish	5	940	71	94
	Squid	3	300	71.66	91.66

Source: Field Survey Data.

Table 5.19: Season-wise Details of Fish Purchases by Veraval Wholesaler

Sr. No.	Species	Season-wise detail of fish purchases- Veraval (n=5)			
		No. of wholesalers (WS)	Total Quantity of fish Purchase (tonnes/WS)	Rate of Fish Purchase (Rs./ Kg)	Selling prices (Rs./ Kg)
I	October to December 2014				
	Croaker	1	50	60	75
	Cuttle fish	4	270	88.75	115
	Pomfret	4	700	546	567
	Prawn	2	3300	162	197
	Rani fish	4	162	50	71.25
	Ribbon fish	5	870	86	100.4
	Squid	3	175	93.33	108.33
	Cat fish	1	40	75	90
	Crab	1	100	65	90
	Sole Fish	1	20	60	75
	Tuna	1	50	50	60
II	January to March 2015				
	Croaker	2	195	95	115
	Cuttle fish	3	330	110	136.66
	Perches				
	Pomfret	5	550	534	567
	Prawn	1	280	100	127
	Ranifish	3	160	38.33	53.33
	Ribbonfish	4	520	75	97.5
	Squid	4	340	63.75	88.75
	Crab	1	100	60	80
	Cat fish	1	80	100	120
	Sole fish	1	50	65	70
	Tuna	2	180	70	97.5
III	April to September 2015				
	Croaker	2	345	90	118.33
	Cuttle fish	3	520	111.66	136.66
	Pomfret	3	250	566	534
	Prawn	3	280	85.5	107
	Ranifish	2	110	37.5	52.5
	Ribbonfish	5	780	75	96
	Squid	4	450	60	75
	Crab	1	50	60	90
	Cat fish	1	80	100	120
	Tuna	2	130	70	90
	Sole fish	1	50	65	70

Source: Field Survey Data.

Table 5.20: Season-wise Details of Fish Purchases by Mangrol Wholesaler

Sr. No.	Species	Season-wise detail of fish purchases- Mangrol (n=5)			
		No. of wholesalers (WS)	Total Quantity of fish Purchase (tonnes/WS)	Rate of Fish Purchase (Rs./ Kg)	Selling prices (Rs./ Kg)
I	October to December 2014				
	Croaker	2	195	95	115
	Cuttle fish	4	530	88.75	116.25
	Perches	2	100	62.5	87.5
	Pomfret	5	710	447	476
	Prawn	5	580	106	137
	Ranifish	3	175	41.66	63.33
	Ribbonfish	5	800	75	96
	Squid	3	250	48.33	68.33
	Cat fish	3	230	80	95
	Indian Sail fish	1	50	30	40
	Jew Fish	1	60	175	200
II	January to March 2015				
	Croaker	1	225	77.5	99.5
	Cuttle fish	4	400	122.5	145
	Perches	1	50	100	110
	Pomfret	5	500	432	459
	Prawn	4	375	96.5	113.75
	Ranifish	5	370	50	70
	Ribbonfish	5	980	74	94
	Squid	4	190	65	86.25
	Cat fish	3	280	45	60
	Indian Sail fish	1	50	40	55
	Jew Fish	1	50	130	150
III	April to September 2015				
	Croaker	1	75	90	110
	Cuttle fish	5	320	86	105
	Perches	1	50	70	90
	Pomfret	4	460	457.5	486.25
	Prawn	5	310	88.4	119.7
	Ranifish	5	118	52	72
	Ribbonfish	5	955	77	92
	Squid	3	125	53.33	73.33
	Cat fish	3	230	90	108.33
	Indian Sail fish	2	50	40	55
	Jew Fish	1	50	150	170

Source: Field Survey Data.

The wholesale price of Pomfret varied from Rs. 476 per kg in Mangrol to Rs 567/kg in Veraval and Porbandar during Season I (October to December). However, the price of Pomfret has gone up to Rs 637.5 per kg in Porbandar during Season III (April to September), basically due to poor catches and increase in demand.

The seasonwise analysis reveals that the Season I (October to December) was the major period of fish catch and marketing. In Porbandar harbor alone, the average amount of Ribbon fish and Cuttle fish sold in wholesale market was 1340 tonnes and 1220 tonnes per wholesaler, respectively. The fish selling was relatively lower in next two seasons. This was mainly due to fish catches in Season I and was poor in subsequent seasons.

5.3.1.2 Loss Incurred by Wholesaler due to Poor Post-harvest Infrastructure

It may be seen from Table 5.21 that the percentage of losses in fish value due to poor post-harvest infrastructure during Season I and Season II was to the tune of 6-10 per cent in case of 60 per cent of wholesalers in Porbandar harbor. However, during Season III, 6-10 per cent loss was experienced by 40 per cent of wholesalers in same harbor. The higher extent of losses (11-15%) was faced by 20 per cent of wholesalers during Season I and III, whereas such range of losses was not found in Season II in Porbandar harbor.

Relatively, the percentage of losses in fish value due to poor post harvest infrastructure to the tune of 11-15 per cent was the highest in Veraval and was lowest in Porbandar. On the other hand, the percentage of losses in fish value in the lower range (to the tune of 1-5 per cent) was more in Porbandar and was the lowest in Veraval harbour.

Table 5.21: Detail of Loss incurred by Wholesaler due to Poor Post Harvest Infrastructure

Sr. No.	Harbour/Loss Range	Loss in wholesale market (% loss in fish value- Rs/kg)		
		Oct.- Dec. 2014	Jan.-Mar 2015	April Sept.2015
A	Porbandar (n=5)			
	1-5 %	20.0	40.0	40.0
	6-10 %	60.0	60.0	40.0
	11-15 %	20.0	0.0	20.0
B	Veraval (n=5)			
	1-5 %	20.0	20.0	0.0
	6-10 %	40.0	40.0	40.0
	11-15 %	40.0	40.0	60.0
C	Mangrol (n=5)			
	1-5 %	0.0	20.0	20.0
	6-10 %	60.0	40.0	40.0
	11-15 %	40.0	40.0	40.0
D	All (n=15)			
	1-5 %	13.3	26.7	20.0
	6-10 %	53.3	46.7	40.0
	11-15 %	33.3	26.7	40.0

Source: Field Survey Data

5.3.1.3 Targeted Purchasers and Consumers in Wholesale Market

Marketing strategy encompasses selecting and analyzing the target market and creating and maintaining an appropriate marketing mix that satisfies the target consumers. The targeted purchasers and consumers of fish wholesalers in selected harbors of the State are given in Table 5.22. In selected harbors, out of 15 sample HHs, only 6 HHs (40 %) have targeted to sell to exporter, 5HHs (33.33 %) have targeted to sell to processers and remaining 4 HHs (26.67%) for sale to major urban markets of the country.

After targeting more profit fetching purchasers such as exporter, processors and major urban centres, the wholesalers have then targeted to nearby consumers. This happens when there is high fish in a particular period. It was found that out of 15 samples HHs, in second stage, 11 respondents (73.33%) had targeted the consumers living beyond 20 kms

range of the fish wholesale market. About 8 HHs (53.33%) have targeted consumers living in 5-20 km periphery of the wholesale market.

Table 5.22: Details of Targeted Purchasers/ Consumers for Wholesaler

Sr. No.	Targeted Purchasers/ Consumers	Rank -Targeted Purchasers/ Consumers for Wholesalers (n=15)						
		I	II	III	IV	V	VI	Total
1	Exporters	40.0	60.0	0.0	0.0	0.0	0.0	100.0
2	Processers & Exporters	33.3	40.0	26.7	0.0	0.0	0.0	100.0
3	Major urban Centres	26.7	0.0	73.3	0.0	0.0	0.0	100.0
4	Beyond 20 kms	0.0	0.0	0.0	73.3	20.0	6.7	100.0
5	Between 5 -20 Kms	0.0	0.0	0.0	20.0	53.3	26.7	100.0
6	Within a radius of 1-5 km	0.0	0.0	0.0	6.7	26.7	66.7	100.0

Note: Rank I stands Highest importance & Rank VI implies lowest importance
Source: Field Survey Data

5.3.1.4 Facilities Availed by Wholesaler

Fish being highly perishable after harvest requires proper preservation and storage to increase the shelf life (Clucas and Ward, 1996). Major methods of fish preservation and processing have been identified as freezing, icing and drying. There has been adequate ice supply in selected wholesale markets (Table 5.23). All selected sample HHs also got ice in time. On the whole, 60 per cent HHs expressed that ice price was more or less stable throughout the year. The average ice price was around Rs.1.30 per kg. In Porbandar market, the ice price was Rs.1.22 per kg. The ice price varied from Rs 1.17 per kg in Veraval to Rs.1.52 per kg in Mangrol wholesale market. The prevailing ice price in Mangrol wholesale market was higher due to lesser availability of ice plants.

Table 5.23: Supply of Ice to Wholesaler

Sr. No.	Particular	Supply of Ice - Wholesaler			
		Porbandar	Veraval	Mangrol	Overall
1	Adequate (%)				
	Yes	100	100	100	100
	No	0	0	0	0
2	Timely (%)				
	Yes	100	100	100	100
	No	0	0	0	0
3	Uninterrupted (%)				
	Yes	40	60	80	60
	No	60	40	20	40
4	Stable Price of Ice (%)				
	Yes	80	60	40	60
	NO	20	40	60	40
5	Price of ice paid (Rs/Kg)	1.22	1.17	1.52	1.30
	a) Oct-Dec 2014	1.24	1.2	1.33	1.26
	b) Jan-March 2015	1.21	1.2	1.45	1.29
	c) April-Sept 2015	1.34	1.2	1.38	1.31

Note: % to total wholesalers.
Source: Field Survey Data

5.3.1.5 Status of Fish Wholesale Markets

As mentioned earlier, fish markets and the marketing of fish are generally conducted by fish traders, either individually or as groups, or through Fish Traders' Associations and Fishermen Cooperative Societies. Most of the fish markets are managed by fish traders and processors. However, it was found that in seashore areas, the wholesale markets have no modern infrastructural facilities, not even overhead roofs in case of some. The details of status of fish wholesale markets in selected harbors are given in Table 5.24.

The average capacity of wholesale market varied from 48 tons per day in Porbandar to 66 tons per day in Mangrol. About 87 percent wholesale markets have linkage with other markets and consuming centres. Mainly insulated vehicles (80%) were used for transport of fish from the harbor to the wholesale markets.

Table 5.24: Details of Status of the Fish Wholesale Markets

S.N.	Particulars	Detail of Status of the fish wholesale markets (%) n=15			
		Porbandar	Veraval	Mangrol	Overall
1	Capacity of the wholesale market (Tons/day)	48	52	66	55.33
2	Linkage with other markets and consuming centres	80	80	100	86.67
3	Number of markets (Av) linked	2	3	3	2.67
4	Type of transport				
	A) insulated	100	60	80	80.00
	B) non-insulated vehicles	0	40	20	20.00
5	Type of cold storage facilities				
	A) Cold storage	40	20	20	26.67
	Capacity of the wholesale market (Tons)	1300	50	800	716.67
	B) freezer boxes	60	80	80	73.33
	Capacity of the wholesale market (Tons)	200	300	250	250.00
	C) Chill plants				
6	Regular fish supply				
	Yes	100	60	80	80.00
	No	0	40	20	20.00
7	Assured qualities				
	Yes	100	100	60	86.67
	No	0	0	40	13.33
8	Capacity to hold huge supplies	100	80	60	80.00
9	No capacity to hold huge supplies	0	20	40	20.00
10	Mode of Marketing activities				
	A) Open auction	80	40	20	46.67
	B) Direct sale	20	40	60	40.00
	C) Electronic bidding				
	D) other mode of transaction (Contract)	0	20	20	13.33
11	Staff involved (Average no.)	21	12	28	20.33

Source: Field Survey Data

Among the types of cold storage facilities availed by wholesalers, freezer boxes were major ones that used by about 73 per cent wholesalers, while remaining 27 per cent had used cold storage facility. About 80 per cent respondents could get regular fish supply and about 87 per cent got the fish of assured quality. About 80 per cent of them had the capacity to hold huge supplies. On an average, 20 people were engaged with a wholesaler. As far as mode of marketing is concerned, open auction method was followed by 80 per cent wholesalers in Porbandar whereas 60 per cent wholesalers in Mangrol resorted to direct sale method of marketing.

5.3.1.6 Bottlenecks Faced by the Wholesalers

It may be noted from Table 5.25 that the wholesalers did not face much difficulties in terms of supply, marketing and upkeep of the markets. Only about 27 per cent wholesalers expressed that they faced problem of market storage facilities.

Table 5.25: Details about Bottlenecks Faced by the Wholesalers

Sr. No.	Particulars	Bottlenecks Faced by the Wholesalers	
		Inadequate	adequate
1	In terms of Supply	0.00	100.0
2	In terms of marketing	0.00	100.0
3	In terms of upkeep of the market	0.00	100.0
4	Market Storage facilities	26.67	73.33

Source: Field Survey Data

5.3.2 Retailer

5.3.2.1 Marketing of Fish in Retail Market

The local retail markets for marine fishes catered the need of local people in the cities and nearby areas. However, during the survey, it was found that there were no proper shops/buildings for marketing of fish in retail. The fishes were sold on the roadside without facility of proper roof, electricity, water, drainage, storage room and proper flooring. At some places, small platforms were constructed in the market. There were no proper lavatory and washing facilities in most of the retail markets. The hygienic conditions were also very poor. Fishes were piled up on the floor and sold.

Most of the fish merchants did not use ice or any chilling facilities while very few of them used meager amount of crushed ice during selling the fishes. As a result, the quality of fishes deteriorated and retailers were forced to sell them at lower price. Majority of retail fish markets those were visited by the research team are found to be ill-managed and unhygienic. There were no proper handling, washing, cleaning, icing or re-

icing of the fishes in the market places. The details of the retailers and retail markets and consumers are discussed in the present section.

5.3.2.2 Socio- Economic Characteristics of Retailer in Fish Market

It may be seen from the Table 5.26 that the majority of fish retailers were women (90%). The average age of retailers was about 48 years. Only about 33 per cent of them were literate. The literacy rate of Female retailers was better in Porbandar harbor compared to other places.

Table 5.26: Socio- Economic Characteristics of Retailer

Sr. No.	Particulars	Socio- Economic Characteristics of Retailer (n=30)			
		Porbandar	Veraval	Mangrol	Overall
1	Age (Av.)	45.7	45.4	51.6	47.56
2	Gender (%)				
	i) Male	10.0	10.0	10.0	10.0
	ii) Female	90.0	90.0	90.0	90.0
3	Education				
	Male				
	Illiterate	0	100	100	66.67
	Literate	100	0	0	33.33
	Female				
	Illiterate	44.44	77.78	77.78	66.67
	Literate	55.56	22.22	22.22	33.33

Source: Field Survey Data

5.3.2.3 Season-wise Fish Purchases and Sold by retailer

A large number of species were found to be sold in the retail markets of selected harbors in Gujarat (Tables 5.27 to 5.29). The major species of fish found and purchased in retail markets of Porbandar were ribbon fish, crab, cuttle fish, pomfret and Indian prawn. Some major species found in retail markets of Veraval and Mangrol harbors were cat fish, prawn/shrimp and small sciaenids. Some of the highly valuable fishes in the retail markets were Indian prawns, pomfret and shrimps. The prices of fish vary depending on species, fish sizes, fish condition/quality and market demands.

Table 5.27: Season-wise details of Fish purchases by Porbandar Retailer

Sr. No.	Species	Season-wise detail of fish purchases- Retailer- Porbandar (n=10)			
		Fish Purchase (tonnes/RL)	Rate of Fish Purchase (Rs./ Kg)	Fish sold (tonnes/RL)	Selling prices (Rs./ Kg)
I	October to December 2014				
	Cat fish	135	85.0	118	108.0
	Cuttle Fish	26	137.5	26	157.5
	Crab	222	170.0	202	192.0
	Croaker	15	37.5	15	52.5
	Giant Cat Fish	117	73.8	105.5	88.1
	Indian Prawn	184	150.8	183.8	165.8
	Jewfish	27	216.7	22	243.3
	Little Tuna	70	84.2	67.8	112.5
	Pomfret	57	832.5	52	1016.3
	Prawn	5	125.0	5	130.0
	ribbon fish	223	85.6	217	113.9
	Seer fish	33	230.0	21	253.8
	Silver bar	28	60.0	27.8	83.3
	Small Sciaenids	598	132.5	520.9	164.4
	Squid	44	93.3	42	111.7
	Others Fish				
II	January to March 2015				
	Cat fish	192	111.3	170	137.5
	Cuttle Fish	10	130.0	10	145.0
	Crab	214	150.0	194	170.0
	Croaker	5	40.0	5	50.0
	Giant Cat Fish	112	73.3	105.9	90.0
	Indian Prawn	238	157.5	227.8	172.5
	Jewfish	50	200.0	43	230.0
	Little Tuna	62	95.0	61.9	105.0
	Pomfret	68	857.5	62.9	1078.8
	ribbon fish	244	85.0	228	104.4
	Seer fish	30	220.0	20	250.0
	Silver bar	10	40.0	9.8	70.0
	Small Sciaenids	710	135.4	642.9	162.7
	Squid	63	111.4	57	134.3
	Others Fish	25	40.0	24.9	50.0
III	April to September 2015				
	Cat fish	113	117.8	95	146.1
	Cuttle Fish	5	80.0	5	130.0
	Crab	0	0	0	0
	Croaker	5	40.0	5	50.0
	Giant Cat Fish	80	90.0	69.9	112.5
	Indian Prawn	173	170.0	173	182.0
	Jewfish	34	173.3	30	220.0
	Little Tuna	57	96.3	54.9	110.0
	Pomfret	47	882.5	44.9	1078.8
	Prawn	2	100.0	2	130.0
	ribbon fish	172	94.4	143	117.8
	Seer fish	25	220.0	15	250.0
	Small Sciaenids	556	130.0	490	165.3
	Squid	47	98.0	40	136.0
	Others Fish	6	40.0	5	50.0

Source: Field Survey Data

Table 5.28: Season-wise detail of fish purchases by Veraval Retailer

Sr. No.	Species	Season-wise detail of fish purchases- Retailer- Veraval (n=10)			
		Fish Purchase (tonnes/RL)	Rate of Fish Purchase (Rs./ Kg)	Fish sold (tonnes/RL)	Selling prices (Rs./ Kg)
I	October to December 2014				
	Bombay Duck	15	50.0	14	90.0
	Cat fish	167	66.0	132	87.0
	Cuttle Fish	17	50.0	14	70.0
	Crab	20	35.0	20	100.0
	Mix	10	50.0	5	60.0
	Pomfret	8	266.7	8	275.0
	Prawn	13	90.0	8	128.3
	Rani fish	3	100.0	3	100.0
	Seer fish	2	100.0	2	120.0
	Scab	15	45.0	10	60.0
	Silver bar	13	33.0	12.9	37.5
	Small Sciaenids	166	107.1	164	142.9
	Squid	2	100.0	2	300.0
	Jewfish	2	50.0	2	60.0
II	January to March 2015				
	Bombay Duck	10	60.0	10	90
	Cat fish	70	60.0	58	72
	Cuttle Fish	10	100.0	7	150
	Crab	26	28.3	26	73
	Mix	10	50.0	5	60
	pomfret	2	700.0	2	750
	Prawn	17	76.7	12	97
	Rani fish	50	50.0	40	80
	Scab	10	50.0	5	60
	Silver bar	15	16.0	14	20
	Small Sciaenids	167	98.0	164	129
	Squid	10	45.0	10	50
	Surmai	2	100.0	2	200
	Tuna	2	50.0	2	80
	Vekhli	10	12.5	10	35
III	April to September 2015				
	Bombay Duck	12	50	10	80
	Cat fish	75	52	60	66
	Cuttle Fish	90	75	55	120
	Mix	10	50	5	60
	Prawn	262	74.7	242	83.7
	Rani fish	10	50	5	60
	Squid	8	20	3	30
	Surmai	2	100	2	200
	Vekhli	10	15	10	35

Source: Field Survey Data

Table 5.29: Season-wise detail of fish purchases by Mangrol Retailer

Sr. No.	Species	Season-wise detail of fish purchases- Retailer- Mangrol (n=10)			
		Fish Purchase (tonnes/RL)	Rate of Fish Purchase (Rs./ Kg)	Fish sold (tonnes/RL)	Selling prices (Rs./ Kg)
I	October to December 2014				
	Bombay Duck	17.5	42.5	17.5	77.5
	Cat fish	104	69.5	92	86.0
	Indian Prawn	53.75	46.3	46.5	65.0
	Pomfret	42.5	125.0	39.5	157.5
	Rani fish	60	48.0	50	68.0
	ribbon fish	89.5	68.8	78.5	83.8
	Scab	42	45.0	38	50.0
	Seer fish	38.5	60.0	33.5	83.3
	Shrimp	390	86.0	570	114.0
	Silver bar	32	36.7	29	43.3
	Small Sciaenids	20	62.5	16	80.0
	Spotted bat fish	66	61.0	61	75.0
	Squid	23	51.8	18	65.0
	Little Tuna	35	38.3	32	50.0
II	January to March 2015				
	Bombay Duck	14	47.5	13.3	82.5
	Cat fish	83	75.0	79	92.5
	Indian Prawn	38	50.0	35	69.0
	Pomfret	32	140.0	28	167.5
	Rani fish	38	55.0	31	73.8
	ribbon fish	41	69.6	34	82.4
	Scab	38	45.0	33	50.0
	Shrimp	255	105.0	198	132.0
	Silver bar	17	45.0	14	55.0
	Small Sciaenids	20	62.5	18	80.0
	Spotted bat fish	20	70.0	15	88.3
	Squid	18	32.5	13	40.0
	Little Tuna				
	Cuttle fish	14	47.5	13.3	82.5
III	April to September 2015				
	Bombay Duck	10	50.0	9.8	80.0
	Cat fish	55	55.0	53	72.5
	Pomfret	9	333.3	8	373.3
	Rani fish	28	56.7	22	76.7
	ribbon fish	45	77.5	39	92.5
	Scab	40	48.8	36	52.5
	Seerfish	12	40.0	11.9	47.7
	Shrimp	280	87.5	245	120.0
	Silver bar	33	23.0	30.9	28.8
	Small Sciaenids	25	73.3	22	88.3
	Spotted bat fish	10	30.0	8	50.0
	Squid	18	32.5	13	40.0
	Cuttle fish	10	50.0	9.8	80.0

Source: Field Survey Data

The retail price of Indian prawns varied from Rs. 158 per kg in Mangrol to Rs 166 per kg in Veraval during Season I October to December). However, the price of Indian Prawns has gone up to Rs 182 per kg in Porbandar during Season III (April to September), due to decline in fish production and increase in demand. The retail price of pomfret varied from Rs 157 per kg in Mangrol to Rs 1016 per kg in Porbandar during Season I (October to December). Sometimes the price of some species like Pomfret varied widely across various harbors depending on size, quality and demand of fish. The retail prices of most of the fishes have gone up during second and third seasons compared to first season.

However, the quantity of fish sold during the Seasons II and III was found to be more in case of some species compared to first season. In Porbandar harbor, the seasonal average amount of Small Sciaenids, Ribbon fish and Cuttle fish sold in retail market were 598 tonnes, 223 tonnes and 222 tonnes per retailer, respectively. The selling of Small Sciaenids has increased to 710 tonnes per retailer during season I.

Table 5.30: Source of Fish Purchase and Sold by Retailer

Sr. No	Sources of	Source of Fish Purchase and Sold															
		Porbandar (n=10)				Veraval (n=10)				Mangrol (n=10)				ALL (n=30)			
		Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.	Oct.-Dec. 2014	Jan.-Mar 2015	April Sept. 2015	Av.
A	Fish Purchase																
1	Fisherman	30.0	30.0	30.0	30.0	0.0	20.0	10.0	10.0	30.0	10.0	50.0	30.0	30.0	30.0	20.0	26.7
2	Broker/ Middlemen	70.0	70.0	70.0	70.0	70.0	50.0	70.0	63.3	50.0	70.0	40.0	53.3	70.0	70.0	70.0	70.0
3	Both	0.0	0.0	0.0	0.0	30.0	30.0	20.0	26.7	20.0	20.0	10.0	16.7	0.0	0.0	10.0	3.3
B	Sold to																
1	Retailers-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	Proccerssors -2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Consumer-3	100	100	100	100	70.0	100	100	90.0	80.0	100	100	93.3	100	100	90.0	96.7
4	Hotel-4	0.0	0.0	0.0	0.0	30.0	0.0	0.0	10.0	20.0	0.0	0.0	6.7	0.0	0.0	10.0	3.3

Source: Field Survey Data

It may be seen from Table 5.30 that the major sources of purchase of fish by the retailers were the brokers or middle men. About 70 per cent of total fishes were purchased by retailers through the brokers/middlemen. Entire fishes in the retail market were sold to the consumers coming from the nearby areas.

5.3.2.4 Loss Incurred by Retailers due to Poor Post Harvest Infrastructure

It may be seen in Table 5.31 that the percentage of losses in fish value due to poor post-harvest infrastructure during Season I was to the tune of 6-10 per cent in case of 60 per cent of retailers in Porbandar market. However, during Season III, the 6-10 per cent loss was experienced by 30 per cent of retailers in the same harbor. The higher extent of losses (16-20%) was not faced by any retailers during any seasons in Porbandar, however such range of losses was found in other harbors.

Table 5.31: Detail of Loss incurred by Retailer due to poor post harvest infrastructure

Sr. No.	Harbour/Loss Range	Loss in value due to inadequate post harvest infrastructure **Retailer** (% loss in fish value- Rs/kg)		
		Oct.- Dec. 2014	Jan.-Mar 2015	April Sept.2015
A	Porbandar (n=5)			
1	1-5 %	30.0	40.0	50.0
2	6-10 %	60.0	40.0	30.0
3	11-15 %	10.0	20.0	20.0
4	16-20%	0.0	0.0	0.0
B	Veraval (n=5)			
1	1-5 %	20.0	30.0	0.0
2	6-10 %	50.0	40.0	60.0
3	11-15 %	20.0	30.0	30.0
4	16-20%	10.0	0.0	10.0
C	Mangrol (n=5)			
1	1-5 %	30.0	30.0	20.0
2	6-10 %	50.0	30.0	60.0
3	11-15 %	10.0	30.0	20.0
4	16-20%	10.0	10.0	0.0
D	All (n=15)			
1	1-5 %	26.7	33.3	23.3
2	6-10 %	53.3	36.7	50.0
3	11-15 %	13.3	26.7	23.3
4	16-20%	6.7	3.3	3.3

Source: Field Survey Data

5.3.2.5 Targeted Consumers in Fish Retail Market

The targeted purchasers and consumers of fish retailers in selected harbors of the State are given in Table 5.32. In selected harbors, about 67 per cent of retailers have targeted to sell fish to nearby consumers within a radius of 1-5 kms, whereas the fish consumers living between 5-20 km radius were targeted by about 22 per cent retailers and the fish consumers living between beyond 20 km radius were targeted by about 12 per cent retailers.

Table 5.32: Targeted Consumers for Retailers

Sr. No.	Particulars	Targeted Purchasers/ Consumers for Retailer (n= 30)			
		Porbandar	Veraval	Mangrol	Overall
1	Within a radius of 1-5 km	90	60	50	66.67
2	Between 5 -20 Kms	5	20	40	21.67
3	Beyond 20kms	5	20	10	11.67

Source: Field Survey Data

5.3.2.6 Facilities Availed by Retailer

The major facility required by the fish retailers was availability of ice to keep the fish afresh in the market places as well as in their storage boxes. As could be seen from Table 5.33, about 93 per cent of selected sample retailers got ice in adequate quantity and about 90 per cent of them could get ice in time and uninterruptedly. On the whole, only about 33 per cent retailers expressed that ice price was more or less stable throughout the year.

The average ice price in retail market was around Rs.1.25 per kg. In Porbandar retail market, the ice price was the highest of Rs.1.28 per kg. The ice price varied from Rs 1.23 per kg in Veraval to Rs.1.28 per kg in Porbandar retail market. The prevailing retail price of ice in Mangrol was about 1.25 per kg. It may be observed that the price of ice was more during the season I compared to other seasons.

Table 5.33: Details of Supply of ice – Retailer

Sr. No.	Particular	Supply of ice – Retailer (n= 30)			
		Porbandar	Veraval	Mangrol	Overall
1	Adequate (%)				
	Yes	100	80	100	93.33
	No	0	20	0	06.67
2	Timely (%)				
	Yes	100	80	90	90.00
	No	0	20	0	10.00
3	Uninterrupted (%)				
	Yes	100	80	90	90.00
	No	0	20	10	10.00
4	Stable Price of Ice (%)				
	Yes	0	50	50	33.33
	NO	100	50	50	66.67
5	Price of ice paid (Rs/Kg)	1.28	1.23	1.25	1.25
	a) Oct-Dec 2014	1.38	1.28	1.28	1.31
	b) Jan-March 2015	1.17	1.19	1.25	1.20
	c) Apr-Sept 2015	1.29	1.23	1.22	1.24

Source: Field Survey Data

5.3.2.7 Status of Retail Fish Market

The details of status of the fish retail markets in selected harbors are presented in Table 5.34. The average capacity of the retail market varied from 42 tons per day in Porbandar to 75.5 tons per day in Veraval. All the retailers used non-insulated vehicles for transport of fish from the harbor or wholesale markets and to the retail markets due to lesser distance.

Among the types of cold storage facilities availed by retailers, ice boxes were the major ones that used by all the retailers. Also all the retailers could get regular fish supply in assured quality and they had the capacity to hold huge supplies. As far as mode of marketing is concerned, direct sale method was followed by about 97 per cent retailers. Mostly single member had handled the fish selling in retail market.

Table 5.34: Status of Retail Fish Market

Sr. No	Particulars	Units	Status of Retail Fish Market			
			Porbandar	Veraval	Mangrol	Overall
1	Capacity of the Retail market	(Tons Per Day)	42	75.5	56.5	58
2	Type of transport vehicles	Insulated-	0	0	0	0
		Non-Insulated	100	100	100	100
3	Type of cold storage	Cold Storage	0	0	0	0
		Freezer Boxes	0	0	0	0
		Chill Plants-	0	0	0	0
		Ice Box	100	100	100	100
		Capacity Of Box	46	39	38	41
4	Fish supply is regular	Yes	100	100	100	100
		No	0	0	0	0
5	Fish supply in assured qualities	Yes	100	100	100	100
		No	0	0	0	0
6	The fish market has the capacity to hold huge supplies in times of large arrivals	Yes	0	0	0	0
		No	100	100	100	100.00
7	How the marketing activities are done	Direct Sale	100	90	100	96.67
		Open Auction	0	10	0	3.33
8	Staff involved in his retail business	Numbers	1	1.2	1.4	1.2

Source: Field survey data

5.3.3 Fish Consumers

5.3.3.1 Socio- Economic Characteristics of Fish Consumers

The socio-economic characteristics of the fish buyers and the details of fish purchase by them in the retail market are presented in Tables 5.35 and 5.36. About 57 per cent respondent buyers were from age group of 20-40 years while about 43 per cent were having age more than 40 years (Table 5.35). Among the fish buyers, 67 per cent were male and reaming 33 per cent were female. Occupation-wise, buyers came from all sections, but majority were in service (26.7%) as the selected retail markets were located mainly in urban areas. The average family size of the fish consumers was 6.37 persons.

Table 5.35 Socio- Economic Characteristics of Consumer

Sr. No.	Particulars	Socio- Economic Characteristics of consumer			
		Porbandar	Veraval	Mangrol	Overall
1	Age (Av) years	41.5	44.5	33.5	39.7
	Age between 20-40 years (%)	50	40	80	56.67
	Age more than 40 years (%)	50	60	20	43.33
2	Gender				
	i) Male (%)	30	70	100	66.67
	ii) Female (%)	70	30	0	33.33
3	Main occupation (%)				
	Male				
	Student	0	10	10	6.67
	Fishing	0	20	0	6.67
	Service	20	30	30	26.67
	Labour	0	0	40	13.33
	Store keeper	10	10	0	6.67
	other	0	0	20	6.67
	Female				
	House wife	70	20	0	30.00
	Business	0	10	0	3.33
4	Family size (Av.)	4.9	7.8	6.4	6.37
	i) Male	1.9	3.1	2.4	2.47
	ii) Female	1.8	2.1	2.6	2.17
	iii) Children	1.2	2.6	1.4	1.73

Source: Field Survey Data

5.3.3.2 Fish Purchase Behaviour of Consumer

It may be seen in Table 5.36 that on an average, consumers have purchased the fish four days in a week. Majority of consumers purchased cuttle fish, squid, ribbon fish, jinga and pomfret. The average quantity of purchase was 0.89 kg per visiting day. All the consumers expressed that they used to get desired type and quality of fish since all these markets are located very close to main harbor areas. About 83 percent of the consumers reveal that the average price was reasonable. Across the selected harbors, there were no major variations in the types of purchases made by the consumers.

Table 5.36: Fish Purchase behavior of Consumer

Sr. No.	Particulars	Purchases fish by Consumer			
		Porbandar	Veraval	Mangrol	Overall
1	Av. No of days in week	4.4	3.5	3.8	3.90
2	Species Distribution (%)				
	i) Ribbon fish	20	15	20	18.33
	ii) Cuttle fish	10	10	15	11.67
	iii) Squid	20	20	30	23.33
	iv) Pomfret	30	15	5	16.67
	v) Jinga	10	30	20	20.00
	vi) Other	10	10	10	10.00
3	Quantity (kg/purchase)	0.9	0.83	0.95	0.89
4	Price (Rs./kg)	102	117	115	111.33
5	Get the type and quality of fish (%)				
	Yes	100	100	100	100.00
	No	0	0	0	0.00
6	Reasonable price (%)				
	Yes	80	80	90	83.33
	No	20	20	10	16.67

Source: Field Survey Data

5.3.3.3 Fish Processing in Selected Harbors

Fish is one of the most perishable items among the foodstuff. It cannot be stored in normal temperature overnight. Processing aims at controlling, if not totally arresting the process of spoilage and make the fish available in variety of forms acceptable to the consumers. The biochemical changes taking place in the fish post-mortem is very complex, several changes take place in the fish muscle constituent leading to change in texture and flavour producing odoriferous compounds indicative of spoilage. The degree of spoilage depends on several factors. The loss mainly occurs due to faulty handling and discard of small size fishes. There are several methods of processing and preservation of fish. The main methods are curing, caning and freezing. Processing channels are crucial for fisheries sector as all fish items mean for export marketing need to pass through these channels.

5.4 Harbor wise Capacity of Fish Processing Plant

The harbor wise capacity and utilization of processing plant is presented in Table 5.37. The overall total installed capacity for processing seafood in sample processor in Gujarat was 57.9 tons per day with utilization capacity varied from 58.3 to 72.4 percent in different seasons. It is evident from the table that, the installed capacity of an average processing plant in Porbandar was 80.3 tons per day which was higher than that in Veraval (52.8 tons per day) and Mangrol (40.8 tons per day). However, the capacity utilization in processing plant was higher in Veraval as compared to Porbandar and Mangrol. In Veraval, the utilization capacity of plant varied from 71.1 to 82.0 per cent across different seasons; whereas the same in Porbandar and Mangrol varied from 56.7 to 77.9 per cent and from 44.8 to 49.1 per cent, respectively. It is evident from the table that the overall utilization capacity of plant was highest during the season I (Oct. – Dec) as compared to other seasons.

Table 5.37: Harbor wise Capacity of Plant

Sr. No.	Particular	Harbor wise capacity (tons per day)		
		Capacity	Utilization	%
A	Porbandar			
	Oct-Dec 2014	80.25	62.5	77.88
	Jan-March 2015	80.25	45.5	56.70
	Apr-Sept 2015	80.25	45.5	56.70
B	Veraval			
	Oct-Dec 2014	52.75	43.25	81.99
	Jan-March 2015	52.75	37.5	71.09
	Apr-Sept 2015	52.75	38.25	72.51
C	Mangrol			
	Oct-Dec 2014	40.75	20	49.08
	Jan-March 2015	40.75	18.25	44.79
	Apr-Sept 2015	40.75	20	49.08
D	Overall			
	Oct-Dec 2014	57.92	41.92	72.38
	Jan-March 2015	57.92	33.75	58.27
	Apr-Sept 2015	57.92	34.58	59.70

Source: Field Survey Data

5.4.1 Season-wise Details of Fish Taken for Processing

The season-wise details of fish taken for processing have been presented in Table 5.38. On an average, a selected processor had purchased fish of 2741.7 tons to 3216.7 tons at the rate of Rs. 179.6 to 186.3 per kg for processing in a season. Overall, the processed quantity sold during a season varied from 2504.2 tons to 2900.0 tons; whereas the selling price varied from Rs. 308.3 per kg to Rs. 322.5 per kg. Overall, the economic loss varied from Rs. 29.2 per kg in Season III to Rs. 31.3 per kg during Seasons I and II.

Table 5.38: Season-wise Details of Fish Taken for Processing

Sr. No.	Season-wise	Season-wise detail of fish taken up to processing				
		Quantity of fish taken for processing (ton)	Rate of Fish Purchase (Rs./ Kg)	Processed output quantity (ton)	Sold prices (Rs./ Kg)	Economic loss (Rs./ Kg)
A	Porbandar					
	Oct-Dec 2014	3800	162.5	3537.5	250	23.75
	Jan-March 2015	2875	200.0	2650	287.5	28.75
	Apr-Sept 2015	3250	187.5	2950	337.5	27.5
B	Veraval					
	Oct-Dec 2014	3875	188.75	3412.5	317.5	33.75
	Jan-March 2015	3050	182.5	2787.5	300	30
	Apr-Sept 2015	3250	187.5	3037.5	325	30
C	Mangrol					
	Oct-Dec 2014	1975	207.5	1750	362.5	36.25
	Jan-March 2015	2300	175.0	2075	337.5	35
	Apr-Sept 2015	2250	163.75	2025	305	30
D	Overall					
	Oct-Dec 2014	3216.67	186.25	2900.00	310.00	31.25
	Jan-March 2015	2741.67	185.83	2504.17	308.33	31.25
	Apr-Sept 2015	2916.67	179.58	2670.83	322.50	29.17

Source: Field Survey Data

The harbourwise analysis reveals that the average quantity of purchase in Season I (Oct. to Dec) was the highest in Veraval (3875 tons) followed by Porbandar (3800 tons) and Mangrol (1975 tons). Similar trend in purchase was observed in other two seasons as well. However, the highest sold quantity during Season I was realized in Porbandar (3537.5 tons), which was followed by Veraval (3412.5 tons) and Mangrol (1750 tons) during the same season. Among the harbors, the economic loss was

the highest in Mangrol as compared to the same in Porbandar and Veraval. This was basically processor due to inadequate availability of ice plants at harbor level and lower quality of fish caught in Mangrol.

5.4.2 Sources of Fish Purchases and Sold by Fish Processors

The details on sources of fish purchases and sold by the fish processors is presented in Table 5.39. Overall 66.67 per cent of sample processors purchased the fish from both wholesale market and fishermen and 8.33 percent of them purchased fish from broker/middleman + fisherman. It is evident from the table that only 16.67 per cent respondents had purchased fish from fisherman and 8.33 per cent has purchased from wholesale market directly.

Table 5.39: Sources of Fish Purchases and Sold by Processors

Sr. No.	Particulars	Sources of Fish Purchases and sold- Processor			
		Porbandar	Veraval	Mangrol	Overall
A	Sources of fish purchases				
	Fishermen	0.00	50	0.00	16.67
	Wholesale Market	0.00	0.00	25	8.33
	Broker/ Middleman	0.00	0.00	0.00	0.00
	Wholesale Market+ fishermen	100	25	75	66.67
	Broker/ Middleman+ Fishermen	0.00	25	0.00	8.33
	Other	0.00	0.00	0.00	0.00
B	Fish Sold				
	Exporters	92.01	90.97	89.61	90.86
	Domestic Market	7.99	9.03	10.39	9.14

Source: Field Survey Data

As far as processed fish and fish products sold by the processors is concerned, overall 90.9 per cent of the processors sold the product to exporters; whereas only 9.1 per cent of them sold in domestic market. In Porbandar, 92.0 per cent processors sold their quantity in export market whereas in Veraval and Mangrol, 91.0 per cent and 90.87 per cent fish was sold to export market, respectively.

5.4.3 Transport of Raw Materials by Fish Processors

The major fishing harbors are important primary trading centres also. The agents of exporters also operated in these centres as the major export oriented items like shrimps, squids, cuttlefish and high value fishes were landed at these centres. Insulated van and fishes stacked like ice box, thermal box, and insulated box were used by the processors involved in fish trade for transporting fish to distant markets. As revealed from Table 5.40, on the whole, 33.3 per cent processors used insulated vans for transport of raw fish from harbor to distant centers. In Porbandar, all processors used insulated vans, while in other harbors, none of the processor used insulated vans. All the processors in Porbandar used ice box for fish stalking whereas 75 per cent processors in Veraval and 50 per cent processors in Mangrol used ice boxes for the same. Overall, about 83.3 per cent of processors did grading and sorting of fishes in the processing plants; whereas only 16.67 per cent of them relied on on-board sorting of fishes.

Table 5.40: Transport of raw materials by Processor

Sr. No.	Particulars	Transport of raw materials (%)- Processor			
		Porbandar	Veraval	Mangrol	Over all
A	Insulated van	100	0	0	33.33
B	Fishes stacked	100	100	100	33.33
	a) Ice box	100	75	50	75.00
	b) Insulated box	0	25	50	25.00
	c) Thermal box	0	0	0	
C	Grading/sorting				
	a) On board	0	25	25	16.67
	b) plant	100	75	75	83.33

Source: Field Survey Data

5.4.4 Processing Plant Incompliance with export houses/ Countries

The fish processing sector has been almost entirely privatized and over the past several years, it has become one of the most rapidly developing sub-sectors of the food processing sector. The greatest numbers of fish processing firms mostly are located in coastal areas. The

main task facing these companies/ plants is to comply with various certifying agencies such as EIA (Export Inspection Agency of India), EU (European Union), F&D act of USA, HACCP (Hazard Analysis and Critical Control Point) etc. It may be seen in Table 5.41 that all the sample processing plants were complied with EIA norms, HACCP norms and were registered with the Marine Products Exports Development Authority (MPEDA). About 58.33 per cent processors were compiled with EU norms and F&D of USA.

Table 5.41: Processing Plant Incompliance with export houses/ Countries

Sr. No.	Particulars	Processing Plant Incompliance (%)			
		Porbandar	Veraval	Mangrol	Over all
1	EIA (Export Inspection Agency of India) Norms	100	100	100	100
2	EU (European Union) Norms	100	50	25	58.33
3	F&D of USA	75	100	0	58.33
4	HACCP (Hazard Analysis and Critical Control Point)	100	100	100	100
5	Registered with the MPEDA	100	100	100	100

Source: Field Survey Data

5.4.5 Value Additions by Fish Processors

Value addition is the most important aspect of fish processing industry, mainly because of increased opportunities for the exports and earning of foreign exchange. Besides, value addition is one of the possible approaches to raise the profitability of fish processing industry, which now lays greater emphasis on quality assurance. The harbor wise details on value addition by processors are given in Table 5.42. At overall level, about 75 per cent of total quantities of fish were used for export as frozen fish and remaining 25 per cent as whole fish plus frozen. Overall 80 to 90 per cent of total processed quantity of fishes were exported to Europe, Japan, US, China, Vietnam, Dubai, Italy and South Korea and 10-20 per cent of total quantity of processed fish products were sold in Delhi, Ahmadabad Jodhpur, Mumbai, Surat, Vadodara, Anand, Pune and other domestic markets. Overall about 75 per cent processed products were ready to cook and eat.

Table 5.42: Details of value additions by Processor

Sr. No.	Details of value addition by Processor								
	Harbour & Value addition/processed product	%	Target market		Fish product				Ready to Cook & eat
					Export		Domestic		
			Exporting countries	Domestic markets	Qty	Value (Rs./Kg)	Qty	Value (Rs./kg	
A	Porbandar								
	Frozen Whole Fish+ Frozen	75 25	Europe, Japan, US, Malaysia, China, Vietnam, Europe & china	Delhi, Ahmadabad, Nimach Jodhpur Pune, Surat	90-95	Purchase price + 2-5 $	5-10	+40-50 Rs.	75
B	Veraval								
	Frozen Whole Fish+ Frozen	100	China , Vietnam, Italy, Spain	Ahmadabad, Mumbai, Surat, Pune, Anand,	80-95	+ 5-8 $	5-20	70-80	100
C	Mangrol								
	Frozen Whole Fish+ Frozen	50 25	Japan, US, China, Dubai, UAE, Vietnam, south Korea	Ahmadabad, Mumbai, Vododara, Pune, Surat	70-90	Purchase price + 2-5 $	10-30	30-40	50
D	Overall								
	Frozen Whole Fish+ Frozen	75 25	EUROPE, Japan, US, Malaysia, China, Vietnam, Europe, Italy, Spain,dubai, UAE, south Korea & china	Delhi, Ahmadabad, Nimach Jodhpur Pune, Surat, Anand & Vododara	80-90	Purchase price + 3-5 $	20	50-60	75

Source: Field Survey Data

5.5 Factors Helpful in Minimizing Post-harvest Losses of Fishes

The modernized post-harvest facilities are essential to minimize post-harvest losses of fish and fish products. Table 5.43 presents the perceptions of the processors regarding the required improvements in post harvest infrastructures so as to minimize the losses. As the table shows, overall about 58.3 per cent of processors have revealed first preference to insulated storage boxes on board. They have assigned second preference to clean landing platform with washing and drainage facilities and third preference to cold storage/chill plants facilities. It may be noted that the sample processors had assigned forth preference to cold chain network facility in fishing region.

Harbourwise analysis reveals that processors in Veraval have attached more importance to insulated storage boxes on board followed by the requirement of cleaner landing platform with washing and drainage facilities in their harbor. Both these facilities are also assigned more

importance in other two harbors also. It may be seen that about 75 per cent sample processors in Porbandar and Mangrol have assigned forth preference to cold chain network facility while about 75 per cent of Veraval processors have assigned forth preference to cold storage/chill plants within the fish harvest premises.

Table 5.43: Factors helpful in Minimizing Post-harvest Losses of Fishes (Processor)

Sr. No.	Rank	Factors helpful in minimizing post harvest loss of fishes- Processor			
		A cleaner landing platform with washing and drainage facilities	Insulated storage boxes on board the fishing vessel	Cold storage/chill plants within the FH premises	Cold chain network facility
A	Porbandar				
	I	50	50	0.00	0.00
	II	50	50	0.00	0.00
	III	0.00	0.00	75	25
	IV	0.00	0.00	25	75
B	Veraval				
	I	25	75	0.00	0.00
	II	75	25	0.00	0.00
	III	0.00	0.00	25	75
	IV	0.00	0.00	75	25
C	Mangrol				
	I	50	50	0.00	0.00
	II	50	50	0.00	0.00
	III	0.00	0.00	75	25
	IV	0.00	0.00	25	75
D	Overall				
	I	41.67	58.33	0.00	0.00
	II	58.33	41.67	0.00	0.00
	III	0.00	0.00	58.33	41.67
	IV	0.00	0.00	41.67	58.33

Note: Rank is given by the respondent (most important to relatively less important- rank I to IV)
Source: Field Survey Data.

To conclude, there are appreciable losses occurs at harvest and post harvest stages and it is imperative that losses at all levels should be reduced. Therefore, governments and development agencies should ensure that changes in post-harvest fisheries-related policy and practices take stock of the loss assessment tools, information generated and experience of the programme. Fish loss assessments should be incorporated into national data collection systems and used to regularly inform policy (Akande and Diei-Ouadi, 2010).

The next chapter presents the summary and policy implications.

Chapter VI

Summary and Conclusions

6.1 Backdrop

The fisheries sector plays an important role in the Indian economy. It contributes to the national income, exports, food and nutritional security and in employment generation. This sector is also a principal source of livelihood for a large section of economically underprivileged population of the country, especially in the coastal areas. This sector provides livelihood to approximately 14.49 million people in the country. It has been recognized as a powerful income and employment generator as it stimulates growth of a number of subsidiary industries and is a source of cheap and nutritious food besides being a source of foreign exchange earner. The fisheries sector is rarely a strategic sector for national economic development. Although it plays a prominent role in developing States rich fishery resources relative to their populations, it is nonetheless an important economic activity, and very often a strategic one, in many coastal regions of India.

The fisheries sector in India is a very important economic activity and a flourishing sector with varied resources and potentials. Starting from a purely traditional activity in early fifties when India commenced with the first Five-Year Plan, fisheries and aquaculture have now transformed into a significant commercial enterprise. The vibrancy of the sector can be visualized by more than 13 fold increase India achieved in fish production in just six decades, i.e. from 0.75 million tonnes in 1950-51 to 10.07 million tonnes during 2014-15. This resulted in an unparalleled average annual growth rate of over 5 percent over the years which have placed the country on the forefront of global fish production, only after China. In fact fish output in India doubled during last two decades period, that is between 1995-96 and 2014-15. Besides meeting the

domestic needs, the dependence of over 14.5 million people on fisheries activities for their livelihood and foreign exchange earnings to the tune of US$ 5.51 billion (2014–15) from fish and fisheries products, equaled about 18 percent of the export earnings from the agriculture sector, amply justifies the importance of the sector on the country's economy and in livelihood security. India is also an important country that produces fish through aquaculture in the world. India is home to more than 10 percent of the global fish diversity. Presently, the country ranks second in the World in total fish production with an annual fish production of about 10.07 million metric tonnes, contributing to about 5.7 per cent of global fish production in 2012.

In India, fisheries and aquaculture are vibrant economic activities, and has been one of the fastest growing food production systems during the last three decades. Their significance and contribution towards agricultural (4.75 per cent GDP in 2012-13 at current prices) and national economies (0.83 percent to national GDP in 2012-13 at current prices), livelihood and nutritional security, employment generation (14.49 million people) and foreign exchange earnings (over Rs. 33441 crores in 2014-15) have been enormous though understated so far. Out of the total fish production in India, about 65 percent production is from resources inland and remaining 35 percent from marine sources, fisheries sector occupies a very important place in the socio-economic development of the country. The main challenges facing fisheries development in the country have been in assessment of fishery resources and their potential in terms of fish production, development of sustainable technologies for fin and shell fish culture, yield optimization, harvest and post-harvest operations, landing and berthing facilities for fishing vessels, reducing harvest and post-harvest looses, augmenting export of marine products, generating employment and improving welfare and socio-economic status of fishermen. Marine and inland fisheries and aquaculture constitute the main components of fisheries sector in India. Aquaculture is practiced in both fresh and blackish waters.

Marine Fisheries:

Marine fisheries constitute a valuable source of food and employment and a net contributor to the balance of payment. Marine fisheries have progressively increased by nearly six times during the last five decades period. The estimated marine resources potential of the Indian Exclusive Economic Zone (EEZ) is 4.24 million metric tonnes at the present exploitation rate (GOI, 2011). India shares its international coastal borders with two countries, viz. Pakistan in the West and Bangladesh in the East. It is separated from Sri Lanka by a narrow channel connected by the Palk Strait and Gulf of Mannar. The country has a long coastline of 8118 km and equally large areas under estuaries, backwaters, lagoons, etc. conducive for developing capture as well as culture fisheries. With the declaration of the EEZ in 1977, an area of 2.02 million sq km. (comprising of 0.86 million sq. km on the west coast, 0.56 million sq.km on the east coast and 0.60 sq.km around the Andaman & Nicobar Islands) was protected for fisheries. The East Coast covers four states and two Union Territories (West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, Pondicherry and Andaman & Nicobar Islands) and the West Coast covers five states and two Union Territories (Gujarat, Daman & Diu, Maharashtra, Goa, Karnataka, Kerala, and Lakshadweep). The maximum length of coast line (1912 km) is from Andaman & Nicobar Island followed by Gujarat (1600 km). Thus, Gujarat state accounts for about one fifth of length of coast line of our country.

Inland Fisheries and Aquaculture:

India is the third largest producer of inland fish in the world (after China and Bangladesh). There are three types of inland fisheries *viz*: Riverine, Reservoir, and Tank/Lake/Pond. With a combined length of 45000 km and 20000 sq km of catchment area, the country's riverine resources provide one of the richest fish germplasm of the world. Due to India's extensive water resources, about 65 per cent of fish production is from inland fisheries. These fresh water resources are divided into major

rivers basins namely, Brahmaputra, Ganga, Mahanadi, Godavari, Krishna, Cauvery, Sindhu, Narmada, Tapti and other west flowing small rivers originating from the Western Ghats. The freshwater culture resources in the country comprise 2.41 mha of ponds and tanks. The resources where fish farming can be undertaken include the floodplain lakes and other natural lakes, reservoirs, irrigation canals and paddy fields.

6.2 Growth in Fish Production

Fish production in India has shown an increasing trend from 0.75 million metric tonnes (MMT) in 1950-51 to reach 10.07 MMT in 2014-15. With a vast production potential, particularly in inland fisheries (mainly reservoirs) and aquaculture has shown in this periods. In case of marine fisheries, production has increased from 0.53 MMT in 1950-51 to 3.44 MMT in 2013-14. The annual growth rate of marine fish production has fluctuated sharply. It increased from 2.32 per cent in 1955-56 to 9.53 per cent in 1960-61 and stood at 25.21 per cent during 1989-90. Growth rate was negative during the 1965-66, 1981-83, 1986-88, 1997-99 and 2003-05. Since 2008-09, growth rate has been positive except during 2012-13.

In the inland sector, the growth has been steady, increasing from 0.218 MMT during 1950-51 to about 6.136 MMT in 2013-14, with an average annual growth rate (on previous year) of 7.29 per cent in 2013-14 against 2.29 per cent in 1955-56. With a vast production potential, particularly in inland fisheries (mainly reservoirs) and aquaculture, the sector has shown an average growth of about 6 per cent over the five year plan periods. The total fish production during 2013-14 registered 9.58 million metric tonnes, with a contribution of 6.14 million metric tonnes from inland sector and 3.44 million metric tonnes from marine sector.

Andhra Pradesh dominates in national fish production basket with having highest share of 19.5 percent, followed by West Bengal (16 percent) and Gujarat (8 percent). The states like Tamilnadu, Karnataka and Kerala accounted for around 6 percent each in total fish production of the country during the corresponding year. These six states put together

accounted for more than 62 percent of total fish production of the country in TE 2014-15.

As mentioned earlier, out of total fish production in India, about 65 percent production accounts inland and remaining 35 percent accounts marine fish. Across the states, Andhra Pradesh and West Bengal have emerged as the leading producers of inland fish during 2014-15 accounting 26 and 23 percent of total inland production respectively, followed by Bihar (7.0 %). These three states together accounted for more than 55 percent of inland fish production in India in 2013-14. In case of marine fish production, Gujarat has emerged as the leading producer (accounts 20.20 % in total) followed by Kerala (15.17 %), Maharashtra (13.58%), Andhra (12.73%) and Tamilnadu (12.55%). Thus these five major states together accounted for about 74 percent of total marine fish production in India. Thus, among states, Gujarat is leading marine fish producer and sharing one fifth of total marine fish produced in India.

However, as mentioned earlier, there are appreciable losses during both harvest and post-harvest stages in fisheries. It is important to know the causes of losses of fish value.

6.3 Post Harvest Losses in Marine Fisheries

In India, fish is the major source of protein for over one-third of the population especially for the rural poor in coastal areas. About 35 per cent of Indian population is fish eaters and the per capita consumption is 9.8 kg whereas the recommended intake is 13 kg (Srinath et al, 2008; GOI, 2011). The marine fish production has also been stagnating over recent years (CMFRI, 2004). As per FAO, the post harvest loss in world fisheries is 10 per cent. The limited supply of sustainable fishery resources dictates that increasing demands for fishery products will not be satisfied by merely increasing the fish harvest. However, a net increase in production and availability of good quality fish and fishery products can be achieved through an effective post-harvest fishery system that will include adequate and better infrastructure facilities which would prevent loss of

the commodity. There are appreciable losses during both harvest and post harvest stages in fisheries. Harvest losses are losses that occur at the time of harvesting and onboard the fishing craft. Considering the nutritional significance coupled with stagnating catches in India, it is imperative that losses at all levels should be reduced.

Though the sector has transformed in terms of its nature and significance, there are challenges yet to be addressed but reducing or if possible, eliminating economic losses of fisheries due to inadequate post-infrastructure (PHI) facilities is one of the most important of them. Being a highly perishable commodity, fish requires proper landing facilities, processing, storage, transport and distribution facilities running through the entire supply chain from capture to consumer. Adequate provisions of such infrastructure may result in the utilization of fish in a cost-effective and efficient way and absence of such required infrastructure facilities result in considerable wastage and losses. As there is limited scope for horizontal expansion to cope with the public food demand, vertical intensification through integration of different farm based enterprises and post-harvest loss reductions could help to meet expected increase in production demand and quality (Kevin, 2006). Thus, post-harvest fish losses are one of the immediate policy concerns as it happens in most of the fish distribution chains in India.

The present study is an attempt to overcome all these challenges in order to evaluate and assess the economic losses due to inadequate post-harvest infrastructure facilities for fisheries sector in Gujarat state, which is an important contributor to marine fishery resources in India.

6.4 Objective and Methodology of the Study

The specific objectives of the study are:

1) To examine the growth, composition and the contribution of the fisheries sector in Gujarat, state;
2) To evaluate the availability of the post-harvest infrastructure facilities for marine fisheries sector in the state;

3) To review the Government policies and programs for the provision of post-harvest infrastructure facilities for marine fisheries sector in the state;
4) To evaluate and assess the economic losses on account of inadequate post-harvest infrastructure facilities for fisheries sector in the state; and
5) To arrive at relevant policy implications for development of marine fishery in the state.

The study is based on both primary and secondary data. The secondary data were collected from published sources as well as from the Department of Fisheries, Government of Gujarat. The primary data were collected during month of October 2015 covering immediate three periods spread in the year 2014-15 (October 2014 to September 2015). 5 from three fishing harbours i.e. Veraval, Porbandar and Mangrol of Gujarat. These fishing harbours have been chosen for collecting the infrastructural gap to arrest post-harvest fish losses in Gujarat. From each site, stakeholders involved in the supply chain viz. boat owner (30), fishermen (30), wholesalers (10), retailers (10) and small processors (6) and exporters (6) including the administrators were interviewed to collect information on the various aspects including fish quality and loss assessment data.

6.5 Fisheries Development in Gujarat (focus on Marine Fisheries)

Gujarat is the northern most maritime State on the west coast of India situated between 20.6 and 24.42 degrees latitude and 68.10 and 74.28 degrees east longitude. Gujarat has one of the richest fishing grounds in India and the most important commercial varieties of fish (such as Pomfret, Hilsa, Bombay duck, Ribbon fish, Catfish, Rays, Cuttle fish, Shrimps etc.). Thus, Gujarat possesses a vast resource with favourable climates and environment condition for flourishing fish production through aquaculture.

Gujarat is endowed with a wide range of marine and inland aquatic resources. The state has a long coastline extending to 1600 km accounts for 19.70 per cent of the total coastline of the country and about 46 per cent of the western coastline of India. It has a continental shelf area of 0.18 million km^2, Exclusive Economic Zone (EEZ) of 0.214 million km^2, which occupies 32 per cent of the continental shelf area and 10 per cent of the total EEZ of India. The Gujarat coast, including the two Gulfs, is blessed with physical features congenial to the development of fisheries (Fig. 2.1). The major fisheries resources of the state include Elasmobranches, Bombay ducks, Sciaenids, Shrimps, Seer fishes, Tunas, Threadfin Breams, Pomfrets, Catfishes, Lizard fishes, Bull's eyes, Carangids, Anchovies, Ribbon fishes, Croakers, Prawns, Lobsters and Cephalopods. Along the coastline of Gujarat, 851 fishing villages/towns and 286 marine landing centers are located. Gujarat has 123 fish landing centers located in 226 fishing village. About 19 per cent of the landing centers are located in Valsad district followed by 15.45 per cent in Kutch district and 13.82 per cent each in Jamnagar and Junagarh and 8.13 per cent in Surat district. About 55062 fisherman family and 316972 fisher folk population is located in fishing villages.

Over the last five decades, fisheries sector of Gujarat has undergone radical changes. While marine resources of Gujarat are spread mainly in the Arabian sea, the inland waters in the form of rivers, canals, estuarines, ponds, reservoirs, brackish water impoundments, waterlogged areas etc. constitute a bed rock of inland fisheries in the state. The total fish production in the State has increased by almost ten times during last five decades period, i.e. from 0.79 lakh metric tonnes in 1960-61 to 7.93 lakh MT in 2013-14. The state has taken necessary steps in order to achieve the targets fixed for both inland and marine fish production in State. Out of the total production of 7.93 lakh MT in 2013-14, about 88 percent was marine fish while remaining 12 per cent was inland fish production. Thus marine dominate the fish production in Gujarat. Gujarat is the third highest fish producer in India (after West Bengal and Andhra Pradesh) and

the largest producer of marine fish. Gujarat's share in the total fish production has been fluctuating in volume terms and has come down in value terms in the last decade. The main reason could be the declining fish catch and quality of catch. It is reported that 35 per cent of the catch in the marine sector is low value miscellaneous fish. As mentioned earlier, in total marine fish production in the state, small sciaenid accounts for around 27 per cent followed by Bombay duck (14.30%), ribbonfish (5.63 %), Cuttlefish (3.85%) and catfish (3.6 %) in the year 2012-13.

The data on districtwise marine production in Gujarat during 2004-05 to 2014-15 indicate that Junagadh district contributes the bulk of the marine landings (40.79%), followed by Valsad (13.39%), Porbandar (13.28%), Kutch (10.12 %), Jamnagar (9.73%), Amreli (7.26%) and Navsari (4.0%). The remaining districts such as Bhavanagar, Rajkot, Surat, Baruch and Kheda accounts for less than one percent share in total. The Saurashtra coast between the Gulf of Kutch and Gulf of Cambay, presents unique oceanographic features and is endowed with a wide variety of highly relished table fishes. An incredible achievement of the state has been made in the foreign exchange earnings through export of fish and fish products.

Ice plants and cold storages are the major kinds of post harvest infrastructures available in required number in most of the coastal districts of Gujarat. The presence of other infrastructures is very less in various districts of the state.

There are 5 fish harbours existing in the state. They are located in Dholai, Jakhau, Veraval, Mangrol and Porbandar with total fish production capacity of 388000 metric tons and another 5 harbours have been proposed to be established in the state. Junagadh district has two major harbors, viz. Mangrol and Veraval harbour are with the highest fish production capacity of 235000 MT. Out of 14200 fishing crafts, 6500 are in Veraval, 3500 are in Porbandar and 2800 are in Mangrol. As per 2007 Census, the state had 28706 boats; of which 18536 boats were mechanized and 10170 boats were non- mechanized. In the

year 2012-13, total 36770 boats were in-operation near Gujarat coast, of these 24612 boats were mechanized and 12158 boats were non-mechanized. During the period from 2000-01 to 2012-13, annual rate of growth of fishing boats was estimated to be 1.88 per cent, while same was 2.86 percent per annum for mechanized boast. However, rate of growth was negative in case of non- mechanized during the same period.

6.6 Fisheries Policies and Programmes in Gujarat

The control and regulation of fishing and fisheries within territorial waters is the exclusive province of the state, whereas beyond the territorial waters, it is the exclusive domain of the Union (Government of India). The Ministry of Agriculture and Farmers Welfare, Government of India as per the allocated rules of fisheries, helps the coastal states and Union Territories in development of fisheries within the territorial waters, besides attending to the requirements of the sector in the Exclusive Economic Zone EEZ (Fig 3.1). The Ministry of Agriculture (Department of Animal Husbandry, Dairying and Fisheries- DAHD&F), within the purview of its allocated business, helps the coastal States/UTs in development of fisheries within the territorial waters, besides attending to the requirements of the sector in the EEZ. Therefore, management of fishery exploitation in the EEZ requires close coordination between the Union and the States (GOI, 2011).

The State/UT Governments are the principle custodians of fisheries and aquaculture activities in their respective jurisdictions (land as well as the territorial waters). In the marine sector, they are responsible for fisheries development and management with the main objectives of planning and development of infrastructure facilities for landing and berthing of fishing craft, creating suitable marketing facilities, implementation of various fisheries development programmes *viz*., channelizing financial assistance for purchase of fishing implements, implementation of socio-economic programmes and interactions with the Government of India and other agencies for technical and financial

assistance. Each State/UT has a Department of Fisheries, which functions as its main implementation agency for fisheries and aquaculture development programmes.

The state level fisheries management is undertaken mainly through licensing, prohibitions on certain fishing gear, regulations on mesh size and establishment of closed seasons and areas, under the Marine Fishing Regulation Act (MFRA). Zones are demarcated by each State based on distance from the shoreline (from 5 km to 10 km) or on depth. These in-shore zones, where trawling and other forms of mechanized fishing are not permitted, are perhaps the most important space-based fisheries management measure in place. The closed season or 'monsoon fishing ban' is another important 'temporal-spatial' management measure implemented on both the east and west coasts of India for a period of 47 days and 65 days respectively, during, what is considered to be the spawning and breeding season.

Central Govt. drafted a Model Bill pertaining to Fisheries Management in the states and circulated it as an advisory exercise to all the states. Various states such as Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa and Pondicherry landed to the advice and have drawn up their Marine Fishing Regulation Act (MFRA). Gujarat has adopted its Fisheries act in 2003. The Gujarat Fisheries Act 2003 was published in "Gujarat Government Gazette', on the 12th March, 2003. The main objective of act is to provide 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 coast line of the State

Besides Central Government Schemes, the State Government of Gujarat is also implementing various need based programmes like: assistance to the fishing vessels for purchasing electrical equipments, life saving equipments, Distress Alert Transmission (DAT), fishing nets, insulated boxes, solar lights, assistance for fish marketing to women, assistance to artisanal fishermen, training to fishermen and extension services. Fish landing centers are also

upgraded by the State Government. Some of the major schemes implemented for development of fishermen in the state are:

(a) Subsidy for acquiring Modern Equipments

(b) Relief to families of the fishermen captured by Pakistani Authority

(c) Motorisation/Mechanization of Traditional Craft/Boats

(d) Safety Measures on Fishing Boats

(e) Processing, Preservation and Marketing

(f) Purchase of Gill Nets for Small and *Pagadiya* Fishermen

(g) Assistance for Women Self Help Group of Fishing Community

(h) Scheme for having hygienic or portable toilets on fishing boats

(i) Assistance for Training of Schedule Caste Youth Fishermen

(j) Schemes for Fishing Activities in Salty Water

(k) Housing scheme for Fishermen

(l) Scheme for Fish Seeds Growing and Collection

(m) Scheme for Boat/ Fishing Nets

(n) Assistance for Purchase of Plastic kits (boxes) for transporting fish

(o) Assistance for establishing group hatchery for colorful fishes.

(p) Group Accident Insurance Scheme for active fishermen

6.7 Post-Harvest Infrastructure in Selected Harbours in Gujarat

Adequate infrastructure is the basic requirement for the development of any sector and fishery in general and marine fisheries in particular is no exception. The important infrastructures in the fisheries sector are the landing and berthing facilities and fishing harbors. Strengthening of infrastructure development at the culture phase and also post-harvest infrastructure such as storage facilities, ice plants, cold chains, roads and transportation etc., as well as effective marketing system in identified aquaculture areas are the key requirements for the development of this sector. This would ensure high profit margins to the producers enabling faster fisheries and aquaculture development. Veraval, Porbandar, Mangrol and Jafarabad are the major fishing harbours in Gujarat out of which Veraval and Mangrol are within Gir Somnath district.

Fishers in Gujarat use different kinds of crafts for fishing. For example non-motorised traditional crafts, motorised (out-board motor: OBM) boats, in-board motor (IBM) boats and small trawlers. Small-scale fishers mostly use traditional boats with out-board motors for fishing (Khakkhar, 2004), however the traditional boats have largely been replaced by fiberglass crafts (Johnson & Sathyapalan, 2006). During the discussion with stakeholders and field visit to selected three harbours, it was noted that these harbours have inadequate facilities and due to which these harbours suffer with post harvest losses.

The following are the major problems with harbours.

- Inadequate availability of potable water.
- Poor power supply position.
- Inadequate drainage facilities.
- Inadequate repair facilities for fishing boats.
- Lack of trained labour for pre-processing and processing of fish/Shrimp.
- Lack of HRD facilities for post harvest operations.
- Lack of promotional policies for encouraging private investment.

The Government officials of State Fisheries Department also face some problems while operating on field. We have discussed with them and observed that marine pollution has been increasing on the coastal belt of Gujarat, largely because of the growth of chemical industry. This has caused, to some extent, the destruction of marine life in the coastal waters of Gujarat. Most of the Stakeholders (fishermen, boat owner, processor) and officers opined that several types of high value fish like *hilsa* that earlier used to come abundantly to the coastal waters of Gujarat have now been disappearing.

6.8: Findings from Primary Survey

6.8.1 Boat Owner and Fisherman

6.8.1.1 Socio-Economic Characteristics

- On an average, fishermen and boat owners were about 41 years old with around 19 years of experience in fishing. The fishermen were younger and relatively less experienced than boat owners. Though the respondents from Mangrol harbor were relatively younger than Veraval respondents, they were more experienced. All the respondent fishermen and boat owners were male, thus no female generally involved in going on fishing in sea business. In case of education, average age of respondents was 7.7 years. The boat owners were more educated (10.3 years) as compared to its counterpart (5.0 years). The rate of illiteracy was about 27 percent in case of fishermen as compared to no case of boat owners. About 97 percent of respondents in both cases were from Hindu religion and having dominance of social group of SEBC followed by General category. Only in case of fishermen, 20 percent of sample respondent belongs together to SC & ST category.
- The average family size of respondent fishermen was smaller (7.3 persons) as compared to boat owners (8.5 persons), having average of 7.92 members per family together. Veraval harbor respondents family size was the highest one (10.5 persons) followed by Porbandar (7.35 persons) and the lowest was in Mangrol (5.3 persons). The average sex ratio was found around 994 females per 1000 males in selected families. Only 28 percent of total family members were engaged in fishing, comprising of 74.7 percent of total male and 3.6 percent of total females and no children. It was very strange to note that percentage number of family members to total members engaged in fishing was found higher in case of boat owner (32 percent) than fishermen (23.3 percent), that too no woman in fisherman category was involved in fishing. The females

from boat owner group were involved in post harvest fishing business, not in fishing.

- The main occupation of all respondents was fishing, supported by subsidiary occupation as cultivators/agriculture labour/own nonfarm business/ service. The some of the fishermen from Porbandar harbor had supporting occupation as cultivator and agriculture labour which is evident from larger size of agricultural land holding (0.70 ha) than Mangrol (0.20 ha) and Veraval (0.06 ha). Non-farm labour, own non-farm business and service occupation was supporting to 5-7 percent respondent families.
- In case of dwelling structure, at overall level, 68.3 respondents houses were pucca in nature. About 83 percent boat owners has pucca house as compared to 53.3 percent of fishermen. The average gross annual income of both groups was estimated to be Rs. 4.75 lakh from main occupation and Rs. 0.27 lakh from subsidiary occupation. Across the groups, gross annual income from main source was more than double in case of boat owner (6.83 lakh) than fishermen (2.67 lakh). Same the case in case of subsidiary income as well. All the selected respondents had ration cards, out which 85 percent had APL card and remaining 15 percent had BPL card. However, all the boat owners has APL card, while 70 percent of fishermen had same card. Thus 30 percent of fishermen families were categorized under below poverty line criteria. As expected hardly 10 percent each of boat owners and fishermen from Porbandar and Mangrol had taken some kind of training of fish handling, having average duration of 4 days or so.

6.8.1.2 Fishing Crafts (Boats) and Fishing Gears:

- The details on different fishing crafts and fishing gears available with selected respondents high concentration of motorized crafts/boats was observed with selected respondents. On an

average of both categories, per household had 2.08 motorised crafts and 0.23 traditional crafts. The boat owners had more number of both the crafts per household than fishermen, i.e. 3.17 motorized crafts/hh as compared to 1.0 motorized craft/ha with fishermen. Same the case was with traditional crafts also. Across the harbors, Mangrol respondents had highest number of crafts (3.15) followed by Veraval (2.20) and the lowest was in Porbandar (1.60). The pattern noticed earlier in distribution of crafts with boat owner and fishermen was found same across the harbors.

- The type of fishing gear used varies by type of fishing operation and target species. Trawlers and Gill net are commonly used in family fishing as they are considered as relatively low cost gear situated for catching many fish species. On an average, every household (both groups together) had 7.32 trawlers and 2.98 gill netters. Besides every household possesses other gears such as purse seine and cast nut (4.32), deep sea trawlers (0.75) and very few households had long lines tuna, squid jigging and shore seining. Across harbors, the highest number of trawlers per households was observed in Veraval, while Mangrol respondents had the highest number of gill netters and other gears/hh. The number of trawlers/hh was found highest in case of boat owners (3.53) as compared to fishermen (1.10), both found highest in Mangrol harbor.

6.8.1.3 Temporal Fishing Restrictions (Ban Period):

- In view of fisheries situation that exists in west coast of India, temporal restrictions, i.e. seasonal closure of fishing is implemented independently by each State government to manage the fishery resources. It is also known as monsoon ban period declared every year during south west monsoon period of 90 days in Gujarat. Thus, fishing ban period in selected three horbours is of 90 days each year from 15th of May to 15th of August. It is due to the fact that fish come closer to the shore and estuary during breeding. During this

period, maintenance works of vessels are taken up. Fishing season varies along the coastal belt. Therefore ban period ranges between 30 to 145 days in different coastal states of India. The ban period for fishing also helps somehow in fishery resources management as there are clear signals that resources in the inshore are being fully exploited and the scope for increasing production from the present level is limited.

6.8.1.4 Details of Fishing Activities

- The marine fisheries enterprise exploit a large number of species using different crafts and gear in different localities Trawl and purse nets aroused in these boats and were operated by a larger group consisting of more than 5 fishermen on a single boat. The details on seasonwise hourbourwise fishing activities by selected boat owners and fishermen shows that on an average, the fishing days per season were estimated to be 64.9 days, (ranges between 65-69 days in three selected seasons during 2014-15). The highest fishing days were recorded in October-December period (67.2 days), followed by January-March period (66.8 days) and lowest were in April to September period (60.8 days), which may be due to 90 days fishing ban during this season.
- Every season, around 6-7 trips were made (around 13-14 days per trip) with around 7 persons on board. In case of Porbandar and Veraval, all trips were multi-days fishing (ranges between 6-18 days), while 90 percent of trips of Mangrol respondents were multi-days and remaining 10 percent were a day fishing trips. Across both the groups, more than 95 percent of respondents had used motorized boat for fishing. The use of traditional crafts has been observed in Veraval and Mangrol harbor, while its share in total trips made was hardly 1-2 percent in the both groups.

- Further, number of fishing days as well as days of fishing per trip were recorded more in case of boat owner (68.2 days and 14.3 days respectively) as compared to fishermen (61.7 days and 12.3 days respectively), while number of fishing trips per season were much higher in fishermen (8.1 trips) than boat owner (4.9 trips). The average number of fishermen on board was 7.5 in case of boat owner, while same were 6.9 people in case of fishermen. Thus, fishermen made around 8 trips per season while boat owner could do hardly 5 trips in each season. However, duration of trip was longer in second case.

6.8.1.5 Fish Caught & Sold

- On an average, around 14 tonnes fish per trip was caught in selected harbors. The maximum fish was landed at Veraval harbor by selected boat owners and fishermen, i.e. 14.65 tonnes/trip and the lowest was in Porbandar (12.23 tonnes/trip). Fish catch depends entirely on the size of the boats, types of fishing gear, types of nets and also the number of times the fishermen go to the sea in a day. Out of total fish landed at harbours, about 85 percent fish was of Grade I and remaining was categorized as low grade (around 15 percent), i.e. Grade II. Across the harbours, the percentage of Grade I fish ranges between 82 to 87 percent.
- It was observed that not only the fish landed per trip was higher in case of boat owner than fishermen but also the percentage of Grade I quality fish was higher. About 15 percent Grade I fish was found higher with boat owner than fisherman. Besides, high percentage of fish was dumped or categorized as waste at fisherman level (4.7%) that of 1.3 percent at boat owner level which must have implication on income of fisherman. The reason for relatively high ratio of low value fish with fishermen than boat man was may be due to inadequate facilities available on board (such as washing facility) and use of dragging for hauling the fish (see, section 5.2.9).

However, catch and quality are the function of fishing efforts, type of fishing gear and the nature of the fishing ground.. In the both cases, fish landed at Porbandar harbor was of relatively low grade quality than other two harbours namely Veraval and Mangrol. The fish use as dry/fish meal was found around 3.6 percent of total fish landed.

- The sale pattern of fish landed indicates that at overall level, about 94 percent of total fish was sold, of which around 37 percent each was sold to exporter, around 29 percent to wholesaler and contractor and remaining was sold to retailer. In case of fishermen and boat owner, the percentage of fish sold to total was also around 93 percent and both groups preferred to sell one third of their output to the exporter.

6.8.1.6 Specieswise Seasonwise Value of Fish

- Across seasons, in case of boat owner, average price per kg of Grade I fish ranges from as high as Rs. 800/- per kg for Pomfret and as low as Rs. 50/kg for prawn/rani, while Grade II fish ranges between Rs. 730/kg for Pomfret to Rs. 40/kg for red fish. In case of fisherman, Grade I fish ranges from Rs. 800/kg for Pomfret to Rs. 40/kg for red fish while for Grade II fish rate ranges from Rs. 600/kg for Pomfret to Rs. 40/kg for prawn. The simple average of price realized for Grade I for all three season by the boat owner was Rs.181/kg, while in case of fisherman, it was Rs. 172/kg. While for Grade II fish, boat owner realized lower price of Rs. 68/kg as compared to Rs. 105/kg realized by fishermen.

6.8.1.7 Causes of Losses of Fish Value

- Considering the nutritional significance coupled with stagnating catches in India, it is imperative that losses at all levels should be reduced. There are appreciable losses during both harvest and post-harvest stages in fisheries. The harvest and post-harvest losses has

been defined as the quantity of marine fish which is not available or is not fit for human consumption due to physical damage, spoilage or some other reasons. Harvest losses are losses that occur at the time of harvesting and onboard the fishing craft. It is important to know the causes of losses of fish value.

- The economic losses in terms of low market value of fish due to poor post-harvest infrastructure have been estimated to Rs. 18.10 per kg. The rate of fish loss was higher during the period Oct-Dec and was the lowest during April-Sept period. The higher rate of loss was recorded by fisherman (around Rs.19/kg) as compared to boat owner (Rs.16/kg).
- The major reasons for losses at this stage were physical damage during fishing and spoilage due to improper icing, whereas very minimal share was loss due to fish being eaten away by birds. The motorized trawlers followed by gill netters are major causes for fish losses.
- The method of sale adopted and preferred by boat owner and fishermen was sale at pre-agreed price, followed by auction method of sale, sale to contractor and combination of above methods. The timeliness of receipt of money also matters in fishery business, especially for fishermen which are totally dependent on same. It was observed that on an average 50 percent of respondent mentioned that they had received money in advance while corresponding figures for fishermen and boat owner were 61.1 and 40 per cent respectively. Thus, 60 per cent fishermen received money in advance, while remaining amount was received in mix way, i.e. some advance and some after 15 days or so. In case of boat owner, 20 percent respondent received money after a 15 days' time.

6.8.1.8 Time and Cost incurred in Fishing Activity

- At overall level, about 15 fishing nets/gears were taken during each fishing trip which was made around 126 nautical miles away from the sea shore. The approximate time taken for fishing was around 141 hours while time taken for landing/unloading fish was 31.6 hours by machine and 3.2 hours by manually. The time taken for fishing per trip was higher in case of boat owner (153.8 hours) than fishermen (128.1 hours), while time taken of loading/uploading was less in case of fishermen that of boat owner. On an average 2688 liters of diesel fuel was taken on board/trip, out of which 88 percent fuel was used.
- The total operational expenditure incurred has been estimated to be Rs. 1.71 lakh/per visit comprised of expenditure on food and water, fuel cost, ice cost, hired labour and other miscellaneous items. There was huge difference in cost incurred by respondents of three selected harbors. The highest cost was incurred by the respondents from Veraval harbor (Rs. 2.24 lakh) while the lowest cost was recorded by respondents from Porbandar harbor (Rs. 1.44 lakh per trip). The high cost per trip at Veraval respondent would be due to longer time taken for fishing (174.1 hours). Around two third of total cost was incurred on fuel only, followed by about one fifth of total cost on hired human labour for fishing activity. Thus, these two costs put together accounted for about 84 percent of total cost. The expenses on food with water and miscellaneous expenditure accounted for around 7 percent each to total cost. The same trend was in case of fishermen and boat owner except ice cost and quantity. The total quantity of ice used by boat owner per trip was 4725 kg as compared to 2767 kg by fisherman.

6.8.1.9 Infrastructural Facilities Available on Board

- The infrastructural facilities available on board play an important role in reducing the post harvest losses. At overall level, fish hold capacity of fishing vessel was 10.7 tonnes/boat, which was almost same in case of both boat owner and fisherman. The average number of ice boxes available were 11.17 having capacity of 480 kg. It is important to note that no fishing boat had insulated box on board. The lifting facilities were available on about 53 percent boats while dragging facility was with remaining ones. The status of fish hold in both categories and at all three harbors was fresh one. The washing and cleaning facility was available on about 83 percent craft, while 17 percent were not having this facility. However, in case of boat owner, all the fishing boats/craft had this facility.
- Further, all the selected respondents had on board processing facility. Among the various processing facilities, icing facility was available on all fishing crafts of both fishermen and boat owner, having average capacity of about 10 tones. However, no boat had other processing facilities like freezing facility, canning facility, smoking facility, smoking facility and any other facility on board. The sorting of board facility was available on all the crafts used by fishermen and boat owners. On an average 1.22 hours were spent in sorting/grading of fish on board. Veraval respondents had spent relatively more in grading the fish on board as compared to other two harbor respondents. Thus, icing facility was available on board for all crafts and sorting was done on board by the fishermen and boat owner.

6.8.1.10 Details on Low Value Fish

- The details on low value fish indicate that at all three harbors and by both categories, no fish (young fish) was categorized as low value fish, while due to spoilage, about 0.3 tons of fish per trip has been

treated as low value. Out of total spoilage, 61.32 percent is classified as by catch which was used for fish meal.

6.8.1.11 Facilities on Sea Shore

- Fishing harbours are being developed at both major and minor ports. The status of availability and condition of facilities at selected three harbors as mentioned by the respondent fishermen and boat owners shows that at overall level, on average about 72 percent respondents were satisfied with landing platform. Half of the respondents from Veraval harbor were not satisfied with condition of landing platform. The condition of washing and cleaning facilities available at selected harbours was unsatisfactory at Porbandar and Mangrol while same was very poor at Veraval harbor. At the time of survey, we were informed that new facilities creation is in progress in order to improve the prevailing condition at these harbors.
- All the respondents opined that out of three harbours, two harbours namely Porbandar and Veraval harbor had storage facility, i.e. flake ice plants. It was very unlike to mention here is that more than 60 percent of respondent mentioned that facilities like drinking water, parking facilities, toilet/sanitation facilities, drainage facilities, commutation and approach facilities are unsatisfactory or very poor. It was expected that when the basic infrastructure at sea shore is so poor, facility of solar dryer was not available. Therefore, state government should take necessary steps to create required facilities at sea shore on war footing level.

6.8.1.12 Facilities away from Sea Shore

- The details on distance of facilities away from sea shore indicate that on an average, the facilities like chill plants, cold storage, ice plants and insulated vans are available about 3 kms away from sea shore. These facilities were available relatively closer to Veraval and

Mangrol harbor than Porbandar harbor. Flake ice plant facility was much closer to Porbandar harbor than other two harbours.

6.8.13 Transport of Raw Fish

- In order to transport the raw fish, availability of insulated van facility was very rarely available in selected three harbors in Gujarat. Mostly trolley was used for transport of raw fish followed by use of ice boxes for same. The grading and sorting of raw fish was done on board by both boat owner and fishermen of all three harbors.

6.8.1.14 Important Post-Harvest Facilities to minimize losses

- The respondents were asked to share and rank their suggestions on important post harvest facilities to minimize losses of fishes. At overall level, at overall level, the highest number of respondents (46.7 per cent) ranked I to the facility of having clear landing platform with washing and drainage facilities followed by facility of cold storage/chill plants with in the FH premises (36.7 per cent) and insulated storage boxes on board the fishing vessel (16.7 per cent). The same preference was recorded by the respondents of Veraval and Mangrol. While in case of Porbandar, preference was not same. Porbandar respondents ranked I to the facility of cold storage/chill plants with in the FH premises while facility of cold chain network was ranked as less preferred facility in all three harbours. Same trend was observed in case of fisherman and boat owner.

6.8.1.15 Losses due to Inadequate Post-Harvest Facilities on Shore

- It was observed that about 32 percent respondents had incurred loss of 2-5 percent of total sale value, while 25 and 15 percent respondents incurred loss between 5-10 and 10-25 percent of total sale value respectively. Across the harbor, the trend was same, while across category, it was not same. Due to inadequate facilities, about 57 percent fishermen had incurred loss between 5-15 percent (of

total sale value), while 37 percent boat owners incurred loss in this range. Thus, fishermen were at more loss than boat owner due to inadequate facilities. Therefore, necessary post harvest facilities need to be created on war footing basis.

6.8.1.16 Awareness about Fish Market

- At overall level, average distance of the fish wholesale market from sea shore was 7.5 kms. The wholesale market was nearer to Veraval sea shore (3.3. kms) and while in case of Mangrol, it was located 14.3 kms away from sea shore. The boat owner approaches the wholesale market which is 11 kms away from sea shore whereas fishermen prefer wholesale market nearer (4.0 kms) to him. Therefore duration of transport of landed fish from shore to market was higher in case of boat owner (1.7 hours) than fisherman (0.9 hours, i.e. 54 minutes). The respondents opined that one intermediary exist between fishermen /boat owner and wholesaler/retailer.

6.8.1.17 Problems faced by Fishermen and Boat Owner

- The major harvesting problems cited by the respondent were storm, cyclone, tsunami, high wave, raining, poor facilities for bathing and drinking water and incidence skin diseases. The non availability of cold storage facility was major problem under storage category. Non availability of additional subsidy on fuel, inadequate supply of fuel were other problems cited.

6.8.2 Marketing of Fish and Fish Products

- All the fish landing centres are primary fish markets from where fishes are transported to the wholesale or retail markets. The retail markets are located in major towns and cities in the state. There was a sharp increase in the prices of many of the highly preferred

species in the state in recent years owing to the increased demand from both domestic as well as export sectors.

- The technological improvements in the transport and processing of marine fish facilitated fish from distant harbours to reach wholesale and retail markets in the state. However the perishable nature of fish compelled its quick disposal at each point of transaction and has resulted in the involvement of more intermediaries in the marketing channel leading to high marketing costs and margins.
- As there is a big gap between supply and demand, fish marketing or fish business is very profitable. The fish markets and the marketing of fish are generally conducted by fish traders, either individually or as groups, or Fish Traders' Associations or Fishermen's Cooperative Societies. Four levels of markets or marketing systems are observed in the distribution channel of fish trade i.e. fish wholesaler/trader-processer / exporter – retailer- consumer.

6.8.2.1 Wholesaler

- Wholesale fish markets are not well developed throughout the state. Fish landing centres are administered mutually by Fishery Department and fishermen association. Though some of the landing centres are well developed, some lagged behind due to the poor participation of all stakeholders. The major species of seawater fish normally caught by fishermen in three major harbors (Porbandar, Veraval and Mangrol) of Gujarat are croaker, cuttle fish, perches pomfret, prawn, rani fish, ribbon fish, shrimp and squid. The major species of fish found and purchased in Porbandar harbor during 2014-15 were ribbon fish, cuttle fish, pomfret and perches. Some major species found in Veraval and Mangrol harbors were ribbon fish, pomfret, cuttle fish and prawn. The highly valuable fishes in the wholesale markets were pomfret and cuttle fish which are mostly traded by selected sample wholesalers. The prices of fish

vary considerably depending on species, fish sizes, fish condition and market demand.

- The wholesale price of Pomfret varied from Rs. 476 per kg in Mangrol to Rs 567/kg in Veraval and Porbandar during Season I (October to December). However, the price of Pomfret has gone up to Rs 637.5 per kg in Porbandar during Season III (April to September), basically due to poor catches and increase in demand.
- The seasonwise analysis reveals that the Season I (October to December) was the major period of fish catch and marketing. In Porbandar harbor alone, the average amount of Ribbon fish and Cuttle fish sold in wholesale market was 1340 tonnes and 1220 tonnes per wholesaler, respectively. The fish selling was relatively lower in next two seasons. This was mainly due to fish catches in Season I and was poor in subsequent seasons.
- The percentage of losses in fish value due to poor post-harvest infrastructure during Season I and Season II was to the tune of 6-10 per cent in case of 60 per cent of wholesalers in Porbandar harbor. However, during Season III, 6-10 per cent loss was experienced by 40 per cent of wholesalers in same harbor. The higher extent of losses (11-15%) was faced by 20 per cent of wholesalers during Season I and III, whereas such range of losses was not found in Season II in Porbandar harbor. Relatively, the percentage of losses in fish value due to poor post harvest infrastructure to the tune of 11-15 per cent was the highest in Veraval and was lowest in Porbandar. On the other hand, the percentage of losses in fish value in the lower range (to the tune of 1-5 per cent) was more in Porbandar and was the lowest in Veraval harbour.
- Marketing strategy encompasses selecting and analyzing the target market and creating and maintaining an appropriate marketing mix that satisfies the target consumers. The data on targeted purchasers and consumers of fish wholesalers in selected harbors

of the State shows that in selected harbors, out of 15 sample HHs, only 6 HHs (40 %) have targeted to sell to exporter, 5HHs (33.33 %) have targeted to sell to processers and remaining 4 HHs (26.67%) for sale to major urban markets of the country

- After targeting more profit fetching purchasers such as exporter, processors and major urban centres, the wholesalers have then targeted supply nearby consumers. This happens when there is high fish in a particular period. It was found that out of 15 samples HHs, in second stage, 11 respondents (73.33%) had targeted the consumers living beyond 20 kms range of the fish wholesale market. About 8 HHs (53.33%) have targeted consumers living in 5-20 km periphery of the wholesale market
- Fish being highly perishable after harvest requires proper preservation and storage to increase the shelf life (Clucas and Ward, 1996). Major methods of fish preservation and processing have been identified as freezing, icing and drying. There has been adequate ice supply in selected wholesale markets. All selected sample HHs also got ice in time. On the whole, 60 per cent HHs expressed that ice price was more or less stable throughout the year. The average ice price was around Rs.1.30 per kg. In Porbandar market, the ice price was Rs.1.22 per kg. The ice price varied from Rs 1.17 per kg in Veraval to Rs.1.52 per kg in Mangrol wholesale market. The prevailing ice price in Mangrol wholesale market was higher due to lesser availability of ice plants.
- The fish markets and the marketing of fish are generally conducted by fish traders, either individually or as groups, or through Fish Traders' Associations and Fishermen Cooperative Societies. Most of the fish markets are managed by fish traders and processors. However, it was found that in seashore areas, the wholesale markets have no modern infrastructural facilities, not even overhead roofs in case of some.

- The average capacity of wholesale market varied from 48 tons per day in Porbandar to 66 tons per day in Mangrol. About 87 percent wholesale markets have linkage with other markets and consuming centres. Mainly insulated vehicles (80%) were used for transport of fish from the harbor to the wholesale markets.
- Among the types of cold storage facilities availed by wholesalers, freezer boxes were major ones that used by about 73 per cent wholesalers, while remaining 27 per cent had used cold storage facility. About 80 per cent respondents could get regular fish supply and about 87 per cent got the fish of assured quality. About 80 per cent of them had the capacity to hold huge supplies. On an average, 20 people were engaged with a wholesaler. As far as mode of marketing is concerned, open auction method was followed by 80 per cent wholesalers in Porbandar whereas 60 per cent wholesalers in Mangrol resorted to direct sale method of marketing.
- Wholesalers did not face many difficulties in terms of supply, marketing and upkeep of the markets. Only about 27 per cent wholesalers expressed that they faced problem of market storage facilities.

6.8.2.2 Retailer

- The local retail markets for marine fishes catered the need of local people in the cities and nearby areas. However, during the survey, it was found that there were no proper shops/buildings for marketing of fish in retail. The fishes were sold on the roadside without facility of proper roof, electricity, water, drainage, storage room and proper flooring. At some places, small platforms were constructed in the market. There were no proper lavatory and washing facilities in most of the retail markets. The hygienic conditions were also very poor. Fishes were piled up on the floor and sold.
- Most of the fish merchants did not use ice or any chilling facilities while very few of them used meager amount of crushed ice during

selling the fishes. As a result, the quality of fishes deteriorated and retailers were forced to sell them at lower price. Majority of retail fish markets those were visited by the research team are found to be ill-managed and unhygienic. There were no proper handling, washing, cleaning, icing or re-icing of the fishes in the market places.

- The majority of fish retailers were women (90%). The average age of retailers was about 48. Only about 33 per cent of them were literate. The literacy rate of Female retailers was better in Porbandar harbor compared to other places.
- A large number of species were found to be sold in the retail markets of selected harbors in Gujarat. The major species of fish found and purchased in retail markets of Porbandar were Ribbon fish, Crab, Cuttle fish, Pomfret and Indian Prawn. Some major species found in retail markets of Veraval and Mangrol harbors were Cat fish, Shrimp and Small Sciaenids. Some of the highly valuable fishes in the retail markets were Indian Prawns, Pomfret and Shrimps. The prices of fish vary depending on species, fish sizes, fish condition/quality and market demands.
- The retail price of Indian prawns varied from Rs. 158 per kg in Mangrol to Rs 166 per kg in Veraval during Season I October to December). However, the price of Indian Prawns has gone up to Rs 182 per kg in Porbandar during Season III (April to September), basically due to fall in fish caught and increase in demand. The retail price of pomfret varied from Rs 157 per kg in Mangrol to Rs 1016 per kg in Porbandar during Season I (October to December). Sometimes the price of some species like Pomfret varied widely across various harbors depending on size, quality and demand of fish. The retail prices of most of the fishes have gone up during second and third seasons compared to first season.

- However, the quantity of fish sold during the Seasons II and III was found to be more in case of some species compared to first season. In Porbandar harbor, the seasonal average amount of Small Sciaenids, Ribbon fish and Cuttle fish sold in retail market were 598 tonnes, 223 tonnes and 222 tonnes per retailer, respectively. The selling of Small Sciaenids has increased to 710 tonnes per retailer during season I.
- The major sources of purchase of fish by the retailers were the brokers or middle men. About 70 per cent of total fishes were purchased by retailers through the brokers/middlemen. Entire fishes in the retail market were sold to the consumers coming from the nearby areas.
- The percentage of losses in fish value due to poor post-harvest infrastructure during Season I was to the tune of 6-10 per cent in case of 60 per cent of retailers in Porbandar market. However, during Season III, the 6-10 per cent loss was experienced by 30 per cent of retailers in the same harbor. The higher extent of losses (16-20%) was not faced by any retailers during any seasons in Porbandar, however such range of losses was found in other harbors.
- In selected harbors, about 67 per cent of retailers have targeted to sell fish to nearby consumers within a radius of 1-5 kms, whereas the fish consumers living between 5-20 km radius were targeted by about 22 per cent retailers and the fish consumers living between beyond 20 km radius were targeted by about 12 per cent retailers.
- The major facility required by the fish retailers was availability of ice to keep the fish afresh in the market places as well as in their storage boxes. About 93 per cent of selected sample retailers got ice in adequate quantity and about 90 per cent of them could get ice in time and uninterruptedly. On the whole, only about 33 per cent

retailers expressed that ice price was more or less stable throughout the year.

- The average ice price in retail market was around Rs.1.25 per kg. In Porbandar retail market, the ice price was the highest of Rs.1.28 per kg. The ice price varied from Rs 1.23 per kg in Veraval to Rs.1.28 per kg in Porbandar retail market. The prevailing retail price of ice in Mangrol was about 1.25 per kg. It may be observed that the price of ice was more during the season I compared to other seasons.
- The average capacity of the retail market varied from 42 tons per day in Porbandar to 75.5 tons per day in Veraval. All the retailers used non-insulated vehicles for transport of fish from the harbor or wholesale markets and to the retail markets due to lesser distance.
- Among the types of cold storage facilities availed by retailers, ice boxes were the major ones that used by all the retailers. Also all the retailers could get regular fish supply in assured quality and they had the capacity to hold huge supplies. As far as mode of marketing is concerned, direct sale method was followed by about 97 per cent retailers. Mostly single member had handled the fish selling in retail market.

6.8.2.3 Fish Consumers

- About 57 per cent respondent buyers were from age group of 20-40 years while about 43 per cent were having age more than 40 years. Among the fish buyers, 67 per cent were male and reaming 33 per cent were female. Occupation-wise, buyers came from all sections, but majority were in service (26.7%) as the selected retail markets were located mainly in urban areas. The average family size of the fish consumers was 6.37 persons.
- The consumers have purchased the fish four days in a week. Majority of consumers purchased cuttle fish, squid, ribbon fish, jinga and pomfret. The average quantity of purchase was 0.89 kg

per visiting day. All the consumers expressed that they used to get desired type and quality of fish since all these markets are located very close to main harbor areas. About 83 percent of the consumers reveal that the average price was reasonable. Across the selected harbors, there were no major variations in the types of purchases made by the consumers.

- Fish is one of the most perishable items among the foodstuff. It cannot be stored in normal temperature overnight. Processing aims at controlling, if not totally arresting the process of spoilage and make the fish available in variety of forms acceptable to the consumers. The biochemical changes taking place in the fish post-mortem is very complex, several changes take place in the fish muscle constituent leading to change in texture and flavour producing odoriferous compounds indicative of spoilage. The degree of spoilage depends on several factors. The loss mainly occurs due to faulty handling and discard of small size fishes. There are several methods of processing and preservation of fish. The main methods are curing, caning and freezing. Processing channels are crucial for fisheries sector as all fish items mean for export marketing need to pass through these channels.

6.8.3 Fish Processing Plant

- The harbor wise capacity and utilization of processing plant shows that at overall total installed capacity for processing seafood in sample processor in Gujarat was 57.9 tons per day with utilization capacity varied from 58.3 to 72.4 percent in different seasons. The installed capacity of an average processing plant in Porbandar was 80.3 tons per day which was higher than that in Veraval (52.8 tons per day) and Mangrol (40.8 tons per day). However, the capacity utilization in processing plant was higher in Veraval as compared to Porbandar and Mangrol. In Veraval, the utilization capacity of plant varied from 71.1 to 82.0 per cent across different seasons; whereas

the same in Porbandar and Mangrol varied from 56.7 to 77.9 per cent and from 44.8 to 49.1 per cent, respectively. The overall utilization capacity of plant was highest during the season I (Oct. – Dec) as compared to other seasons.

- On an average, a selected processor had purchased fish of 2741.7 tons to 3216.7 tons at the rate of Rs. 179.6 to 186.3 per kg for processing in a season. Overall, the processed quantity sold during a season varied from 2504.2 tons to 2900.0 tons; whereas the selling price varied from Rs. 308.3 per kg to Rs. 322.5 per kg. Overall, the economic loss varied from Rs. 29.2 per kg in Season III to Rs. 31.3 per kg during Seasons I and II.
- The harbourwise analysis reveals that the average quantity of purchase in Season I (Oct. to Dec) was the highest in Veraval (3875 tons) followed by Porbandar (3800 tons) and Mangrol (1975 tons). Similar trend in purchase was observed in other two seasons as well. However, the highest sold quantity during Season I was realized in Porbandar (3537.5 tons), which was followed by Veraval (3412.5 tons) and Mangrol (1750 tons) during the same season. Among the harbors, the economic loss was the highest in Mangrol as compared to the same in Porbandar and Veraval. This was basically processor due to inadequate availability of ice plants at harbor level and lower quality of fish caught in Mangrol.
- Overall 66.67 per cent of sample processors purchased the fish from both wholesale market and fishermen and 8.33 percent of them purchased fish from broker/middleman + fisherman. Only 16.67 per cent respondents had purchased fish from fisherman and 8.33 per cent has purchased from wholesale market directly.
- As far as processed fish and fish products sold by the processors is concerned, overall 90.9 per cent of the processors sold the product to exporters; whereas only 9.1 per cent of them sold in domestic market. In Porbandar, 92.0 per cent processors sold their quantity in

export market whereas in Veraval and Mangrol, 91.0 per cent and 90.87 per cent fish was sold to export market, respectively.

- The major fishing harbors are important primary trading centres also. The agents of exporters also operated in these centres as the major export oriented items like shrimps, squids, cuttlefish and high value finfishes were landed at these centres. Insulated van and fishes stacked like ice box, thermal box, and insulated box were used by the processors involved in fish trade for transporting fish to distant markets. On the whole, 33.3 per cent processors used insulated vans for transport of raw fish from harbor to distant centers. In Porbandar, all processors used insulated vans, while in other harbors, none of the processor used insulated vans. All the processors in Porbandar used ice box for fish stalking whereas 75 per cent processors in Veraval and 50 per cent processors in Mangrol used ice boxes for the same. Overall, about 83.3 per cent of processors did grading and sorting of fishes in the processing plants; whereas only 16.67 per cent of them relied on on-board sorting of fishes.
- The fish processing sector has been almost entirely privatized and over the past several years, it has become one of the most rapidly developing sub-sectors of the food processing sector. The greatest numbers of fish processing firms mostly are located in coastal areas. The main task facing these companies/ plants is to comply with various certifying agencies such as EIA (Export Inspection Agency of India), EU (European Union), F&D act of USA, HACCP (Hazard Analysis and Critical Control Point) etc. All the sample processing plants were complied with EIA norms, HACCP norms and were registered with the Marine Products Exports Development Authority (MPEDA). About 58.33 per cent processors were compiled with EU norms and F&D of USA.

- Value addition is the most important aspect of fish processing industry, mainly because of increased opportunities for the exports and earning of foreign exchange. Besides, value addition is one of the possible approaches to raise the profitability of fish processing industry, which now lays greater emphasis on quality assurance. The harbor wise details on value addition by processors indicate that at overall level, about 75 per cent of total quantities of fish were used for export as frozen fish and remaining 25 per cent as whole fish plus frozen. Overall 80 to 90 per cent of total processed quantity of fishes were exported to Europe, Japan, US, China, Vietnam, Dubai, Italy and South Korea and 10-20 per cent of total quantity of processed fish products were sold in Delhi, Ahmadabad Jodhpur, Mumbai, Surat, Vadodara, Anand, Pune and other domestic markets. Overall about 75 per cent processed products were ready to cook and eat.
- The modernized post-harvest facilities are essential to minimize post-harvest losses of fish and fish products. The data on perceptions of the processors regarding the required improvements in post harvest infrastructures so as to minimize the losses indicate that about 58.3 per cent of processors have revealed first preference to insulated storage boxes on board. They have assigned second preference to clean landing platform with washing and drainage facilities and third preference to cold storage/chill plants facilities. It may be noted that the sample processors had assigned forth preference to cold chain network facility in fishing region.
- Harbourwise analysis reveals that processors in Veraval have attached more importance to insulated storage boxes on board followed by the requirement of cleaner landing platform with washing and drainage facilities in their harbor. Both these facilities are also assigned more importance in other two harbors also. About 75 per cent sample processors in Porbandar and Mangrol have

assigned forth preference to cold chain network facility while about 75 per cent of Veraval processors have assigned forth preference to cold storage/chill plants within the fish harvest premises.

6.9.3 Policy Suggestions

- The post harvest infrastructure in marine sector in Gujarat seems to have received less attention. It is also true that as the industry has been pre-occupied with the exports, no major initiatives have been made for the development of the domestic market (may due to less demand). Fish is by and large sold in the most unhygienic conditions and this area needs considerable intervention in the coming period.
- It was observed that the post-harvest fish losses occur at all stages in the fish supply chain from capture to consumer. Huge physical and quality losses were found to occur in supply chain, with economic losses reported to account for around Rs. 18/kg mainly due to poor post-harvest infrastructure. The handling and processing with minimum spoilage is a distant reality and considerable attention needs to be paid on this aspect.
- Although the nutritional losses and human health problems were not the focus of the study, it can be easily admitted that these financial losses add to the food safety and quality concerns under conducive uncontrolled time/temperature conditions.
- To try and reduce or prevent losses, various coping strategies are used by fishermen, processors and traders with varying degrees of success. Despite these, as has been demonstrated by the study, losses still occur, hence the need for careful and continued technical and policy initiatives by agencies involved in it.
- In governments and development agencies should ensure that changes in post-harvest fisheries-related policy and practices take

stock of the loss assessment tools, information generated and experience of the programme. Fish loss assessments should be incorporated into national data collection systems and used regularly to inform policy.

- The fishermen and boat owners should be provided training on proper handling, transport and processing of fishes by the government and cooperative organization.
- Fishing harbours are being developed at both major and minor ports. However, the condition of washing and cleaning facilities available at selected harbours was unsatisfactory at Porbandar and Mangrol while same was very poor at Veraval harbor. The facilities like drinking water, parking facilities, toilet/sanitation facilities, drainage facilities, commutation and approach facilities are unsatisfactory or very poor. Also the facilities like clear landing platform with washing and drainage facilities followed by facility of cold storage/chill plants with in the FH premises and insulated storage boxes on board the fishing vessel need to be created.
- The main problems identified by the fishing communities in selected harbors were absence of facilities like drinking water, parking, sanitation and health care, fire extinguisher and poor floor condition at landing centre. It was generally felt that post-harvest infrastructure is grossly inadequate.
- The retail markets are unhygienic and lack basic facilities that to when more than 90 percent retailers are women. Most of whole fish is sold in the market and there is no processing/value-addition. The retail markets operate in open sky condition and thus in view of less availability of ice, the quality of fish deteriorates very speedily.
- The dredging problem i.e. loading and unloading of fish due to non-navigable depth near sea shore has been faced by fishermen and therefore harbors dredging needs to be carried out regularly.

- It was reported that the prices of fish generally drop down sharply when there is glut in the market mostly during the rainy season (October to December), and therefore marketing and processing activities need to be strengthen by the government. Balancing technical interventions to improve fish quality with the potential increase in selling prices, associated with better quality fish with the demand for cheaper fish by low income consumers, is an important dilemma.
- The fish breeding places need to be protected from encroachment as well as fishing activity should be strictly prohibited during the ban period.
- The dumping of hazardous chemical waste from industries located nearby sea shore (particularly at Veraval and Porbandar) not only affect the fish quality due to polluted water but also results in dying and moving away of good species of fish from the harbor area. That force the fishermen to go far way (till Pakistan border) to catch good fish. Therefore, dumping of industrial waste should be prohibited effectively.
- The harbors like Porbandar and Veraval are overcrowded due to less space in harbor region and large number of boats parked there than its capacity. Because of same, fish catch exceeds the capacity of harbor. Therefore, there is a need of expansion of harbor regions as well as constructions of more number of jetting/landing platforms.
- The limited availability of funds and inadequate staff with fisheries department at harbor level hinder the overall supervision as well as progress in development of infrastructure in harbor region. Therefore, level of administrative and financial autonomy at harbor should be increased with sufficient fund availability so that infrastructure and developmental activities at harbor regions can be stepped up.

- Though it is prohibited by the law, the catching of young fish is still continuing on larger scale which affects the future growth of fish volume and thus fish management in region. Therefore strict monitoring of catching of young fish at harbor level need to be undertaken.

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Annexure I - Supporting Data Tables

Annexure I-A: Details of Fishermen in Gujarat-Census 2007

Sr. No	District	Details of Fishermen in Gujarat-Census 2007									
		Center	Family	Fisherman Population			Marine Pop.	Inland Pop	Active Fishermen		
				Male	Female	Total			Marine	Inland	Total
1	Valsad	68	12876	35378	33090	68468	55851	12617	26652	5032	31684
2	Navsari	59	8086	19254	17912	37166	25252	11914	13426	6348	19774
3	The Dangs	2	140	297	289	586	0	586	0	187	187
4	surat	77	5976	15110	13885	28995	11863	17132	5491	5162	10653
5	Tapi	135	10526	24977	23531	48508	0	48508	0	14542	14542
6	Bharuch	74	5352	14045	12595	26640	6419	20221	3601	12359	15960
7	Narmada	59	1701	4321	4022	8343	0	8343	0	4881	4881
8	Vadodara	75	2819	7523	6733	14256	0	14256	0	3619	3619
9	Panch Mahals	66	2915	9228	8570	17798	0	17798	0	3215	3215
10	Dahod	36	1139	3760	3426	7186	0	7186	0	1366	1366
11	Anand	37	1729	4418	4095	8513	1694	6819	461	2013	2474
12	Kheda	22	647	1639	1416	3055	0	3055	0	710	710
13	Ahemdabad	47	5117	12473	10924	23397	9642	13755	2124	4090	6214
14	Gandhinagar	2	53	109	101	210	0	210	0	119	119
15	Mahesana	5	105	283	263	546	0	546	0	151	151
16	Patan	5	158	465	434	899	0	899	0	166	166
17	Sabarkantha	40	2038	6388	5695	12083	0	12083	0	3125	3125
18	Banadkantha	18	623	1843	1556	3399	0	3399	0	1177	1177
19	Surendranagar	21	2485	7013	6238	13251	0	13251	0	3066	3066
20	Rajkot	20	1796	5247	4852	10099	870	9229	381	3618	3999
21	Bhavnagar	33	1852	5042	4592	9634	6862	2772	2872	931	3803
22	Kuchchh	74	4553	11257	10385	21642	20282	1360	7581	366	7947
23	Jamnagar	32	6052	21181	20160	41341	40900	441	11176	102	11278
24	Porbandar	10	6088	17116	15809	32925	32639	286	7586	101	7687
25	Junadadh	32	15289	46665	45363	92028	88274	3754	39955	1381	41336
26	Amreli	9	2957	13726	13997	27723	27158	565	19021	116	19137
	Total	1058	103072	288758	269933	558691	327706	230985	140327	77943	218270
	Percent			51.68	48.32	100.00	58.66	41.34	64.29	35.71	100.00

Source: GOG (2013).

Annexure I-B: Yearwise Fish Production Target and Achievement

Year	Year wise Fish Production Target (T) and Achievement (A) (Production in Lakh M.T.]								
	Marine			Inland			Total		
	T	A	%	T	A	%	T	A	%
2000-01	7.30	6.20	84.93	0.91	0.41	45.05	8.21	6.61	80.51
2001-02	7.70	6.51	84.55	1.00	0.51	51.00	8.70	7.02	80.69
2002-03	7.20	7.44	103.33	0.80	0.34	42.50	8.00	7.78	97.25
2003-04	7.00	6.09	87.00	0.54	0.45	83.33	7.54	6.54	86.74
2004-05	7.00	5.85	83.57	0.60	0.51	85.00	7.60	6.36	83.68
2005-06	7.00	6.64	94.86	0.65	0.70	107.69	7.65	7.34	95.95
2006-07	7.00	6.77	96.71	0.70	0.77	110.00	7.70	7.54	97.92
2007-08	7.00	6.81	97.29	0.75	0.79	105.33	7.75	7.60	98.06
2008-09	7.00	6.84	97.71	0.75	0.82	109.33	7.75	7.66	98.84
2009-10	7.00	6.87	98.14	0.75	0.84	112.00	7.75	7.71	99.48
2010-11	7.00	6.89	98.43	0.75	0.86	114.67	7.75	7.75	100.00
2011-12	7.00	6.92	98.86	0.75	0.91	121.33	7.75	7.83	101.03
2012-13	7.00	6.93	99.00	0.85	0.95	111.76	7.85	7.88	100.38

Source: GOG (2013).

Annexure I-C (I): Specieswise Marine Fish Production in Gujarat (2000-2001 to 2006-07)

Sr. No.	Name of Species	Species wise Marine Fish Production (2000-2001 to 2006-07) (Production in M.T.)						
		2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	2	3	4	5	6	7	8	9
1	White Pomfret	9169	10981	10655	10014	6515	14487	27562
2	Black Pomfret	2567	3894	4595	2395	1766	2470	5539
3	Bombayduck	86085	79219	76940	78747	84956	92088	91443
4	Thread fin	2079	4342	5197	3002	2285	2940	3057
5	Jewfish	8814	11779	9540	8500	8236	12933	9878
6	Hilsa	1988	4535	1983	1298	1906	2095	3539
7	Clupeids	11186	13850	19677	11813	10793	14759	15892
8	Coilia	9145	11293	12543	11568	11654	8980	9480
9	Shark	14079	14385	17937	12956	10163	15896	27465
10	Mullets	5694	5191	5391	4700	4435	6404	6585
11	Catfish	19568	30001	25990	24899	25979	25851	29594
12	Eel	2694	3224	3638	2609	3418	6405	6279
13	Leather Jacket	2291	2752	3166	1481	2336	4654	6751
14	Seerfish	7706	10971	11881	6873	7388	9277	15866
15	Indian Salmon	885	1517	1074	897	1002	1252	1950
16	Ribbonfish	38429	50754	62852	39423	48135	43179	41118
17	Silver Bar	3043	6577	8457	3955	3963	4840	10189
18	Perches	6942	9890	11908	8894	11731	15493	17719
19	Small Sciaenids	197006	172970	189665	171904	154562	151392	129210
20	Shrimp	44970	40708	43189	45217	48281	53821	50952
21	Prawns (Medium)	7905	7093	5760	7365	5949	10390	10305
22	Prawns (Jembo)	1108	972	947	1615	839	2310	3166
23	Lobster	500	406	421	989	273	1302	2275
24	Crab	1787	1348	2633	1869	1657	1989	3499
25	Levta	2712	2240	2173	1905	1763	2328	3312
26	Squid/Cuttlefish	22857	22415	35476	27780	17504	36152	26297
27	Tuna	-	-	-	-	-	-	10028
28	Carangids/Mackerel	-	-	-	-	-	-	17445
29	Ranifish	-	-	-	-	-	-	16460
30	Solefish	-	-	-	-	-	-	5300
31	Miscellaneous	109265	127522	169950	116468	107462	120197	68607
Grand Total		620474	650829	743638	609136	584951	663884	676762

Source: GOG (2013).

Annexure I-C (II): Species wise Marine Fish Production in Gujarat (2007-08 to 2012-13)

Sr. No.	Name of Species	Species wise Marine Fish Production (2007-08 to 2012-13) Production in M.T.)						
		2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Percent 2012-13
1	2	10	11	12	13	14	15	16
1	White Pomfret	13398	20662	14097	10080	6687	7675	1.11
2	Black Pomfret	2343	4129	3239	2218	2255	3250	0.47
3	Bombayduck	128995	148659	100427	70455	88974	99175	14.30
4	Thread fin	4225	5564	5194	5727	4216	4310	0.62
5	Jewfish	16850	14196	10276	9819	7906	5799	0.84
6	Hilsa	2378	1600	3104	9355	3817	1714	0.25
7	Clupeids	14493	19094	16333	10254	12069	11324	1.63
8	Coilia	9064	9836	10234	14299	10564	11230	1.62
9	Shark	14466	12943	17580	13500	11576	8770	1.26
10	Mullets	6184	5526	4915	4966	6599	5799	0.84
11	Catfish	36085	45094	41668	29889	31263	24971	3.60
12	Eel	6663	5562	4815	2967	4456	4843	0.70
13	Leather Jacket	6163	6495	6558	4997	3068	3184	0.46
14	Seerfish	11127	10574	13124	10365	12126	9634	1.39
15	Indian Salmon	1290	674	2624	5432	1947	2242	0.32
16	Ribbonfish	29708	29231	31288	60344	59407	39061	5.63
17	Silver Bar	6960	6928	5894	6062	6637	5021	0.72
18	Perches	21923	15914	20097	18932	16292	13649	1.97
19	Small Sciaenids	140219	148699	158686	166146	169836	186998	26.96
20	Shrimp	40851	29111	34820	33214	38716	40867	5.89
21	Prawns (Medium)	9922	8771	13865	12871	7944	7209	1.04
22	Prawns (Jembo)	1107	720	951	1917	1732	1580	0.23
23	Lobster	470	527	379	952	709	797	0.11
24	Crab	1997	2435	2433	3326	7949	4712	0.68
25	Levta	2266	1868	2388	1761	2430	3724	0.54
26	Squid/Cuttlefish	20098	18016	22875	35598	30609	26685	3.85
27	Tuna	16644	9487	5066	4772	5967	3639	0.52
28	Carangids/Mackerel	15934	8341	10389	9794	9016	7153	1.03
29	Ranifish	28837	21918	13591	14655	11049	19231	2.77
30	Solefish	8499	7887	9518	4582	6589	11508	1.66
31	Miscellaneous	61689	63394	101017	109681	110083	117806	16.99
Grand Total		680848	683855	687445	688930	692488	693560	100.00

Source: GOG (2013).

Annexure I –C (III) Districtwise and Specieswise Marine Fish Production for the Year 2012-2013

Name of Fish	Marine Fish Production [Prod.in M.T. & Price in Rs. in Lakhs												
	Valsad	Navsari	Surat	Bharuch	Anand	Rajkot	Kachchh	Jamnagar	Porbandar	Junagadh	Amreli	Bhavnagar	otal
White pomfret	1371	1044	75	0	0	0	1277	1403	528	1588	386	3	7675
Black pomfret	0	0	8	0	0	0	1103	859	335	902	42	0	3249
Bombay duck	32831	5197	1455	673	69	117	6836	1092	91	17587	32679	547	99174
Thread fin	340	0	1	0	0	4	205	3152	193	230	184	0	4309
Jewfish	278	0	1	0	0	41	435	2695	87	921	1340	0	5798
Hilsa	800	0	8	19	0	0	9	189	10	490	0	189	1714
Clupeids	29	1012	113	248	28	24	2115	2945	818	3248	605	140	11325
Coilia	3537	1326	58	7	16	0	1935	84	0	1177	3083	7	11230
Shark	258	329	10	0	7	0	731	1272	339	4798	967	58	8769
Mullets	1916	626	208	623	18	2	724	1170	67	0	296	150	5800
Catfish	716	313	40	208	12	63	1627	4175	3956	9946	3843	74	24973
Ewl	0	0	0	0	4	0	153	2235	483	1652	308	7	4842
Leather jacket	0	0	0	0	0	0	1	1185	347	1650	0	0	3183
Seerfish	0	556	0	0	0	0	211	5843	614	2408	0	3	9635
Indian Salmon	188	0	0	0	0	0	73	1834	1	146	0	0	2242
ribbonfish	25	303	0	0	0	1	801	2397	11459	23189	881	6	39062
Silver Bar	6	0	0	0	0	0	701	1482	394	2356	84	0	5023
Perches	0	0	0	24	0	0	2100	2251	4117	4245	872	39	13648
Small Sciaenids	9	3664	0	8	0	56	15243	11883	20621	132703	2758	53	186998
Shrimp	17790	2626	179	1352	72	49	6926	3131	790	6306	1117	530	40868
Prawn [Medium]	2197	1088	49	31	72	0	1497	608	480	989	7	191	7209
Prawn [Jembo]	8	275	14	0	0	0	246	491	246	296	0	3	1579
Lobster	122	78	1	0	0	0	195	134	116	135	0	16	797
Crab	1301	584	149	173	12	39	436	412	261	1147	37	162	4713
Levta	1768	635	294	828	14	6	0	0	0	0	0	179	3724
Squis/ Cuttlefish	0	13	0	0	0	0	175	3804	12475	10212	0	6	26685
Tuna	0	0	0	0	0	0	0	1309	99	2046	185	0	3639
Carangida/ Mackerel	0	0	0	0	0	0	0	621	2219	4308	5	0	7153
Ranifish	0	1257	0	0	0	0	0	1098	11826	5020	30	0	19231
Solefish	9	9	0	0	0	0	7093	597	403	3239	154	4	11508
Miscellaneous	22975	5631	586	599	98	127	19933	7457	17411	35163	7771	54	117805
TOTAL	88474	26566	3249	4793	422	529	72781	67808	90786	278097	57634	2421	693560

Source: GOG (2013).

Annexure I-D: Districtwise Marine Fish Production (2000-2001 to 2012-2013)

Year	Marine Fish Production Prod. in M.T]												
	Valsad	Navsari	Surat	Bharuch	Anand	Rajkot	Kachchh	Jamnagar	Amreli	Junagadh	Porbandar	Bhavnagar	Total
2	3	4	5	6	7	8	9	10	11	12	13	14	15
2000-01	93194	N.A	9681	2046	1442	1716	64697	72552	52166	318340	N.A	4640	620474
2001-02	65374	24951	6909	1412	1585	2030	80014	83398	36405	270742	74127	3882	650829
2002-03	74348	30126	8217	1775	2029	1458	80714	102846	45794	298032	94503	3796	743638
2003-04	79721	30048	8882	1638	2016	1744	71995	37957	49753	247559	74003	3820	609136
2004-05	78623	33567	8683	1500	2614	1907	64680	45935	59265	233294	49912	4971	584951
2005-06	79064	34703	11228	1587	3023	1528	62394	66489	66750	281456	51047	4615	663884
2006-07	57739	29955	10414	3789	2276	2709	59353	65232	77776	300804	60437	6278	676762
2007-08	41450	15510	9529	6419	264	2280	58724	59225	61624	259763	161486	4574	680848
2008-09	35166	8673	3538	6864	421	953	53292	62618	200774	250781	56387	4388	683855
2009-10	81354	11345	4488	6078	487	1040	60405	88293	101906	265049	63411	3589	687445
2010-11	87497	19428	2525	5804	314	1072	72977	67530	60711	280229	88610	2233	688930
2011-12	87594	20159	3208	6405	456	955	72897	67146	60576	280897	89555	2640	692488
2012-13	88474	26566	3249	4793	422	529	72781	67808	57634	278097	90786	2421	693560
% age 2012-13	12.76	3.83	0.47	0.69	0.06	0.08	10.49	9.78	8.31	40.1	13.09	0.35	100

NOTE: The separate production data of Navsari and Porbander are not available for the year 2000-01 and they are included in Valsad and Junagadh district respectively.
Source: GOG (2013).

Annexure I-E (I): Districtwise Mechanized and Non -Mechanized Boats in Gujarat

Sr. No.	District	Districtwise Mecheanised and Non -Mechanised Boats of Gujarat state (2012-2013)											
		Mechanised Boats								Non-Mechanised Boats		Total Boats	%
		Trawler	Gill neter	FRP IBM	FRP OBM	Wooden OBM	Dolneters/ Others	Total Mechn.	Mechn. Percent	Total Non-Mechn.	N.M. Percent		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Valsad	549	904	328	0	0	769	2550	10.36	561	4.61	3111	8.46
2	Navsari	250	0	125	0	0	319	694	2.82	378	3.11	1072	2.92
3	The Dangs	0	0	0	0	0	0	0	0.00	0	0.00	0	0
4	Surat	0	10	127	12	0	0	149	0.61	870	7.16	1019	2.77
5	Tapi	0	0	0	0	0	0	0	0.00	2327	19.14	2327	6.33
6	Bharuch	0	248	463	0	0	0	711	2.89	940	7.73	1651	4.49
7	Narmada	0	0	0	4	0	0	4	0.02	394	3.24	398	1.08
8	Vadodara	0	0	4	3	28	0	35	0.14	495	4.07	530	1.44
9	Panch Mahals	0	0	0	0	1	0	1	0.00	2145	17.64	2146	5.84
10	Dahod	0	0	0	2	0	0	2	0.01	539	4.43	541	1.47
11	Anand	0	0	0	0	0	0	0	0.00	168	1.38	168	0.46
12	Kheda	0	0	0	0	0	0	0	0.00	38	0.31	38	0.1
13	Ahemdabad	0	0	0	0	0	0	0	0.00	359	2.95	359	0.98
14	Gandhinagar	0	0	0	0	0	0	0	0.00	0	0.00	0	0
15	Mahesana	0	0	0	0	0	0	0	0.00	0	0.00	0	0
16	Patan	0	0	0	0	0	0	0	0.00	2	0.02	2	0.01
17	Sabarkantha	0	0	0	0	0	0	0	0.00	509	4.19	509	1.38
18	Banadkantha	0	0	0	0	0	0	0	0.00	148	1.22	148	0.4
19	Surendranagar	0	0	0	0	0	0	0	0.00	464	3.82	464	1.26
20	Rajkot	0	0	118	0	0	0	118	0.48	861	7.08	979	2.66
21	Bhavnagar	0	0	206	0	0	0	206	0.84	20	0.16	226	0.61
22	Kuchchh	12	231	1086	3	25	173	1530	6.22	165	1.36	1695	4.61
23	Jamnagar	216	402	852	1347	5	0	2822	11.47	385	3.17	3207	8.72
24	Porbandar	2324	115	16	2444	0	0	4899	19.90	133	1.09	5032	13.69
25	Junadadh	4269	122	351	4927	24	574	10267	41.72	257	2.11	10524	28.62
26	Amreli	0	30	21	0	0	573	624	2.54	0	0.00	624	1.7
	Total	7620	2062	3697	8742	83	2408	24612	100.0	12158	100	36770	100

Source: GOG (2013).

Annexure I-E (II): Districtwise Mechanized and Non-Mechanized Marine Boats of Gujarat state (2012-2013)

Sr. No	District	Mechanized and Non-Mechanized Marine Boats (2012-2013)											
		Mechanized Boats								Non-Mechanized Boats		Total Boats	%
		Trawler	Gillnetter	FRP IBM	FRP OBM	Wooden OBM	Dolneters/Other	Total Mechn.	Mechn. %	Total Non-Mech	N.M. %		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Valsad	549	877	325	0	0	768	2519	10.59	163	11.16	2682	10.63
2	Navsari	250	0	123	0	0	313	686	2.89	297	20.34	983	3.9
3	Surat	0	10	57	12	0	0	79	0.33	1	0.07	80	0.32
4	Bharuch	0	0	31	0	0	0	31	0.13	0	0	31	0.12
5	Anand	0	0	0	0		0	0	0	0	0	0	0
6	Rajkot	0	0	113	0	0	0	113	0.48	59	4.04	172	0.68
7	Bhavnagar	0	0	206	0	0	0	206	0.87	0	0	206	0.82
8	Kachchh	12	231	1086	3	25	173	1530	6.44	165	11.3	1695	6.72
9	Jamnagar	216	402	852	1347	5	0	2822	11.87	385	26.37	3207	12.71
10	Probandar	2324	115	16	2444	0	0	4899	20.6	133	9.11	5032	19.94
11	Junagadh	4269	122	351	4927	24	574	10267	43.18	257	17.6	10524	41.7
12	Amreli	0	30	21	0	0	573	624	2.62	0	0	624	2.47
	Total	7620	1787	3181	8733	54	2401	23776	100	1460	100	25236	100

Source: GOG (2013).

Annexure I-E (III): District wise Mechanized and Non-Mechanized Inland Boats of Gujarat State (2012-2013)

Sr. No.	District	Mechanized and Non-Mechanized Inland Boats (2012-13)											
		Mechanized Boats								Non-Mechanized Boats		Total Boats	%
		Trawler	Gillnetter	FRPIBM	FRPOBM	Wooden OBM	Dolneters /Others	Total Mechn.	Mechn.%	Total Non-Mechn.	N.M. %		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Valsad	0	27	3	0	0	1	31	3.71	398	3.72	429	3.72
2	Navsari	0	0	2	0	0	6	8	0.96	81	0.76	89	0.77
3	surat	0	0	70	0	0	0	70	8.37	869	8.12	939	8.14
4	Tapi	0	0	0	0	0	0	0	0.00	2327	21.75	2327	20.18
5	Bharuch	0	248	432	0	0	0	680	81.34	940	8.79	1620	14.05
6	Narmada	0	0	0	4	0	0	4	0.48	394	3.68	398	3.45
7	Vadodara	0	0	4	3	28	0	35	4.19	495	4.63	530	4.60
8	Panch Mahals	0	0	0	0	1	0	1	0.12	2145	20.05	2146	18.61
9	Dahod	0	0	0	2	0	0	2	0.24	539	5.04	541	4.69
10	Anand	0	0	0	0	0	0	0	0.00	168	1.57	168	1.46
11	Kheda	0	0	0	0	0	0	0	0.00	38	0.36	38	0.33
12	Ahemdabad	0	0	0	0	0	0	0	0.00	359	3.36	359	3.11
13	Gandhinagar	0	0	0	0	0	0	0	0.00	0	0.00	0	0.00
14	Mahesana	0	0	0	0	0	0	0	0.00	0	0.00	0	0.00
15	Patan	0	0	0	0	0	0	0	0.00	2	0.02	2	0.02
16	Sabarkantha	0	0	0	0	0	0	0	0.00	509	4.76	509	4.41
17	Banadkantha	0	0	0	0	0	0	0	0.00	148	1.38	148	1.28
18	Surendranagar	0	0	0	0	0	0	0	0.00	464	4.34	464	4.02
19	Rajkot	0	0	5	0	0	0	5	0.60	802	7.50	807	7.00
20	Bhavnagar	0	0	0	0	0	0	0	0.00	20	0.19	20	0.17
Total		0	275	516	9	29	7	836	100.00	10698	100.0	11534	100.0

Source: GOG (2013).

Annexure I (F) Statement showing the details of G.P.S. (Global Positioning System) facility with fishing boat

Sr No	Name of Centre/district	No. of Boat having GPS (Global Positioning System) facility among the Registered Boat
1	Veraval (Junagadh)	3224
2	Porbander	1137
3	Jamnagar	300
4	Jafrabad (Amreli)	1402
5	Mangrol (Junagadh)	1349
6	Navsari	10
7	Valsad	3538
	Total	10960

Source: GOG (2013).

Annexure I (G) Statement showing the details of Pagadiya fisherman (2012-13)

Sr. No.	Name of District	No. of Pagadiya Fishermen
1	Valsad	24
2	Navsari	55
3	The Dangs	0
4	Surat	103
5	Tapi	0
6	Bharuch	768
7	Narmada	11
8	Vadodara	2
9	PanchMahal	0
10	Dahod	0
11	Anand	115
12	Kheda	20
13	Ahmedabad	234
14	Gandhinagar	0
15	Maheshana	25
16	Patan	75
17	Sabarkantha	20
18	Banaskantha	0
19	Surendranagar	130
20	Rajkot	502
21	Bhavnagar	228
22	Kachchh	489
23	Jamnagar	110
24	Porbandar	49
25	Junagadh	267
26	Amreli	144
	Total	3371

Source: GOG (2013)

Annexure I (H): Online Boat Registration (as on 31-3-2014)

Sr. No	Name of District	Online Boat Registration (as on 31-3-2014)		
		Total Applications	Total Approved	No. of Certificates Issued
1	Valsad	3437	3337	2935
2	Navsari	10	10	2
3	Surat	226	222	222
4	Bharuch	26	23	23
5	Ahmedabad	3	1	1
6	Rajkot	148	145	115
7	Bhavnagar	60	34	34
8	Kachchh	1216	1196	1196
9	Jamnagar	1983	1879	1847
10	Porbandar	3894	3891	3830
11	Junagadh	11219	11025	10990
12	Amreli	945	938	907
	Total	23167	22701	22102

NOTE: (i) In the interest of National security, it is mandatory to register all the fishing boats online.
(ii) registration facility is available in all the maritime Districts of Gujarat State.
Source: GOG (2013).

Annexure I (I): Biometric Identity Card Issued in Marine Sector (As On 31-7-2014)

Sr.No	Name of District	Total Active Fishermen in Marine Sector (As per Fishermen Census-2007)	Biometric Identity Card Prepared in 1st round in the year-2012	Biometric Identity Card Prepared in 2nd round in the year-2014	Total No. of Biometric Identity Card Issued
1	Valsad	26652	14465	373	14838
2	Navsari	13426	7675	145	7820
3	Surat	5491	4954	508	5462
4	Bharuch	3601	2512	29	2541
5	Anand	461	537	37	574
6	Ahmedabad	2124	1585	196	1781
7	Rajkot	381	340	0	340
8	Bhavnagar	2872	3920	438	4358
9	Kachchh	7581	8039	517	8556
10	Jamnagar	11176	13108	1177	14285
11	Porbandar	7586	12030	396	12426
12	Junagadh	39955	50799	757	51556
13	Amreli	19021	8326	147	8473
	Total	140327	128290	4720	133010

Note: This Biometric Cards will be useful for the marine fishermen to establish their identity and it is in the interest of National Security. Fishermen attaining 16 years of age are eligible to obtain the Biometric Cards.

Annexure I (J) Statement showing the details about the beneficiary of DAT (Distress Alert Transmitters)

Sr No	Name of Centre/district	No. of DAT (Distress Alert Transmitters) Beneficiary
1	2	3
1	Veraval (Junagadh)	63
2	Jamnagar	60
3	Jafrabad (Amreli)	50
4	Navsari	50
5	Valsad	50
6	Mangrol (Junagadh)	50
7	Porbander	131
8	Kachchh	46
	Total	500

Source: GOG (2013)

Annexure I (K): Districtwise Cooperative Fishery Societies in Gujarat

Sr No	Districtwise Fisheries Co-operative	Districtwise Cooperative Fishery Societies in Gujarat (as on 31.03.2013)									
		Total No of Society	Total No of Members	Tribal		Non Tribal		kind of Societies			
				No	Members	No	Members	Marine	Inland	Active	Inactive
1	Valsad	26	13916	5	967	21	12949	21	5	16	10
2	Navsari	19	6230	8	765	11	5465	7	12	10	9
3	The Dangs	0	0	0	0	0	0	0	0	0	0
4	Surat	23	3275	15	2436	8	839	3	20	12	11
5	Tapi	18	8569	18	8569	0	0	0	18	18	0
6	Bharuch	23	1720	15	1283	8	437	3	20	22	1
7	Narmada	11	2673	10	2536	1	137	0	11	7	4
8	Vadodara	26	1511	13	707	13	804	0	26	23	3
9	Panchmahal	21	3533	13	3308	8	225	0	21	18	3
10	Dahod	38	1931	37	1911	1	20	0	38	14	24
11	Anand	5	442	0	0	5	442	0	5	2	3
12	Kheda	11	490	0	6	11	484	0	11	7	4
13	Ahmedabad	16	3034	4	835	12	2199	2	14	16	0
14	Gandhinagar	0	0	0	0	0	0	0	0	0	0
15	Mahesana	2	316	0	0	2	316	0	2	0	2
16	Patan	0	0	0	0	0	0	0	0	0	0
17	Sabarkantha	16	3048	13	2252	3	796	0	16	14	2
18	Banaskantha	10	1032	7	587	3	445	0	10	5	5
19	Surendranagar	22	2667	7	1643	15	1024	2	20	19	3
20	Rajkot	22	1391	0	0	22	1391	0	22	16	6
21	Bhavnagar	21	1749	1	51	20	1698	10	11	17	4
22	Kachchh	20	2699	0	0	20	2699	13	7	14	6
23	Jamnagar	19	1988	0	0	19	1988	7	12	18	1
24	Porbandar	71	8072	0	0	71	8072	67	4	63	8
25	Junagadh	162	18392	1	100	161	18292	150	12	130	32
26	Amreli	37	2860	0	0	37	2860	30	7	32	5
	Total	639	91538	16	2795	472	63582	315	324	493	146

Source: GOG (2013).

Annexure I (L) Statement showing the details of license for retails and wholesaler for the year-2012-13

Sr No	Name of District	License for retails	License for Wholesales
1	2	3	4
1	Valsad	46	19
2	Navsari	1	28
3	The Dangs	0	0
4	Surat	70	20
5	Tapi	261	0
6	Bharuch	176	21
7	Narmada	5	11
8	Vadodara	148	2
9	PanchMahal	3	4
10	Dahod	2	1
11	Anand	44	0
12	Kheda	30	2
13	Ahmedabad	235	0
14	Gandhinagar	0	0
15	Maheshana	16	2
16	Patan	10	0
17	Sabarkantha	67	1
18	Banaskantha	35	0
19	Surendranagar	38	5
20	Rajkot	306	21
21	Bhavnagar	182	0
22	Kachchh	450	17
23	Jamnagar	35	4
24	Porbandar	112	6
25	Junagadh	169	171
26	Amreli	136	6
	Total	2577	341

Source: GOG (2013)

Annexure I (M) Districtwise and Specieswise Marine Fish Average Price in the year 2012-2013

Name of Fish	Marine Fish Average Price (Rs./kg) 2012-13	
	Avg. Price	Value (Rs. In Lakhs)
White pomfret	299.13	22956.9
Black pomfret	172.74	5613.72
Bombay duck	47.47	47074.2
Thread fin	205.84	8870.77
Jewfish	250.65	14535.1
Hilsa	183.35	3143.32
Clupeids	38.68	4379.9
Coilia	29.07	3264.8
Shark	46.86	4109.33
Mullets	69.06	4005.11
Catfish	39.09	9762.22
Ewl	95.48	4624.23
Leather jacket	52.39	1667.97
Seerfish	131.69	12687.7
Indian Salmon	145.78	3267.8
ribbonfish	77.01	30081
Silver Bar	32.32	1623.06
Perches	69.86	9535.89
Small Sciaenids	61.91	115769
Shrimp	79.36	32433.8
Prawn [Medium]	130.21	9387.46
Prawn [Jembo]	270.9	4279.32
Lobster	575.06	4583.8
Crab	48.44	2282.48
Levta	59.4	2211.88
Squis/ Cuttlefish	90.77	24222.7
Tuna	56.84	2068.68
Carangida/ Mackerel	43.13	3085.08
Ranifish	35.78	6881.8
Solefish	36.21	4166.86
Miscellaneous	27.19	32027.9
TOTAL	62.66	434604

Source: GOG (2013).

Annexure I (N): Species wise Year wise Comparative Retail Price of Marine Fish (2000-2001 to 2006-07)

Sr. No.	Name of Species	Retail Price of Marine Fish (Rs/kg)						
		2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	White Pomfret	102.58	113.31	121.38	137.46	147.08	148.21	150.77
2	Black Pomfret	78.55	88.31	87.1	89.89	92.37	97.78	107
3	Bombayduck	22.07	19.52	19.95	22.24	22.24	24.57	21.15
4	Thread fin	76.71	89.57	92.86	78.56	117.59	121.35	126.25
5	Jewfish	64.98	80.82	87.7	85.74	85.44	104.11	116.43
6	Hilsa	45.98	54.34	63.81	70.18	68.54	79.09	79.38
7	Clupeids	31.43	39.52	36.07	34.39	40.53	37.02	37.08
8	Coilia	22.94	21.21	19.26	19.59	16.16	21.01	20.5
9	Shark	28.08	30.16	27.18	30.79	29.21	31.41	35.44
10	Mullets	38.13	42.62	41.34	44.44	40.29	43.7	46.64
11	Catfish	30.22	30.48	31.28	36.83	32.69	33.84	39.6
12	Eel	37.08	42.38	54.83	44.49	40.47	39.55	54.25
13	Leather Jacket	43.26	40.74	41.75	43.95	40.65	54.22	56.4
14	Seerfish	56.61	68.34	70.82	71.74	74.36	76.05	84.38
15	Indian Salmon	60.18	66.74	76.59	67.54	68.26	70.34	91.25
16	Ribbonfish	27.18	26.41	26.05	17.7	23.27	23.72	29.5
17	Silver Bar	27.79	29.29	29.3	30.12	35.78	34.8	36.57
18	Perches	38.18	40.12	41.66	40.35	49.97	57.36	62
19	Small Sciaenids	31.2	23.84	25.22	23.35	24.02	25.1	22.69
20	Shrimp	42.79	39.04	41.51	41.36	48.88	49.22	49.08
21	Prawns (Medium)	73.11	74.42	75.26	79.61	90.12	90.53	97.56
22	Prawns (Jembo)	180	215	191.25	195	251.88	240	255
23	Lobster	330.6	291.14	306.13	408.33	329.82	287.5	295
24	Crab	32.03	27.14	33.21	36.21	38.6	38.5	44.4
25	Levta	36.16	30.27	32.31	35.92	33.31	35.43	36.25
26	Squid/Cuttlefish	25	24.21	52.34	54.16	38.39	57.5	65
27	Tuna	-	-	-	-	-	-	33.43
28	Carangids/Mackerel	-	-	-	-	-	-	39.8
29	Ranifish	-	-	-	-	-	-	27.75
30	Solefish	-	-	-	-	-	-	39.8
31	Miscellaneous	22.8	21.66	23.84	24.02	22.98	24.64	25.27
Grand Total		59.47	61.87	64.81	69.04	70.48	72.09	71.79

Source: GOG (2013).

Annexure I (O): Species wise Year wise Comparative Retail Price of Marine Fish From 2007-2008 to 2012-13

Sr. No.	Name of Species	Retail Price of Marine Fish (Rs/kg)					
		2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
1	White Pomfret	175	196.6	186.5	199.12	202.25	209.13
2	Black Pomfret	84.44	99.89	95.2	102.25	115.35	112.74
3	Bombayduck	25.21	24.36	23.65	31.45	33.4	37.47
4	Thread fin	68.18	118.85	129.35	172.3	185.85	201.84
5	Jewfish	70.63	156.23	199.85	215.45	220.95	250.65
6	Hilsa	53.75	65.62	90.15	110.6	113.25	133.35
7	Clupeids	31.56	35.23	33.15	45.1	46	38.68
8	Coilia	15.45	14.85	23.1	24.36	25.9	29.07
9	Shark	29.46	28.6	29.08	30.45	35.25	46.86
10	Mullets	43.58	44.12	48.95	51.28	58.35	59.06
11	Catfish	32.77	24.32	26.3	29.15	32.1	39.09
12	Eel	46.36	41.62	51.15	61.23	65.9	75.48
13	Leather Jacket	35	35.25	43.75	48.45	49.35	5.39
14	Seerfish	58.18	66.42	92.05	95.56	99.4	101.69
15	Indian Salmon	59.5	71.2	144.1	137.12	146.35	145.78
16	Ribbonfish	24.44	26.9	40.7	52.19	55.45	57.01
17	Silver Bar	27.3	27.11	24.6	25.64	27.45	32.32
18	Perches	42.7	45.32	49.1	51.48	65.35	69.86
19	Small Sciaenids	22.83	23.01	26.5	32.3	35.65	41.91
20	Shrimp	43.75	45.62	53.05	51.62	68.25	79.36
21	Prawns (Medium)	103.33	106.85	105.05	111.09	115.5	120.21
22	Prawns (Jembo)	257.5	255.61	220.1	240.94	245.65	250.9
23	Lobster	382.78	385.64	400.5	532.2	535.6	575.06
24	Crab	37.15	42.37	33.25	35.1	36.25	38.44
25	Levta	39.44	38.64	36.8	42.5	50.5	59.4
26	Squid/Cuttlefish	67.5	58.12	56.12	60.18	70.65	80.77
27	Tuna	31.75	34.56	46.45	44.35	48.5	51.84
28	Carangids/Mackerel	20.5	26.5	32.3	34.1	38.45	43.13
29	Ranifish	18.75	25.67	30.35	32.6	35.25	35.78
30	Solefish	29.71	35.49	25.12	29.85	32.65	36.21
31	Miscellaneous	18.54	19.25	18.1	19.4	22.5	27.19
Grand Total		64.42	71.61	77.88	88.69	93.98	99.54

Source: GOG (2013).

Annexure II

Comprehensive Marine Fishing Policy

Government of India
Ministry of Agriculture
Department of Animal Husbandry & Dairying,

FORWORD

Relevance of the Marine Fisheries Sector extends beyond the livelihood security of the large coastal population to the food security of our countrymen and our foreign exchange generation. The potential of the sector for employment generation through ancillary activities and empowerment of coastal womenfolk is significant. However, the global marine fisheries, especially the coastal sector, has been under constant threat in the recent years basically due to depleting resources, land and sea based pollution and upheaval in the climatic conditions. Concerns over this in the international fora have given rise to conventions and procedures that are to be sincerely implemented by the Governments and meticulously practiced by the stakeholders so as to ensure sustainability in fisheries.

The effort of the Union Government in this regard has resulted in this Comprehensive Marine Fishing Policy document which seeks a focused Endeavour from the coastal States and the Central Departments with full appreciation of the international conventions in force for conservation, management and sustainable utilization of our invaluable marine wealth, without losing its relevance to the food and livelihood security of the coastal communities which totally depend on this. I call upon the Governments of the coastal States and the fisheries fraternity to translate this policy into action by resorting to prompt and effective follow up, including setting up of legal and implementing mechanisms that would be necessary.

I congratulate Dr. K. Gopakumar, former Deputy Director General, ICAR, who headed the Committee appointed by the Government for drafting the Comprehensive Marine Fishing Policy and also its members and the officers of the Department, stakeholders and other experts for their valuable inputs in formulating this first ever national Comprehensive Marine Fishing Policy.

New Delhi.
November, 2004

(Sharad Pawar)

I N D E X

No.30012/1/2003-FY(T-I) Government of India Ministry of Agriculture, Department of Animal Husbandry & Dairying

MARINE FISHING POLICY 2004

1.0 PREAMBLE

The Geographic base of Indian marine fisheries has 8118 km. coastline, 2.02 million sq. km. of Exclusive Economic Zone (EEZ) including 0.5 million sq. km. of continental shelf and 3937 fishing villages. There are 1896 traditional fish landing centers, 33 minor fishing harbours and 6 major fishing harbours which serve as bases for about 2,08,000 traditional non -motorized craft, 55,000 small scale beach-landing craft fitted with outboard motors, 51250 mechanized craft (mainly bottom trawlers and purse-seiners) and 180 deep sea fishing vessels and out of which 80 are in operation. The post-harvest infrastructure consists of freezing plants, canning plants, ice making plants, fishmeal plants, cold storage and peeling sheds which together cater to a sizable labour force of one million people engaged in fishing and another 0.8 million in post-harvest operations. A large number of scientists, technocrats and other categories of personnel are involved in research, education, technology development and administration in marine fisheries. The estimated first sale value of the marine fish landings in the year 2000 was Rs. 10,200 crores. There is a lucrative and organized seafood export trade with the value of the export exceeding Rs. 6300 crores.

A large number of fin fish and shell fish stock principally consisting of sardines, Bombay-duck, ribbonfish Indian mackerel, coastal tunas, seer fishes, penaeid and non-penaeid shrimps, stomatopoda, cephalopods, croakers, threadfin breams, silver bellies and carangids trevallies, leather jackets, scads and horse mackerel are exploited using different craft and gear combinations. Presently the estimated average annual landing of fish and shellfish is around 28 lakh tonnes.

Marine fisheries within the territorial waters are the subject of maritime states whereas fisheries beyond this limit within the EEZ fall in the jurisdiction of Central Government. The Central Government besides playing an advisory role also provides funding support to the States/Union Territories for implementation of Central Sector and Centrally Sponsored Schemes. The policy initiatives are required not only for making marine fisheries sustainable and responsible, but also globally competitive so that Indian producers stand to gain in international markets. This arrangement was appropriate until recently considering that only the resources close to the coasts of the maritime states were harvested. The global scenario with respect to marine fisheries is rapidly changing with major developments in harvesting and processing technology and consequent expansion of global markets for fish and fishery products.

The Ministry of Agriculture has been paying due attention in the past decade to the development of deep-sea fishery in the country. The declaration of Exclusive Economic Zone in 1976 facilitated exploration, exploitation and utilization of marine living resources in the sea around India extending to 200 nautical miles, thereby giving the nation immense opportunities and challenges to harvest the resources and to manage them on sound scientific basis. The past three decades have witnessed rapid initiatives by the government and private agencies in the marine fisheries sector of the country. On realization that most of the deep sea fishery resources beyond the conventional fishing limit and fishing capability of the indigenous craft can be gainfully exploited only if the upgraded and sophisticated vessels of adequate size and capabilities are inducted into the fishery and mobilization of capital and expertise indigenously to achieve this was found difficult in short span of time, the Government addressed this issue in 1981 Charter Policy.

After the expiry of five years of operation of this policy, the Government revised the policy to rectify the deficiencies noticed during its operation and to make it more beneficial to the country. Accordingly a revised 1986 Charter Policy was pronounced. This Charter Policy envisaged acquisition of vessels by the Indian Companies either through import / construction in India or through joint venture etc. As a result of the

above Charter Policy, 97 companies were permitted to operate 311 foreign fishing vessels. Besides augmenting the marine fish production in the country, the policy also facilitated greater inflow of foreign exchange through export of fish caught by these vessels. All these vessels were operating on 100% EOU basis. The conditions for acquisition of vessels of adequate type and number by the Indian companies who chartered vessels helped the growth of Indian deep sea fishing fleet within a short span.

Having laid the foundation for the Indian deep sea fishing industry, the government went ahead to broad base the initiatives through 1991 policy which envisaged joint venture, test fishing and leasing besides allowing continuing the vessels chartered under 1986 policy till the validity of their permits lasted. From the beginning of 1994, the Deep Sea Fishing Policy was criticized by various fishermen groups, mechanized fishing vessel owners, fish processors etc. In addition a large number of representations from Members of Parliament and MLAs were addressed to Ministry demanding to stop giving licenses under the New Policy. The fishermen groups also resorted to agitation stating that their operational area is being encroached upon by the larger vessels operating under charter, joint venture, lease etc., over-exploitation of resources, under-reporting of catch and damages to craft & gear of traditional craft. Therefore, the government appointed a committee to review the deep sea fishing policy, which submitted its report in 1996. The government with minor modifications accepted all the 21 recommendations of this Committee. As per this the Government rescinded all the earlier policies on deep-sea fishing. It was also decided that the fishing policies of the government should be revised from time to time. Accordingly the Government of India subsequently constituted a few Committees in order to gather inputs on the availability of the fishing craft, status of marine fishing resources, issues relating to the various stakeholder groups etc.

The marine fishing policy announced by the Govt. of India in the past focused only on the developmental needs of the deep-sea sector, leaving aside similar issues pertaining to the coastal sector to the respective marine states/ UT's. Even though substantial assistance was channelized through Central and Centrally Sponsored Schemes in to the States/ UT's for the development of coastal fisheries, non-existence of an integrated policy for this sector was found to hamper fulfillment of the national objectives. Therefore in the present policy the Government seeks to bring the traditional and coastal fishermen also in to the focus together with stakeholders in the deep- sea sector so as to achieve harmonized development of marine fishery both in the territorial and extra territorial waters of our country. The theme of comprehensive marine fishing policy is enshrined in the National Agriculture Policy promulgated by this Government. It is significant that the new policy is being pronounced during the initial years of the X Five Year Plan, the elements contained therein may be gainfully used by the implementing Departments in the Central and State Governments to reach the benefits to the stake holders.

The policy objectives are: (1) to augment marine fish production of the country up to the sustainable level in a responsible manner so as to boost export of sea food from the country and also to increase per capita fish protein intake of the masses, (2) to ensure socio-economic security of the artisanal fishermen whose livelihood solely depends on this vocation. (3) to ensure sustainable development of marine fisheries with due concern for ecological integrity and bio–diversity.

2.0 MARINE FISHERIES RESOURCES

The marine fishery resources of the country's EEZ stand assessed at 3.93 million metric tonnes as per the latest update of 2000. This resource is distributed in inshore (58%), off shore (34.9%) and deep sea (7%) waters. The major share of this resource is demersal (2.02 million tonnes) followed by 1.67 million tonnes of pelagic and 0.24 million tonnes of oceanic resources. The estimates also points to the fact that there is scope for further

augmenting the marine fish production by about 1.2 million tonnes if fishing is carried out deploying resource-specific vessels, mainly in the oceanic region. Another phenomenon noticed is the depletion of resources in the coastal sector, which is either species specific or location-specific, both resulting from unsustainable fishing pressure.

The policy therefore underscores the need for a departure from the open access concept in the territorial waters besides putting in place stringent management regimes. Promoting exploitation in the deep sea and oceanic waters would be another approach for reducing fishing pressure in the traditional fishing areas.

3.0. HARVESTING OF MARINE FISH RESOURCES

Harvesting of marine fish resources is categorized into three levels viz. (I) subsistence fishing (ii) small-scale fishing and (iii) industrial fishing.

3.1 The policy advocates protection, consideration and encouragement of subsistence level fishermen and technology transfer to small scale sector and infrastructure support to industrial sector.

3.2 There would be exclusive area in terms of depth and (or) distance earmarked for non-mechanized (non-motorized) traditional craft. An area beyond this would be demarcated for mechanized and motorized craft.

3.3 The area for deep sea fishing vessels including all boats above 20 m OAL and fitted with inboard engine and having chilled or refrigerated fish hold would be beyond the limits prescribed for the other two categories of vessels in 2.2 above.

3.4 Within the territorial waters, the demarcation of area for traditional, motorized and small-mechanized fishing vessels is the purview of the coastal state/union territory. Efforts would be made to harmonize the demarcation of reserved areas to the maximum extent possible so that a uniform pattern is followed in all coastal states /UT's.

3.5 Encouragement to subsistence level fishermen would include scheme to motorize the traditional craft and also providing better material and technology for their traditional craft. The country has a very large fleet of traditional craft (181284 Nos.) Motorization of the entire fleet may make fishing un-sustainable. The motorized craft with their operational limit would end up in overcrowding whereby excerting too much fishing pressure in a limited area. The Policy therefore envisages motorization of about 50% of traditional craft allowing the remaining to carry on subsistence fishing in the near shore waters.

3.6 The small-mechanized sector would be encouraged by providing incentives for acquisition of multi-day fishing units.

3.7 Deep sea vessels would be provided with infrastructure support in terms of landing and berthing facilities. The vessels, which are landing quality fish for export would be provided with suitable incentive as in other export oriented agri-ventures.

3.8 As the bulk of incremental catch to augment annual marine fish production has to come from deep-sea sector and beyond EEZ limit, the Government would encourage introduction of more resource specific vessels of above 20 m length.

3.9 Proposals for import of resource-specific fishing vessels by wholly Indian owned enterprises would be screened and approval accorded for such imports by a designated authority in accordance with well laid out norms. These additional fishing units in the deep-sea sector would be for tuna fishing and squid jigging.

3.10 Special incentives would be provided for wholly Indian owned vessels for venturing into international waters and for concluding fishing arrangements with other nations under license etc.

3.11 Joint venture initiatives with specified equity norms for package proposals involving catching fish from the EEZ for processing at shore and export would be considered.

3.12 Fishing in Antarctic waters by Indian owned vessels or with equity participation or under license would be promoted by working out sustainable strategies.

3.13 The principle of Code of Conduct for Responsible Fishing Operations would be incorporated into every component activity.

3.14 Assessment of existing fishing capacity and plans for regulating or developing one or the other sectors of EEZ would be taken up.

3.15 The existing joint venture fishing vessels would be required to fully indigenise their operations as per the original proposal upon which permits were granted to these companies. No substitution for joint venture vessels would be permitted.

4.0 POST-HARVEST OPERATIONS

Total utilization of harvested fish for food and non-food uses would be the central theme. Efforts would be made to fully comply with international requirements in post harvest care of catch so as to achieve highest standards in food safety. It would be also the concern of the Government to ensure that the post-harvest losses are minimized.

4.1 Implementation of international quality regimes for ensuring food safety in fish and fishery products would be carried out through the nodal agency. A regulatory body would ensure monitoring and verification of compliance. Existing domestic standards for fishery products and by-products would be harmonized with the International Standards so as to ensure quality of fish and fishery products for domestic consumption at par with global standards.

4.2 Packaging and bar coding would be made mandatory for authorized sale of fish and fish products through registered outlets for ensuring food safety.

4.3 Consumer rights would be given due attention in domestic trade of fish and fishery products.

4.4 Hygiene in fishing harbour/pre-processing and processing centers would be streamlined through legislation.

5.0 RESOURCE MANAGEMENT

Exploitation of living resources within 50 meters depth zone is showing symptoms of depletion and in certain belts in the inshore waters it tends to cross optimum sustainable levels. The policy therefore advocates a stringent fishery management system to be in place.

5.1 Though the Marine Fishing Regulation Acts (MFRA's) of coastal states and UT's have adequate provisions for management of resources and fishing operations, it is often found falling short of effective implementation. This calls for a review of the situation and prescribing a fresh model bill on coastal fisheries development and management with a re-orientation on limited access in coastal marine sector through policy initiative, sound legislation and awareness creation.

5.2 Construction and introduction of new fishing units cannot go unchecked any more. All existing boat-building yards shall be registered and construction of any new fishing unit will be after obtaining a license. Standards for fishing vessel construction, especially for those below 20m OAL need to be developed and control would be exercised through new legislation. Provisions would be made to comply with requirement of registration of vessels and Standards of Training, Certifications and Watch keeping of fishing vessel personnel.

5.3 There will be closed season on both the coasts, the duration of which would be decided by a designated authority. Such closed seasons shall be uniform for neighboring states unless the geographic or climatic conditions warrant deviations.

5.4 There would be strict ban on all types of destructive methods of fishing. The designated authority would be competent to declare any method as destructive after it is convinced so based on facts and data pertaining thereto.

5.5 Mesh sizes in different parts of the fishing gear would be regulated. Penalties would be fixed for violations of mesh regulations.

5.6 The designated authority would, if found required doing so, decide the quota for different classes of fishing vessels in any region.

5.7 Catching of juveniles and non- targeted species and discarding less preferred species once they are caught would be strictly prohibited through legislation.

5.8 Posting of observers on commercial fishing vessels and enforcing monitoring control and surveillance system (MCS) would be ensured.

5.9 A resource enhancement programme will be taken up on priority. This would include setting up of multi-species hatcheries for producing seed as required for sea ranching. Designating certain areas as marine sanctuaries and regulating capture of brood stock from these locations would be implemented.

5.10 Open sea cage culture would be promoted to rear or fatten commercially important species of fishes.

5.11 Fish aggregating devices would be promoted as a community based activity.

6.0. FISHERMEN WELFARE

Fishing is the sole livelihood for about 10 lakh fishermen households along the coastline and this policy attaches top priority to ensuring their social security and economic well being.

6.1 A detailed enumeration of the fishermen of the entire country for making available all requisite data on the demographics of this sector would be considered. Each household would be given a card for easy identification and for settlement of claims.

6.2 Cooperative movement of fishermen would be strengthened and extended to areas where it is non-existent. Apex bodies of cooperatives of each state would be up- linked to the national body.

6.3 Uniformity in welfare schemes that are being implemented in different regions would be ensured. Schemes operated parallely by States and Centre would be rationalized.

6.4 Greater participation of cooperatives, NGOs and local self Governments would be sought in implementation of welfare schemes for fishermen, thereby reducing the direct role of Central and State Governments in the process.

6.5 Artisanal fisheries deploying OBMs and small-mechanised boats up to 12m. would be treated at par with agriculture while small scale fisheries involving mechanised boats under 20m OAL would be treated at par with small scale industries. Fishing vessels above 20 m and fishing activity involving mother ships or factory vessels would be treated as industrial activity. The admissibility and extent of concessions for each category would be re-determined accordingly.

6.6 Full time/ occasional fishermen whose household does not own a boat would be treated at par with landless labourer and would qualify for special care and protection.

6.7 Contribution towards Insurance coverage and saving-cum-relief scheme would be restricted to the fishermen who do not own a boat.

6.8 Fishermen Housing Scheme of various descriptions would be unified and implemented as a master plan through a national agency.

6.9 Financing Institutions would be asked to give greater focus to this sector so as to eliminate exploitation of fishermen by middlemen.

6.10 Programmes to improve safety at sea and also to have an early weather warning system in place would be chalked out. The sea safety issue also would be incorporated in to MFRAs for prompt enforcement.

7.0. ENVIRONMENTAL ASPECTS

The effect of environmental factors on the health of living resources needs increased attention in tune with the international awareness on the issue. Health hazards due to consumption of fish harvested from contaminated water is also becoming a matter of great concern in many parts of the world. The agencies responsible for legislation relating to environ mental pollution will be urged to implement them more stringently so that the impact of pollution on fisheries can be minimized.

7.1 Since all wastes-solid, liquid, radioactive or otherwise- find sea as their final destination, fisherman as the main stakeholder of the marine environment has to be sensitized against the land based pollution besides educating him in responsible fishing practices, which would cause the least disturbance to the marine ecosystem including mangroves. Consumers need also to be protected from the deleterious effects of consuming fish contaminated with heavy metals and other hazardous chemicals discharged from industrial establishments. The policy therefore would lay stress on the following aspects:

7.2 In order to minimise impact on coastal waters by industrial effluents, close liaison need to be maintained with Central and State Pollution Control Board for considering suitable legislation for all industrial establishments discharging effluents in to the sea. Such regulations would be made to include Hazard Analysis and Critical Control Points (HACCP) in effluent discharge systems mandatory.

7.3 Coastal area protection by planting mangroves with a view to producing nurseries for shrimp and fish would be introduced as a participatory programme with the active involvement of coastal people, particularly in the fishing community.

7.4 The Coastal Regulation Zone notification would review the present zonation of areas keeping in view the topography of each region and ensure that any human activity in the

high tide limit (HTL) which may cause degradation of the coastal environment would not be permitted.

8.0. INFRASTRUCTURE DEVELOPMENT FOR MARINE FISHERIES.

Development of infrastructure for marine fisheries is of vital importance and should have an integrated approach. The facilities would inter alia include jetties, landing centers, provision for fuel, water, ice, repairs to vessels and gear. The concept of hygienic post harvest handling of fish would also be woven into the project. The policies in this direction would be as follows:

8.1 A master plan for the development of infrastructure for the next ten years would be drawn up.

8.2 Alternatives to the present system of financing of the infrastructure projects by the centre and the state with cost sharing would be tried out. Build-Operate-Own and Build-Operate-Transfer systems through private sector initiative also would be explored.

8.3 Management of most of the facilities already created calls for improvements in terms of internal resource generation, maintenance and upkeep. These issues would be subjected to a detailed study and suitable central legislation would be introduced if found necessary.

9.0. LEGISLATIVE SUPPORT

An enabling legal framework is an essential pre-requisite for proper management and control of fisheries sector. As at present the subject of fisheries is in the state list under article 21 of the Indian Constitution, management and control of coastal fisheries is vested with the maritime states and union territories. At the same time the Union Government carries out management and control of the fishing activities beyond territorial limits in the EEZ.

9.1 Besides reviewing the existing legal frame work for regulating the fishing operations, introduction of additional legal instruments in areas such as operation of Indian flag vessels in the EEZ, introduction of new fishing units, ensuring conservation of resources, limited access fishery, fishery harbour management etc. would be resorted to.

9.2 In view of increase in the incidence of straying by small-mechanised boats into each other's territorial waters and consequent confiscation and arrest of crew, a mutually agreeable system will be brought in place with friendly neighboring countries to have a lasting solution to the problem.

9.3. Endorsing international laws and conventions in the marine fisheries sector and harmonizing the national laws with the international ones wherever necessary with active participation in the regional fisheries management bodies and greater cooperation amongst countries in the region would be given due attention. Participation in the Regional Fisheries Management Bodies (RFM) should be given due consideration for greater co-operation amongst the neighbouring countries in the region.

9.4 Areas such as use of information technology, strengthening of database in marine fisheries, Human Resource Development, eco labeling of marine products, would also be paid needed attention.

10.0 POLICY FOR DEVELOPMENT OF FISHERIES IN THE UNION TERRITORIES OF LAKSHADWEEP AND ANDAMAN & NICOBAR ISLANDS

The waters around these two Island Groups are rich in fish resource, which are currently exploited far below the exploitable limits. Fisheries – capture, post harvest operations

and marketing is still an important means of livelihood for the inhabitants of these islands. Sustainable development of fisheries is therefore considered of paramount importance for achieving the goals of food for all, economic growth and employment generation in these Islands. It is, therefore considered relevant to have the policy initiatives in respect of the two UTs are treated separately in the ensuing.

The two Union Territories are having Exclusive Economic Zone which either partially or wholly is in confluence with internati onal waters. This makes these Island territories vulnerable to IUU Fishing by foreign flag vessels, besides being subjected to the long-term ill effects of unregulated fishing of the straddling and highly migratory species just outside the EEZ. This presupposes adoption of appropriate strategic options.

10.1 UT of Lakshadweep

10.1.1 Of the 36 Islands and a number of sunken banks and open reefs, only ten islands are inhabited. The Islands do not have any rivers or creeks. These coral atolls with a total area of 32 sq. km has a lagoon area of 4200 sq. km and territorial waters of about 20,00 sq. km. The EEZ around of Lakshadweep is about 4 lakhs sq. km. Of a total population of about 60,000, five thousand are directly involved in fishing while another 3000 are indirectly engaged in fisheries related activities for their livelihood. There has been a steady growth of fish production, which once stood at 500 tonnes during 1950 has crossed 10000 tonnes in recent years. However, the present harvest is only about 10-12% of the estimated fishable potential.

10.1.2 The scope for increasing fish production from the UT of Lakshadweep with a view to address the need for employment generation in the Islands necessitate providing the required infrastructure in the Islands for stepping up fishing operations.

10.1.3 Steps would therefore be taken to increase the fishing units upto sustainable level, while taking care to replicate the optimized design with proven success in the Islands territory. An increased supply of fishing units would attract a large number of unemployed youths towards fishing.

10.1.4 An increase in the fishing units would place greater demands on the infrastructure and delicate consumable supply base of the Islands. This would also exert pressure on live bait resources besides impacting on the product marketability both within the Islands and the mainland markets. About 85% of the fish caught currently is made up of skipjack and the yellow fin tuna resource is almost unexploited since the technology for deep long lining is not prevalent in the Islands

10.1.5 Policy for augmenting the fish production from the Islands therefore would include diversification of fishing techniques by popularizing deep water longlining for yellowfin tuna, besides promoting increase in pole and line vessels to the sustainable limits.

10.1.6 Introduction of collector vessels for servicing the augmented long line fleet and development of infrastructure in the strategic uninhabited Islands/reefs for providing service to the fishermen during fishing season would be taken up.

10.1.7 Intensifying the traditional processing techniques of smock/ drying (masmin production) would be supplemented by providing facilities for refrigerated/chilled sea water storage of the catch for transportation to the mainland prior to export. This would also serve the dual purpose of saving firewood, an essential input for producing masmin.

10.1.8 Expansion of the existing canning plant in Minicoy as a joint venture initiative would be considered.

10.1.9 With the changing life style the domestic demand for masmin is also dropping and product diversification and locating export market for improved variants of masmin would be taken up.

10.1.10 Creation of shore-based infrastructure for berthing and landing is constrained by the fragile nature of the coastline, scarcity of electricity, unviable cost of transporting inputs from the mainland and the potential for pollution. However, essentially required infrastructure would be created which carrier vessels and supply vessels would supplement.

10.1.11 New generation fishing boats licensed for fishing in the EEZ would be encouraged to fish in the Lakshadweep waters.

10.1.12 incorporating tagging techniques etc would intensify monitoring of the fishery resource.

10.1.13 Ornamental fish breeding and coastal cage aquaculture would be developed with a community orientation.

10.2 UT of Andaman and Nicobar Islands

10.2.1 In contrast to the Lakshadweep the A&N Island are typically oceanic in nature, volcanic in origin, characterized by low range of hills and valleys. The Islands has a coastline of 1912 km and continental shelf area of 3500 sq km. The EEZ around the Islands measuring about 6 lakhs sq km accounts for 28% of the total EEZ of the country. Out of a total population of 3.56 lakh, about 2500 full time fishermen and 400 part time fishermen are engaged in marine fishing. The present landing of 28000 metric tonnes forms only 11% of the exploitable fishery potential of 2.43 lakh tonnes.

10.2.2 Apart from the large gap between the potential and production, the strength of the Island group lies in its rich marine biodiversity, strategic geographic location, nearness to the southeast Asian markets and entrepreneurship.

10.2.3 Further development of coastal fisheries would be achieved through introduction of improved type of fibreglass craft and improved gear and introduction of intermediate class of fishing vessels.

10.2.4 Offshore fisheries would be developed through introduction of large deep sea fishing vessels.

10.2.5 Infrastructure needs for harvest and post harvest operations would be developed in identified Islands.

10.2.6 Joint venture initiative would be allowed for package proposals consisting of harvest and post harvest operation to be based in the Islands with a view to improving the employment potential.

10.2.7 A major fishing harbour and processing complex would be set up at Campbel Bay to attract investment.

10.2.8 Fishery resources survey will be conducted systematically to continuously monitor the fishery resource and its state of health.

10.2.9 Human resources development in the sector would be given priority to develop skilled manpower needed for meeting the specialised requirement.

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No. 21004/1/2006-Fy(Ind)
Ministry of Agriculture
Department of Animal Husbandry, Dairying & Fisheries
http://dahd.nic.in/Fishpolicy_jv_2006.htm

Krishi Bhawan, New Delhi
Dated the 14th December, 2006.

PUBLIC NOTICE

It is hereby brought to the notice of public that as follow up action of implementation of the Comprehensive Marine Fishing Policy – 2004 and on the recommendations of Empowered Committee on Marine Fisheries, it has been decided to allow operation of Deep Sea Fishing Vessels (20 m. OAL and above) under **JOINT VENTURE** as per the conditions given below.

2. All proposals for acquisition of deep sea fishing vessels (20 m. and above overall length) for operation in Indian Exclusive Economic Zone (EEZ) under **JOINT VENTURE** are required to be submitted as per the under mentioned Guidelines:-

(a) In case of **JOINT VENTURE** with foreign equity collaboration, an Indian company has to produce evidence of at least 51% Indian equity.

(b) The company has to produce evidence of owned / hired shore based processing facility.

(c) The entire catch has to be landed in Indian Port and processed. No Mid – Sea transfer of catch or export of unprocessed catch would be permitted in case of **JOINT VENTURE** project vessels.

(d) Floating processing facility would be considered for operations in A & N Island and Lakshadweep waters.

(e) Only Tuna Long Lining, Squid Jigging, Pole and Line Fishing and Purse Seining would be permitted.

(f) A maximum aggregate tonnage of 400 GRT per company would be permitted.

(g) The total number of **JOINT VENTURE** permissions would be limited to 25% of the notified capacity in terms of number of vessels per category and as reproduced under para – 4 below.

(h) A processing fee @ Rs. 10,000/- per vessel has to be furnished along with the application in the form of Demand Draft payable to Pay & Accounts Officer, Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, New Delhi.

(i) Applicant company should have minimum paid up capital of Rs.10.00 lakhs to apply for up to 2 vessels. In case of additional vessels, the paid up capital should be @ Rs.5.00 lakhs per each additional vessel proposed.

3. The Inter Ministerial Empowered Committee on Marine Fisheries (EC) would consider proposals complete in all respects on merit and vessel wise LOI/ LOP (s) will be

issued for approved proposals. The validity period of LOP will be for one year from the date of its issue and within this period the applicant would be required to acquire the vessel and register it with Indian Mercantile Marine Department (MMD).

4. The optimum number of deep-sea fishing vessels of each category to be permitted in EEZ in next five years is given in following table.

S.No.	***Category***	***Total No.***
1.	Tuna Long Liners	110
2.	Purse Seiners	18
3.	Trap/ Hook & Line vessels	10
4.	Squid Jiggers	15
5.	Pelagic/Mid-water Trawlers	72
6.	Pole & Line	500

5. The operation will be further subject to the general conditions vide the earlier notification dated 17/5/2006 regarding operation of Deep Sea Fishing Vessels in the Indian EEZ.

6. Interested entrepreneurs may address their application to the Joint Secretary (Fisheries), Deptt. of AHD&F, Ministry of Agriculture, Krishi Bhawan, New Delhi.

By Speed Post/Fax

No.30035/15/97-Fy(T-1) Vol.IV
Government of India
Ministry of Agriculture
(Department of Animal Husbandry, Dairying & Fisheries)
.....

Krishi Bhavan, New Delhi
Date: the 03rd March, 2016

OFFICE MEMORANDUM

The undersigned is directed to enclose herewith a copy of the Order of even No. dated 03.03.2016 issued by this Department regarding implementation of a uniform Fishing Ban in the Indian Exclusive Economic Zone (EEZ) beyond territorial waters for conservation and effective management of fishery resources and also for sea safety reasons.

2. The Coastal States and Union Territories are advised to follow the same duration of uniform Fishing Ban within their territorial waters (of 0 to 12 nautical miles) as it is implemented in the EEZ (12 to 200 nautical miles) adjacent to their territorial waters. In case where some State(s)/UT(s) prefers to implement a different Fishing Ban Period in their territorial waters, the State/UT is hereby requested to ensure that fishing boats of that State/UT do not enter the territorial waters of other State(s)/UTs or in the EEZ.

3. The Coast Guard is requested separately to ensure strict implementation of Fishing Ban period in the EEZ and also to prevent entry of fishing boats of one State/UT to another neighbouring State(s)/UT in case different ban periods are implemented among States/UTs in their territorial waters.

4. States who would prefer to have fishing ban of less than 61 days in their territorial waters are advised to reach 61 days ban period in their territorial waters gradually within a period of 04 years for the purpose of ensuring uniformity.

Encl. As above

(**Yoginder Kumar**)
Under Secretary to the Government of India

Distribution to:
The Secretary (Fisheries), All Maritime States/Union Territories as per the list.

List of Secretaries-in-charge of Fisheries of Coastal States and Union Territories

1. Secretary, Government of Kerala, Department of Fisheries, Secretariat, Thiruvananthapuram - 695 001(Fax : 0471-2333115)
2. Special Chief Secretary, Animal Husbandry, Dairy Development & Fisheries Department, Government of Andhra Pradesh, H - Block, Secretariat, Hyderabad - 500 022 (Fax No. 040-3450279).
3. Principal Secretary, Government of Karnataka, Animal Husbandry & Fisheries Department, M.S Building, Room No.401, 4th Floor, III Stage, Bangalore- 560 001 (Fax No. 080- 22253734)
4. Principal Secretary, Government of Orissa, Fisheries & A.R. Department, Bhubaneshwar 751 001 (Fax No. 0674-2390681)
5. Secretary, Government of Tamil Nadu, Animal Husbandry & Fisheries Department, Secretariat, Chennai- 600 009 (Fax No. 044-25672937)
6. Secretary, Department of Agriculture, Cooperation and Fisheries, 7, Sardar Bhawan, 6th Floor, New Sachivalaya Complex, Government of Gujarat, Gandhinagar–382 010 (Fax No. 079- 23252480).
7. Secretary, Government of Maharashtra, Department of Agriculture, Animal Husbandry, Dairy Development & Fisheries, Mantralaya Annexe, Mumbai – 400 030 (Fax No. 022-22026139).
8. Secretary, Fisheries Department Aquaculture, Aquatic Resources and Fishing Harbours, Government of West Bengal, Writer's Building, Kolkata-700 001(Fax No. 033-22141346/22143929)
9. Secretary (Fisheries), Government of Puducherry, Chief Secretariat, Goubert Avenue, Pondicherry-605 001(Fax No. 0413-2334036)
10. Development Commissioner-cum-Secretary (Fisheries), Andaman & Nicobar Administration, Port Blair-744 101 (Fax 03192-232479)
11. Secretary (Fisheries), Government of Goa, Secretariat, Porvorim, Panaji – 403 521(Goa) (Fax No. 0832-2419687)
12. Secretary (Fisheries), Administration of the Union Territory of Lakshadweep, Department of Fisheries, Kavaratti–682 555(Fax No. 04896-263896/262184)
13. Secretary(Fisheries), Union Territories of Daman & Diu, and Dadra & Nagar Haveli, Secretariat, Moti Daman -396 220 (Fax 0260-2230383).

No.30035/15/97-Fy(T-1) Vol.IV
Government of India
Ministry of Agriculture
(Department of Animal Husbandry, Dairying & Fisheries)
.....

Krishi Bhavan, New Delhi
Date: the 03rd March, 2016

ORDER

The President of India is pleased to impose a uniform ban on fishing by all fishing vessels **in the Indian Exclusive Economic Zone (EEZ) beyond territorial waters** on the East Coast including Andaman & Nicobar Islands and West Coast including Lakshdweep Islands as per period mentioned below for conservation and effective management of fishery resources and also for sea safety reasons:

East Coast-from 15th April to 14th June 2016 (both days inclusive) (61days)

West Coast- from 1st June to 31st July 2016 (both days inclusive) (61 days)

The traditional non-motorised units shall be exempted from this uniform fishing ban imposed in the Indian EEZ beyond territorial waters.

This issues with the approval of Competent Authority.

(Yoginder Kumar)
Under Secretary to the Government of India

To,

1. The Secretary (Fisheries), All Maritime States/Union Territories.
2. The Chairman, All Major Port Trust: The ban order may please be served on all the companies operating deep sea fishing vessels from the port.
3. Directorate General of Shipping, 9th Floor Beta Building, i-Think Techno Campus, Kanjurmarg (East), Mumbai - 400 042 with a request to notify all registrars of fishing vessels in the East & West Coasts, A&N Islands, Puducherry & Lakshadweep Islands and Daman & Diu.
4. Director (Operations), Coast Guard Headquarters, National Stadium Complex, New Delhi.
5. Director General, Fishery Survey of India, Botawala Chambers, Sir P.M.Road, Fort, Mumbai / Director NIFPHATT/ CIFNET, Kochi.
6. Director, CMFRI, Post Box No.1603, Ernakulam North PO, Kochi-682 018.
7. President, Association of Indian Fishery Industries, Plot No.60, Pandurangapuram, Vishakhapatnam-3.
8. Deep Sea Fishing Industry Association, E-5, Main Road, Kalkaji New Delhi-110019.
9. Officer-Incharge, NIC DAHD&F, MOA, Krishi Bhavan, New Delhi.

(Yoginder Kumar)
Under Secretary to the Government of India

Annexure IV: GOI Schemes

Annexure IV (a): Marine fisheries and mariculture schemes

Scheme component	Existing funding pattern
Motorization of traditional craft	50% of the unit cost with ceiling of Rs.30 000/ OBM/IBM.
Safety of fishermen at sea	75% of the unit cost (Rs.1.5 lakh) of the safety kit.
Fishermen development rebate on HSD Oil	50% of sales tax relief granted by State/UT with ceiling of Rs. 3/litre with a ceiling of 500 litre/boat/month during fishing.
Conversion of trawlers to resource specific fishing vessels	New
Management of marine fisheries	To bear expenses for conducting awareness programmes. 100% consultancy for implementing CCRF. 100% for capacity evaluation. 100% cost for community outreach programmes on sustainable fisheries. 100% cost for production of audio visuals on overfishing/over capacity.
Enhancement of production through mariculture	New

Annexure IV (b): Development of marine fisheries and mariculture

Components	Proposed unit cost and funding pattern
Motorization of traditional craft	Cap on motorization restriction to 20 000 units with emphasis on States/UTs where the present motorization of traditional crafts is low. The unit cost is fixed at Rs. 70 000 per OBM/IBM with subsidy component of 50% of the unit cost. The existing provision of providing second dose to beneficiary to be discontinued.
Fishermen development rebate on HSD Oil	Subsidy will be provided to all vessels less than 10meter overall length (LoA). 50% subsidy on the Central Excise Duty subject to a maximum of Rs.6/litre to States with a ceiling of 500L/boat/month.
Use of sail in motorized boats	To promote use of sails in motorized boats, one-time 100 % subsidy will be provided. The unit cost may be fixed at Rs. 2500/sail.
Conversion of trawlers to resource specific fishing vessels	The unit cost for conversion is proposed up to Rs. 20 lakh with a subsidy component of 30%. To avail this assistance, the existing trawl unit with the boat should be destroyed. Safety of Fishermen at Sea :Sea safety measures like VHF, Emergency Position Indicating Radio Beacon (EPIRB) and Distress Alert Transmitter (DAT), FRP floats, etc. to be made available to registered mechanized fishing vessels (MFVs). The unit cost for the above items may be limited to Rs. 2.5 lakhs, with a subsidy of 50%. The fishers will have the option to choose the items, if the full package is not required. The unit cost for floatation devices for motorized boats may be Rs.10 000/boat, with 50% subsidy. The assistance towards sea safety may be linked to the Group Insurance for Active Fishermen Scheme for better compliance. This would also ensure the safety of fishers on board MFVs.

Development of Monitoring Control and Surveillance (MCS) system for marine fisheries	The proposed new scheme on Monitoring, Control and Surveillance will inter alia have the following components: · Setting up of an MCS Division in the Department of Animal Husbandry, Dairying & Fisheries (DAHD&F), Ministry of Agriculture; · Setting up of an MCS Division in Department of Fisheries of States/UT Administrations; · Issue of biometric cards to marine fishers; · Development of national fishermen database; · Mandatory registration and licensing of all fishing vessels including artisanal vessels; · Implementation of color coding for all fishing boats; · Fitment of distress alert transmitters, GPS and other safety devices; · Fitment of automatic identification system for tracking and regulating fishing vessels; · Registration and licensing of boat building yards and development of a centralized data base; · Setting up of harbor based MCS Units; · Setting up of fishermen MCS committees at Fishing Harbours (FHs), Fish Landing Centres (FLCs) and fishing villages; · Awareness campaign , outreach and educational programmes and capacity building at all levels; and · Data compilation processing and dissemination. Unit costs are not suggested at this stage as details have to be worked out.
Management of Marine Fisheries	Programmes for management of marine fisheries will include popularization of the Code of Conduct for Responsible Fisheries and implementation of its provisions; outreach programmes on community mobilization for sustainable management of fisheries, including development of community-based fisheries management approaches; production of audio-visual material to aid fisheries management; and capacity development of community. It is suggested to provide 100 % funding support to the activities under this scheme and the units costs may be fixed after assessing the requirements.
Enhancement of production through mariculture	Open sea cage culture: Rs. 6 lakh/cage including input cost with 30% subsidy; 40% subsidy for SC/ST beneficiaries. Establishment of National brood stock bank for marine fin fishes: Rs.15.00 crore/centre for development of brood stock bank and egg production centre is proposed. Full grant to Government Agencies/ Institutions, including Research Institutes. Seed banks: 10 seed banks for marine fin fishes in the maritime States/UTs. Rs. 2.00 crore per seed bank is proposed. Installation of Fish Aggregating Devices (FADS) and Artificial Reefs (ARs): One time grant of Rs. 2.0 crore per State and Rs. 2.0 crore per UT for installing FADs/ARs is proposed. Bivalve culture: Unit cost to be decided by the NFDB. Subsidy component of 30% for general category farmers and 40% for SC/ST beneficiaries is proposed. Seaweed culture: Unit cost to be decided by the NFDB. Subsidy component of 30% for general category farmers and 40% for SC/ST beneficiaries.

Annexure IV (c): Development of infrastructure and post-harvest operations

Components	Proposed unit cost and funding pattern
Construction and expansion of Minor Fishing Harbours (MFH) and Fish Landing Centres (FLCs)	Unit cost of approximately Rs. 50 crore for MFH and Rs. 4 crore for FLC proposed with provision of 75% subsidy to coastal States and 100% for UTs. In case of private sector opting to construct MFH/FLC on BOOT/BOT basis, the cost sharing is proposed on 50:50 basis.
Modernization of Fishing Harbours and FLCs	100% grant to States/UTs @ 10 crore for a MFH and Rs. 1 crore for FLC is proposed.
Strengthening of Post-Harvest Infrastructure Developing fish preservation and storage infrastructure	i) Ice plants @ Rs. 50 lakh for 20 t capacity and Rs. 30 lakh for 10 t capacity is proposed. Subsidy @ of 90% for Government/ Co-operatives and 30% for private entrepreneurs. In case of SC/ST entrepreneurs, the subsidy will be 40 %. ii) Cold storage and processing units of 200 tonne capacity @ 10 crore/unit is proposed. Subsidy component will be as above.
Assistance for maintenance dredging of fishing harbours and fish landing centres.	It is proposed that maintenance dredging of existing MFHs and FLCs be subsidized @ 75% of the cost to coastal States and 100% to UTs. Terms and conditions for assistance to be finalized by the NFDB.

GUJARAT ACT NO. 8 OF 2003.

THE GUJARAT FISHERIES ACT, 2003.

CONTENTS

CHAPTER VII.
MISCELLANEOUS.

The following Act of the Gujarat Legislature, having been assented to by the Governor on the 11th March, 2003 is hereby published for general information.

V.M.KOTHARE,
Secretary to the Government of Gujarat,
Legislative and Parliamentary Affairs Department.

GUJARAT ACT NO.8 OF 2003.

(First published, after having received the assent of the Governor in the "*Gujarat Government Gazette*', on the 12th March, 2003).

AN ACT

to provide 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 coast line of the State and for matters connected therewith or incidental thereto.

It is hereby enacted in the Fifty-fourth Year of the Republic of India as follows:-

CHAPTER I

PRELIMINARY

Short title, extent and commencement.

1. (1) This Act may be called the Gujarat Fisheries Act, 2003.

(2) It extends to the whole of the State of Gujarat, including the territorial waters along the coastline of the State.

(3) It shall come into force on such date as the State Government may, by notification in the Official Gazette, appoint.

Definitions.

2. In this Act, unless the context otherwise requires,-

(a) "Adjudicating Officer" means such fishery officer not below the rank of Deputy Director of Fisheries, as the State Government may appoint for the purpose of section 17;

(b) "biological specimen" means any living or dead organisms;

(c) "Enforcement Officer" means such fishery officer as the State Government may appoint for the purpose of section 15;

(d) "Exotic fish" means all species of fish of any country other than India;

(e) "fish" means any aquatic animal and aquatic vegetation in all stages of their life span;

(f) "Fishery Officer" means an officer appointed by the State Government to be Fishery Officer for the purposes of this Act and includes an officer appointed to exercise the powers and perform functions of the Fishery Officer;

(g) "fishing vessel" means any type of fishing crafts whether or not fitted with mechanical device for propulsion, which is engaged in fishing;

(h) "fishing gear" means any net, cage, trap or other contrivance used for fishing;

(i) "Licensing Officer" means such fishery officer, not below the rank of Superintendent of Fisheries, as the State Government may appoint for the purpose of section 10;

(j) "mariculture" means the culture of fish on the margin of sea in territorial waters;

(k) "Fishing Harbour" means the place such as port, harbour, wharf, pier, dock, jetty and landing place where landing or berthing facilities have been provided for fishing vessels and their adjoining areas set apart for repair yards, fuel and ice supply installations, auction hall, fish processing plant and within such limits as may be specified by the State Government from time to time;

(l) "prescribed" means prescribed by rules made under this Act;

(m) "private water" means water-

(i) which is the exclusive property of any person, or

(ii) in which any person has for the time being an exclusive right of fishing whether as owner, lessee or in any other capacity;

Explanation :- Water shall not cease to be "private water" within the meaning of this definition by reason only that other persons may have by custom a right of fishing therein;

(n) "registered fishing vessel" means a fishing vessel registered under section 12;

(o) "Registration Officer" means such fishery officer as the State Government may appoint for the purpose of section 12;

(p) "specified area" means the area of specified inland water or the territorial water as the State Government may, by notification in the *Official Gazette*, specify;

(q) "specified inland water" means such inland water as the State Government may, by notification in the *Official Gazette*, specify;

(r) "territorial waters" in relations to the State of Gujarat means any part of the open sea adjoining the coast of the State within a distance of twelve nautical miles measured in accordance with sub-

section (2) of section 3 of the Territorial Waters, Continental Shelf-Exclusive Economic Zone and other Maritime Zones Act, 1976.

80 of 1976.

CHAPTER II
PROTECTION OF FISH

Prohibition against destruction of fish by explosive.

3. No person shall use any dynamite or other explosive substance in any water with intent thereby to catch or destroy the fish therein.

Prohibition against destruction of fish by poisoning of water.

4. (1) No person shall put any poison, lime or noxious materials into any water with intent thereby to catch or destroy any fish therein.

(2) The State Government may, by notification in the *Official Gazette*, suspend the operation of sub-section (1) in any specified area and may in the like manner modify or cancel any such notification.

Prohibition against introduction of exotic fish.

5. No person shall introduce any exotic fish in any water with intent thereby to destroy any fish therein.

Power to make rules to protect fish.

6. (1) The State Government may, by notification in the *Official Gazette,* make rules for any water other than private waters for all or any of the following matters, namely:-

(a) Prohibiting or regulating:-

(i) the erection or use of fishing gear,

(ii) the construction of weirs, dam and bunds,

(iii) the release of any industrial waste sewage or effluent to the inland waters which may harmful to species of fish or the food of fish.

(b) regulating the dimension and the kind of nets to be used and the mode of using them;

(c) prohibiting all fishing in the specified waters for a period not exceeding two years;

(d) prohibiting the use of any gun, spear, arrow or the like in any water, with intent thereby to take or destroy any of the fish therein;

(e) prohibiting introduction of any kind of fish which may be harmful to species of fish, without obtaining prior permission;

(f) regulating any fishery in inland waters;

(g) to lease out public water resource for a specified period and to charge fees for such lease;

(h) regulating the standard of sale of fish spawn, fry, fingerling and yearling;

(i) prohibiting the fishing and marketing of the fish during closed season.

Explanation .– For the purpose of this clause, the 'closed season' means such period as the State Government may, by notification in the *Official Gazette*, specify.

(2) In making rules under this section, the State Government may provide for –

(i) the seizure, forfeiture and removal of fishing gear erected or used in contravention of the rules,

(ii) the forfeiture of any fish taken by means of any such fishing gear, and

(iii) the forfeiture of fish taken or sold during the period specified in clause (i) of sub-section (1).

(3) The State Government may, by notification in the *Official Gazette,* apply such rules or any of them to any private water with the consent, in writing, of the owner thereof and of all persons having for the time being any exclusive right of fishery therein.

CHAPTER III
REGULATION OF FISHING IN SPECIFIED AREA

Powers to regulate, restrict or prohibit certain fishing activities within specified area.

7. (1) The State Government may, having regard to the matters referred to in sub-section (2), by notification in the *Official Gazette*, regulate, restrict or prohibit in any specified area,-

(a) the fishing by such class or classes of fishing vessels and for such period as may be specified in the notification;

(b) the catching of such species of fish and for such period as may be specified in the notifiction,

(c) the use of such fishing gears as may be specified in the notification,

(d) the mariculture,

(e) the collection of biological specimen, and

(f) the number of fishing vessels which may be used for fishing.

(2) In issuing a notification under sub-section (1), the State Government shall have regard to the following matters, namely:-

(a) the need to protect the interest of different sections of persons engaged in fishing, particularly of those engaged in fishing

by use of traditional fishing craft such as catamaran, country craft or canoes,

(b) the need to conserve fish and to regulate fishing on scientific basis,

(c) the need to maintain law and order in the sea and on shore, and

(d) any other matter, that may be prescribed.

Prohibition of use of fishing vessels in contravention of notification issued under section 7.

8. No owner or master of a fishing vessel shall use or cause or allow to be used, a fishing vessel for fishing in contravention of the notification issued under section 7:

Provided that nothing in such notification shall be construed as preventing the passage of any fishing vessel from or to the shore through any specified area to or from any area other than specified area, for the purpose of fishing in such other area or for any other purpose:

Provided further that the passing of such fishing vessel through any specified area shall not in any manner cause any damage to any fishing nets or tackles belonging to any person who engages in fishing in the specified area by using any traditional fishing craft such as catamaran, country crafts or canoe.

Prohibition of using fishing vessels which are not licensed.

9. No fishing vessel which is not licensed under section 10 shall, after the date of commencement of this Act (hereinafter referred to as "the said date"), be used for fishing in any specified area:

Provided that nothing in this section shall apply to any fishing vessel existing on the said date for a period of six months from the said date or such longer period as the State Government may, by notification in the *Official Gazette*, specify.

Licensing of fishing vessels.

10. (1) An owner of a fishing vessel may make an application to the Licensing Officer for the grant of a licence for using the fishing vessel for fishing in a specified area and for a specified period.

(2) Every application under sub-section (1) shall be in such form, contain such particulars and accompanied by such fees, as may be prescribed.

(3) The Licensing Officer may, after making such inquiry as he deems fit and having regard to the factors specified in sub-section (4), either grant or refuse to grant to the owner of the fishing vessel, the licence for fishing in the specified area mentioned in the licence:

Provided that no licence shall be granted in respect of a fishing vessel which is not registered under section 12:

Provided further that, no licence shall be refused in respect of a fishing vessel unless the owner of the fishing vessel is given a reasonable opportunity of being heard.

(4) In granting or refusing licence under sub-section (3), the Licensing officer shall have regard to the following factors, namely:-

(a) whether the fishing vessel is a registered fishing vessel,

(b) the condition of the fishing vessel including accessories and fishing gear with which it is fitted,

(c) any notification issued under section 7,

(d) whether the specified period is mentioned in the application, and

(e) any other factors that may be prescribed.

(5) A licence under this section shall be granted in such form, on such terms and conditions and on payment of such fees, as may be prescribed.

(6) A licence granted shall be valid for a period of three years from the date on which it is granted unless it is suspended or cancelled earlier and may be renewed from time to time for a period of three years on payment of such fees as may be prescribed.

Cancellation, suspension and amendment of License.

11. (1) If the Licensing Officer is satisfied either on a reference made to him in this behalf or otherwise, that-

(a) a licence granted under section 10 has been obtained by misrepresentation as to an essential fact, or

(b) the holder of a licence has, without reasonable cause, failed to comply with any of the condition subject to which the licence has been granted or has contravened any of the provisions of this Act or the rules made or any notification issued thereunder,

then without prejudice to any other penalty to which the holder of the licence may be liable under this Act, the Licensing Officer may, after giving the holder of the licence a reasonable opportunity of being heard, suspend or cancel the licence.

(2) Subject to any rules that may be made in this behalf, the Licensing Officer may vary or amend a licence granted under section 10.

12. (1) The owner of every vessel used or intended to be used for the purpose of fishing and kept in the State shall get his vessel registered under this section. **Registration of Vessel.**

(2) (a) Every application for registration of a vessel shall be made by the owner of such vessel to the Registration Officer in such form, containing such particulars and accompanied by such fees as may be prescribed.

(b) the owner of such vessel shall state in the application the port or fisheries harbour from which he intent to operate his vessel.

(3) An application for registration of a vessel under sub-section (2) shall –

(a) in the case of a vessel existing on the date of the commencement of this Act, be made within three months from the said date, and

(b) in the case of any other vessel, be made by the owner thereof within one month from the date he becomes the owner thereof.

(4) The Registration Officer may entertain an application made after the period specified in sub-section (3) if the applicant satisfies the Registration Officer that he had sufficient cause for not making the application within the said period.

(5) (a) The Registration Officer may, after making such inquiry as he deems fit, either grant or refuse to grant to the owner of vessels a certificate of registration.

(b) The certificate of registration be in such form and on such terms and conditions as may be prescribed.

(c) The Registration Officer shall specify in the certificate of registration, the port or fisheries harbour from which the owner of vessel is to operate his vessel.

(d) The particulars of certificate of registration shall be entered in the register to be kept in such form as may be prescribed.

(6) The certificate of registration granted under sub-section (5) shall be valid for a period of five years from the date on which it is issued, unless it is cancelled earlier, and may be renewed from time to time for a period of five years on payment of such fees as may be prescribed.

(7) Every vessel registered under this section shall be assigned a registration mark by the Registration Officer which shall be displayed on the vessel in such manner as may be prescribed.

Permission for operating vessel for the area other than specified in certificate of registration.

13. (1) No owner of a vessel registered under section 12 shall operate his vessel from any port of fishery harbour other than that specified in the certificate of registration issued to him except with the previous permission of the Registration Officer.

(2) (a) An owner of a registered fishing vessel, who intent to operate his vessel from a port or fishery harbour other than the port or fishing harbour specified in the certificate of registration issued to him, may made an application for permission to so operate his vessel, stating in the application the name of the port or fishery harbour from which and the period for which he intent to operate his vessel.

(b) On receipt of an application under clause (a), the Registration Officer may, by an order either grant or refuse to grant the permission.

(c) The Registration Officer may, by an order, terminate the permission granted under clause (b) before the expiry of the period for which it was granted:

Provided that the Registration Officer shall not refuse the permission under clause (b) or terminate permission under clause (c) unless the owner of the registered fishing vessel is given a reasonable opportunity of being heard.

Returns to be furnished by owner of registered fishing vessel.

14. (1) Every owner of a registered fishing vessel shall furnish to the Registration Officer returns of fishing in such forms, for such period, by such dates and in such manner, as may be prescribed.

(2) The Registration Officer may inspect any registered fishing vessel at any time to verify whether the returns furnished under sub-section (1) are correct and complete.

Powers of Enforcement Officer

15. If the Enforcement Officer has reasons to believe that any fishing vessel is being or has been used in contravention of any of the provisions of this Act, or of any rule or order made or any notification issued thereunder or of any condition of the license issued under section 10, then he may –

(i) enter and search such vessel and impound such vessel and seize any fish found in it,

(ii) keep the impounded fishing vessel in such place and in such manner as may be prescribed,

(iii) dispose of the fish so seized and deposit the proceeds there of in such manner as may be prescribed, and

(iv) make a report of the contravention to the Court if the offence is punishable under clause (b), (c), (d) or (e) of sub-section (1) of

section 21 and in other cases, to the Police Officer in charge of a police station.

Finality of orders.

16. Every decision of the Licensing Officer under section 10 for granting or refusing to grant a licence for a fishing vessel or under section 11 for suspending, cancelling, varying or amending such licence and every decision of the Registration Officer under section 12 for registering or cancelling registration or under section 13 for granting or refusing to grant permission or terminating permission shall, subject to any appeal under section 17, be final.

CHAPTER IV
APPEALS AND REVISION

Appeal.

17. (1) Any person aggrieved by the order of:-

(a) the Licensing Officer under section 10 refusing to grant a licence for a fishing vessel or under section 11 suspending, cancelling, varying or amending a licence granted for a fishing vessel, or

(b) the Registering Officer under section 12 refusing to grant the registration of vessel or cancelling the registration of vessel or under section 13 refusing permission to operate vessel at other port or fishing harbour or terminating such permission may, within thirty days from the date on which the order is communicated to him, prefer an appeal to the Adjudicating Officer:

Provided that the Adjudicating Officer may entertain an appeal after the expiry of the period of thirty days, if the appellant satisfies the Adjudicating Officer that he had sufficient cause for not preferring an appeal within such period.

(2) On receipt of an appeal under sub-section (1), the Adjudicating Officer shall after giving the appellant a reasonable opportunity of being heard, pass such order in the appeal as he deems just and proper.

Application of sections 4 and 12 of Limitation Act 1963.

36 of 1963.

18. In computing the period laid down in section 17, the provisions of sections 4 and 12 of the Limitation Act, 1963 shall, so far as may be, apply.

Revision.

19. (1) Subject to rules that may be made in this behalf, the State Government may, of its own motion within two years or on an application by an aggrieved person made to it within one year from the date of an

order passed by an Adjudicating Officer in appeal under section 17, call for and examine the record of any such order and pass such order thereon as it thinks just and proper:

Provided that no record of any proceeding of the Adjudicating Officer shall be called for –

(i) in a case where an appeal lies under section 16 but no appeal has been filed, or

(ii) in a case where appeal has been made under section 17 and such appeal is pending.

(2) No order shall be passed under this section which adversely affects any person unless such person has been given a reasonable opportunity of being heard.

Bar of jurisdiction of civil courts.

20. No civil court shall have jurisdiction to deal with or decide any question which the Fishery Officer, Licensing Officer, the Registration Officer, the Adjudicating Officer or, as the case may be, the State Government is empowered to deal with or decide by or under this Act and no injunction shall be granted by any civil court in respect of any action taken or to be taken in pursuance of any provision of this Act.

CHAPTER V
OFFENCES AND PENALTIES

Offences and penalties.

21. (1)(a) Whoever contravenes the provisions of section 3, 4 or 5 shall, on conviction, be punished with imprisonment for a term which may extend to six months or with fine not exceeding ten thousand rupees or with both.

(b) Whoever use any fishing vessel for fishing in contravention of section 8 shall, on conviction, be punished with fine not exceeding fifty thousand rupees.

(c) Whoever use any fishing vessel which is not licensed for fishing in any specified area in contravention of section 9 shall, on conviction, be punished with fine not exceeding fifty thousand rupees.

(d) Whoever operate his fishing vessel from any port of fishery harbour other than that specified in the certificate of registration in contravention of sub-section (1) of section 13 shall, on conviction, be punished with fine not exceeding twenty thousand rupees.

(e) Any person who commits a breach of any of the provisions of the rules or the order made under this Act shall be punishable with fine which may extend to ten thousand rupees and when breach is

continuing one, with a daily fine not exceeding one hundred rupees during the period of continuance of such breach.

(2) When an offence under any of clauses (a) to (d) of sub-section (1) is a continuing one, the offender shall be punished with a daily fine not exceeding ten thousand rupees during the period of continuance of such offence.

Offences by Companies.

22. (1) Where an offence under this Act has been committed by a company, every person who at time the offence was committed was in-charge of, and was responsible to the company for conduct of the business of the company, as well as the company shall be deemed to be guilty of the offence and shall be liable to proceeded against and punished accordingly:

Provided that nothing contained in this sub-section shall render any such person liable to any punishment provided in this Act if he proves that the offence was committed without his knowledge or that he exercised all due diligence to prevent the commission of such offence.

(2) Notwithstanding anything contained in sub-section (1), where an offence under this section has been committed by a company and it is provided that the offence has been committed with the consent or connivance of, or is attributable to, any neglect on the part of any director, manager, secretary or other officer of the company, such director, manager, secretary or officer shall also be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

Explanation .– For the purpose of this section –

(a)"company" means a body corporate and includes a firm or other association of individuals, and

(b) "director" in relation to a firm means a partner in the firm.

Cognisance of offences.

2 of 1974.

23. (1) Notwithstanding anything contained in the Code of Criminal Procedure, 1973, the offence punishable under clause (a) of sub-section (1) of section 21 or under any rule made under section 6 shall be cognisable.

(2) No court shall take cognisance of any offence punishable under clause (b), (c), (d) or (e) of sub-section (1) of section 21 except on a report in writing made by the Enforcement Officer under section 15.

CHAPTER VI

FISHERIES TERMINAL AUTHORITY

Constitution and composition of Fisheries Terminal Authority.

24. (1) The State Government may, by order, constitute Fisheries Terminal Authority (hereinafter referred to as "the Authority") for such area as may be specified in the order to develop, maintain, manage and administer the fisheries harbour, fish landing jetties including any wharf, pier, dock and other landing place and their adjoining areas set apart by the Authority for repair yards, fuel and ice supply installation, auction hall, fish processing plants, godowns and fish markets.

(2) The Authority shall consist of the following members who shall be appointed by the State Government, namely: -

(i)	Commissioner of Fisheries	Chairman
(ii)	One representative from the Gujarat Maritime Board	Member
(iii)	One representative from Marine Products Export Development Authority	Member
(iv)	One representative from the Gujarat Electricity Board	Member
(v)	One representative from the Gujarat Water Supply and Sewage Board	Member
(vi)	One representative from the Gujarat Fisheries Central Co-operative Association	Member
(vii)	One representative from the National Bank for Agricultural and Rural Development	Member
(viii)	One representative from the National Co-operative Development Corporation	Member
(ix)	One representative from Fish Processors Association	Member
(x)	One representative from Boat Owners Association	Member
(xi)	One representative from Custom Department	Member
(xii)	One representative from Fish Traders	Member
(xiii)	One representative from Lead Bank	Member
(xiv)	One representative from the concerned local Municipality	Member
(xv)	Deputy Director of concerned region	Member-Secretary

Functions of Authority.

25. (1) The Authority shall perform the following functions, namely:-

(a) to develop, regulate and control the fisheries harbour terminals;

(b) to acquire land and purchase of equipment and machinery for fisheries harbour terminals;

(c) to provide safety measures for arrival and departure of the vessels and shore installations within the fisheries harbour terminals;

(d) to arrange quick and hygienic handling and disposal of fish within the fisheries harbour terminals;

(e) to keep the fisheries harbour area clean and free from pollution;

(f) to perform such other functions as may be entrusted by State Government; and

(g) to do such other functions as are necessary for efficient discharge of functions of the Authority.

Amount to be charged for providing services.

26. The Authority may charge such amount as may be fixed by the State Government from time to time, for providing services at the fishing harbour.

CHAPTER VII
MISCELLANEOUS

Exemption.

27. (1) Nothing in this Act shall apply to any vessels belonging to the Central Government or any State Government or Corporation owned or controlled by the Central Government or the State Government which are being used for the purposes of survey and research.

(2) Where the State Government is of the opinion that it is necessary so to do in the public interest, it may by notification in the *Official Gazette*, exempt subject to such conditions, such class or classes of fishing vessels used for fishing in any specified area and for such period as it may specify in the notification, from all or any of the provisions of this Act.

XLV of 1860.

Members officers and employees to be public servants.

28. All officers and employees and the members of the Authority shall, when acting or purporting to act in pursuance of the provisions of this Act or any rule made thereunder, be deemed to be a public servant within the meaning of section 21 of the Indian Penal Code.

Protection of action taken in good faith.

29. No suit, prosecution or other legal proceeding shall lie against any member of the Authority or any Officer or employee of the State Government for anything which is in good faith done or intended to be

done in pursuance of the provisions of this Act, or any rule or order made thereunder.

Power to make rules.

30. (1) The State Government may, by notification in the *Official Gazette,* make rules for carrying out the objects of this Act.

(2) In particular and without prejudice to the generality of the foregoing power, the State Government may make rules for all or any of the following matters, namely:-

(a) the protection of fish under section 6;

(b) the form in which the application for grant of licence for fishing vessel shall be made and the particulars and the fees which shall accompany such application under sub-section (2) of section 10;

(c) the form in which and the terms and conditions on which the licence for fishing vessel may be granted under sub-section (5) of section 10;

(d) the rules subject to which the Licensing Officer may vary or amend the licence under sub-section (2) of section 11;

(e) the form in which the application for registration of vessel shall be made and the particulars and the fees which shall accompany such application under sub-section (2) of section 12;

(f) the form in which and the terms and conditions on which certificate of registration shall be granted and the form in which the register for entering the particulars of such certificate shall be made under sub-section (5) of section 12;

(g) the manner in which the registration mark of vessel shall be displayed by the owner under sub-section (7) of section 12;

(h) the form in which, the period within which, the date by which and the manner in which the owner shall furnish the return under sub-section (1) of section 14;

(i) the place at which and the manner in which the impounded fishing vessel shall be kept by the Enforcement Officer under section 15;

(j) the manner in which the fish so seized shall be disposed of by the Enforcement officer and to deposit the proceeds thereof under section 15;

(k) the rules subject to which the State Government may call for and examine record of order passed by Adjudicating Officer under sub-section (1) of section 19, and

(l) any other matter which is to be or may be prescribed under this Act.

(3) The power to make rules conferred by this section shall be subject to the condition of the rules being made after previous publication:

Provided that if the State Government is satisfied that the circumstances exist which render it necessary to take immediate action, it may dispense with the previous publication of any rule to be made under this section.

(4) All rules made under this section shall be laid for not less than thirty days before the State Legislature as soon as possible after they are made, and shall be subject to rescission by the State Legislature or to such modifications as the Legislature may make during the session in which they are so laid, or the session immediately following.

(5) Any rescission or modification so made by the State Legislature shall be published in the *Official Gazette* and shall thereupon take effect.

Repeal.

4 of 1897.

31. (1) The Indian Fisheries Act, 1897 in its application to the State of Gujarat is hereby repealed.

(2) Notwithstanding repeal of the said Act, anything done or any action taken (including any rule or order made, notification issued or appointment made) by or under the said Act shall, in so far as it is not inconsistent with the provisions of this Act, be deemed to have been made or taken by or under the Act and shall continue in force until superceded by anything done or any action taken under the provisions of this Act.

Annexure VI: Fish Concepts

Fishing Harbours:- a place where fishing boats are tied up

Fishing jetties:-

A platform extending from a shore over water and supported by piles or pillars, used to secure, protect, and provide access toships or boats.

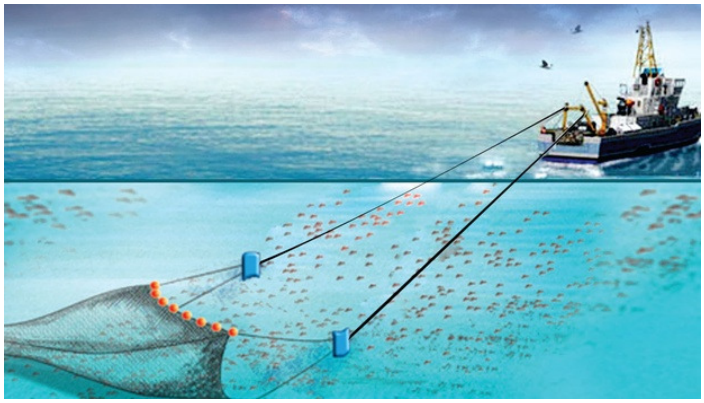
Fish landing centres:- **Fish landing center** is a place where the number or poundage of **fish** unloaded by commercial fishermen or brought to shore by recreational fishermen for personal use.

Trawlers:- **Trawling** is a method of fishing that involves pulling a fishing net through the water behind one or more boats. The net that is used for trawling is called a **trawl**.

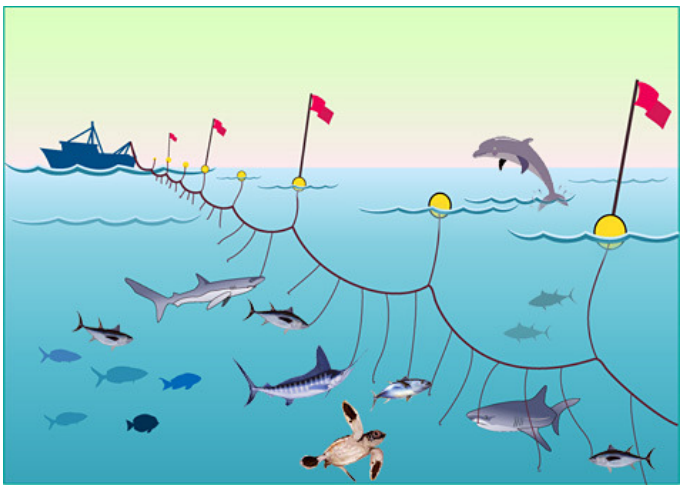
The boats that are used for trawling are called trawlers or draggers. Trawlers vary in size from small open boats with only 30 hpengines to large factory trawlers with over 10,000 hp. Trawling can be carried out by one trawler or by two trawlers fishing cooperatively

Gill netters:- **Gillnetting** is a common fishing method used by commercial and artisanal fishermen of all the oceans and in some freshwater and estuary areas. "Gill nets are vertical panels of netting normally set in a straight line.

Deep sea Trawlers



Long liners for Tuna



Squid Jigging

Traditional fishing crafts

a. **Motorized**

Traditional fishing craft

b. Non-Motorized

Shore seining

Annexure VII: Photographs Data Collection by AERC Staff

Data collection in Fish Retail market at Veraval

Dr. M. Swain discussing with Boat owner at Porbandar Harbour

AERC Staff visit to Fish Processing plant in Porbander


Porbandar Harbour


Data collection from boat owner and fisherman on Mangrol harbour

Data collection from fish retailer in fish retail market of Veraval

Fish storage box in retail market

Data collection from boat owner and fish wholesaler at Veraval Harbour

Dry fish in retail market of Veraval

Data collection from Fish Consumer in Porbandar retail market

Fish wholesale storage

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Comments on draft report

"**Evaluation and Assessment of Economic Losses on Account of Inadequate Post-Harvest Infrastructure Facilities for Fisheries Sector in Gujarat State***"*

Submitted by
Agro-Economic Research Centre
Sardar Patel University, Vallabh Vidyanagar 388 120, Anand, Gujarat

1.	Title of report	" **Evaluation and Assessment of Economic Losses on Account of Inadequate Post-Harvest Infrastructure Facilities for Fisheries Sector in Gujarat State"**
2.	Date of receipt of the Draft report	March 28, 2016
3.	Date of dispatch of the comments	March 31, 2016
4.	Comments on the Objectives of the study	The objectives of the study have been fully addressed with significant additional information
5.	Comments on the methodology	The methodology proposed for collection of primary data and tabulation of results has been followed.
6.	Comments on analysis, organization, presentation etc.	The authors have adhered to the chapter outline and table formats. Report has given useful information about the fishery sector in Gujarat and reasons for post harvest losses. The report is presented in six chapters. All chapters are well written and focused.
7.	References:	The references are cited properly

8. General remarks

- Please refer to chapter II and chapter V. The quote of Devi et al 2012b and 2014 are relevant in the matter of the Government planning for change in managerial approaches/policy approaches affecting the livelihood security of the stakeholders.

- However, the present project aims at addressing the issue of post harvest losses owing to lack of infrastructures. Here the project tries to identify the incidence of losses and suggest remedial measures to fill the infrastructural gap and also suggest policy changes/measures and implementation mode which would greatly benefit the minimization of post-harvest fishery losses. Hence elaborate references to socio-economic indicators in chapter II and V can be avoided.

- Similarly, references to fishery resources which including elaborate discussion of inland fishery resources are considered to be out of context of the project objectives. It is opined that a casual references can be made about the overall fishery resources of the state, to ensure a comprehensive fine tuned report.

- In most of the places (Table 5.18, 19 and 20) under species of fish prawn and shrimp have been shown under different categories. However, these are penaeid mondon and indicus species and hence these can be clubbed together and appropriately mentioned in the table.

- Similarly, it is cuttle fish and not cattle fish. Make appropriate corrections wherever it occurs in the report.

- Due to positive of time, critical chapters namely chapter V and VI have been corrected under **'traction mode'** and mailed separately.

9. Overall view on acceptability of report:

- The report may be accepted after due corrections as mentioned above.

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Action Taken on Comments

All the comments given by the Coordinator on the draft report have been incorporated at the appropriate places in the final report.

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