

Report of the National Workshop on the Code of Conduct for Responsible Fisheries



REPORT OF THE NATIONAL WORKSHOP ON THE CODE OF CONDUCT
FOR RESPONSIBLE FISHERIES

29- 30 September, 2000
Chennai, India

Edited by Yugraj Singh Yadava



BAY OF BENGAL PROGRAMME
Chennai, India
2001

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ABSTRACT

For bibliographic purposes, this document should be cited as Yadava, Y S (ed), Report of the National Workshop on the Code of Conduct for Responsible Fisheries, 29-30 September, 2000, Chennai, India, BOBP Report No. 90. Pages 166.

The Code of Conduct for Responsible Fisheries is one of the most important international instruments devised for wholesale management of the living aquatic resources of our planet. The Code is an outcome of several contemporary global initiatives, which expressed concern about the over-exploitation of important fish stocks, damage to the ecosystems, economic losses, and issues affecting the fish trade.

As a first step toward promoting implementation of the Code of Conduct for Responsible Fisheries in India, a National Workshop for coastal States and Union Territories was organized by the Bay of Bengal Programme (BOBP) in association with the Government of India at Chennai during 29-30 September 2000. The objectives of the Workshop were to fully familiarise government functionaries with the elements of the Code and the technical guidelines that have been prepared by FAO to assist member-countries in implementing the Code.

The National Workshop brought together senior fisheries administrators working with the Union Ministry of Agriculture and the State and Union Territory Governments, scientists and experts from fisheries institutions, and representatives from national and international NGOs. The Workshop, saw an enthusiastic participation by 43 delegates and incidentally, it was the first occasion when senior fisheries administrators from the Union and the coastal States and Union Territories had assembled to discuss the Code and arrive at an implementable plan of action. For many of the participants, the Workshop also marked the first systematic exposure to the Code of Conduct.

The two-day Workshop highlighted several problems concerning implementation of the Code in a large country like India. Keeping in view the strengths and weaknesses of national and state governments, the vastness of the country and the diverse and highly complex demographic and socio-political fabric, the planners and experts concluded that massive efforts would be needed to take the Code to the grassroots level quickly in India. The report contains the Plan of Action and the papers presented at the Workshop by the experts and senior officers representing the coastal States and the Union Territories.

PREFACE

This document contains the report of a “National Workshop on the Code of Conduct for Responsible Fisheries”. The Workshop was held in Chennai, India, between September 29 and 30, 2000 and was organized by FAO’s Bay of Bengal Programme in association with the Government of India.

This report contains the papers presented by the experts at the Workshop including the keynote address and the presentations by various coastal States and Union Territories of India.

The Bay of Bengal Programme is a multi-agency regional fisheries programme which covers seven countries around the Bay of Bengal – Bangladesh, India, Malaysia, Maldives, Indonesia, Sri Lanka and Thailand. The BOBP plays a catalytic and consultative role in developing coastal fisheries management in the Bay of Bengal to help improve the conditions of small-scale fisherfolk in member countries.

The BOBP is sponsored by the Governments of Denmark and Japan. The executing agency is the Food and Agriculture Organization of the United Nations (FAO).

FOREWORD

The Code of Conduct for Responsible Fisheries, which was adopted on October 31, 1995, is five years old now. This landmark international instrument, devised for the management of the world's aquatic resources, is global and is directed at everyone engaged in the conservation, management and development of fisheries. The Code, which is voluntary and standard-setting one, is aimed at establishing principles and standards of behaviour for responsible fishing and fisheries practice after taking into account relevant biological, technological, economic, social, environmental and commercial aspects.

The contribution of fisheries to the countries in the Bay of Bengal region is substantial. Any decline in fisheries would severely impact the food security and national economy of the BOB countries. While governments in the region have recognized the need for better fisheries management and adoption of the Code, action has been lacking. Ignorance and lack of understanding are largely responsible. The constraints include not merely a lack of resources and technical expertise, but also the will and the determination to implement the Code.

The BOBP is proud to have held this Workshop, which was aimed at assessing the progress of the implementation of the Code in the coastal States and Union Territories of India and evolving an acceptable and implementable plan of action. For most of the participants, the Workshop marked the first systematic exposure to the Code of Conduct and it has been successful in meeting its objectives.

This Report is a compendium of the presentations made by the participants in the Workshop and also includes current national statistics on important aspects of fisheries and aquaculture.

BOBP, as a catalyst and facilitator, has been instrumental in sensitizing Governments across the Bay on the needs of adopting appropriate policy measures from time to time. We hope that dissemination of this Report will help in further sensitizing the stakeholders and generating awareness of the increasing responsibility that we all face in improving responsible practices and promoting sustainability in fisheries.

Chennai

Yugraj Singh Yadava
Interim IGO coordinator
Bay of Bengal Programme

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WORKSHOP PROSPECTUS

Background

Awareness of the generally poor state of many of the world's major fisheries, ineffective conservation and management practices, and the need to ensure long-term sustainable development in the fisheries sector led to the adoption of the Code of Conduct for Responsible Fisheries (Code) by the FAO Conference in October 1995.

Although voluntary in nature, the FAO Conference called upon all countries and those involved in fisheries to collaborate in the fulfillment and implementation of the objectives and principles of the Code. India has accepted and agreed to implement the Code.

The resolution of the FAO Conference laid the basis for FAO to promote further and assist in the implementation of the Code. To this extent the Government of India with the support of the BOBP has proposed to organise a national Workshop for participants from both East and West Coastal States and Union Territories, to elicit and facilitate the structural changes required to improve the conservation, management, sustainable development and productive utilization of the marine fisheries resources.

Structure of the Code

The Code of Conduct consists of twelve Articles and two annexes. The last seven Articles lay down the general principles and address six substantive technical areas, including.

- fisheries management
- fishing operations
- aquaculture development
- integration of fisheries into coastal area management
post-harvest practices and trade and
- fisheries research

The Rationale for the Adaptation of the Code

In order to reflect the particular needs and situations of different regions and fisheries, adaptation of the Code may be desirable, to foster greater national implementation of the Code and should therefore be encouraged as far as it is consistent with the objectives and principles of the Code.

Popular participation in adapting the Code to suit national conditions may lead to enhanced acceptance of the Code, because stakeholders are more likely to regard a locally adapted Code as being *home grown* and somewhat their *own*.

A useful starting point to commence the process of national adaptation of the Code is to have a national Workshop. This Workshop is being organised by the BOBP with the support of the Government of India in order to identify national/ state priorities, areas of particular relevance, limitations, constraints and approaches to be adopted for implementation of the Code.

Coastal States and Union Territories adaptation of the Code is *inter alia* likely to yield the following benefits:

- Facilitate national implementation of the Code in which States and Union Territories with similar resources and problems can identify them and look together for solutions,
- A sense of direct participation in the Code process will be fostered, thus facilitating a greater commitment to local and national implementation,
- Identification of specific problems and priorities, including those relating to different fisheries, gear and management practices as well as to fishery enhancement techniques and aquaculture development,

- Identification of additional areas which are not specifically or sufficiently covered in the Code but which are important for the nation,
- Identification of major *local* constraints to the implementation of the Code and of approaches needed to address those constraints and
- Elaboration of and agreement on strategies and technical guidelines to assist with the implementation of the Code at the national level.

Objectives and Purpose of the Workshop

The objective of the National Workshop is to facilitate a greater understanding of the Code among all those concerned with fisheries in the coastal States! Union Territories of India and to foster steps towards the more effective implementation of the Code in the country.

Funding

The Workshop will be funded by the BOBP.

Structure of the Workshop

An Agenda for the Workshop is attached. The emphasis of the Workshop will be on providing essential information concerning the contents and implementation of the Code, review some of the substantive articles of the Code in the light of fisheries needs and requirements in the country, and chalk out a strategy for its implementation.

Location and dates

The Workshop will be held in Chennai during 29-30th September 2000 at Hotel Shelter 19, 20 & 21, Venkatesa Agraharam Street, Mylapore, Chennai, 600 004.

Participation

Senior Level Fisheries Personnel from the Government of India and coastal States and Union Territory Departments of Fisheries will be invited to participate in the Workshop.

Eminent Fisheries Scientists and Experts will participate in the Workshop as resource persons to facilitate discussion and to provide technical advice as required.

Language

The Workshop will be conducted in English.

Administrative Arrangements

Administrative arrangements for the Workshop will be handled by the Coordinator, BOBP. Enquiries concerning administrative arrangements should be addressed to the Coordinator, BOBP.

Report and Output of the Workshop

The report of the Workshop will be published in English. It will outline a strategy for implementation of the Code India. The BOBP will coordinate the production of the Workshop report.

Workshop Team Coordinator and Further Information

The Coordinator of the Workshop will be **Dr Y S Yadava**. Further information concerning the Workshop should be addressed as follows:

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AGENDA

29.9.2000

0830-0900

Registration of Participants

0900-0910

Welcome Address
Secretary
Fisheries and Livestock
Government of Tamil Nadu

Mr M V Chunkath

0910-0920

Background and Purpose of the Workshop
Fisheries Development
Commissioner
Government of India

Mr M K R Nair

0920-0930

Nature, Scope and Objectives of the Code
Coordinator, BOBP

Dr Y S Yadava

0930-0940

Introductory Remarks

Mr Peter Rosenegger
FAO Representative in India &
Bhutan

0940-1000

Key Note Address &
Inauguration of the Workshop

Mr N K Sinha
Secretary
Deptt of Animal Husbandry
& Dairying, Government of India

1000- 1030

Coffee Break

1030-1130

‘Responsible Fisheries: Can it be
achieved with a Code of Conduct?’

Dr John Kurien
CDS, Trivandrum

1130-1230

Overview of Marine Fish Stocks, and
their Management in India
Mumbai

Dr V S Somvanshi
Director General, FSI

1230-1330

Lunch

1330-1530

Presentation by Coastal States/ Union Territories

Gujarat
Maharashtra
Goa
Karnataka
Lakshadweep
Kerala
Tamil Nadu
Podicherry
A&N Island
Andhra Pradesh
Orissa
West Bengal

1530-1600	<i>Coffee Break</i>	
1600-1700	Fisheries Research to Support Management of India's Fisheries: Past, Present and Future	Dr K Gopakumar Deputy Director General ICAR, New Delhi
30.9.2000		
0900-1000	Seafood Quality Assurance and Eco-Labeling	Mr Jose Cyriac Chairman, MPEDA, Cochin
1000-1100	The Code and its Adaptation for Development of Small – Marine Fisheries in India	Mr. Sebastian Mathew Coordinator, ICSF, Chennai
1100-1130	<i>Coffee Break</i>	
1130-1230	Role of FAO in Facilitating the Operationalisation and Implementation of the Code	Dr Kee-Chai CHONG
1230-1330	<i>Lunch Break</i>	
1330-1530	<i>Panel Discussion</i> Mr N K Sinha, Chairman Mr Peter Rosenegger Mr Jose Cyriac Mr M K R Nair Dr Kee-Chai CHONG Dr V S Somvanshi Dr G R M Rao Dr V Sampath Dr M Sakthivel Dr John Kurien Mr Sebastian Mathew Mr G D Chandrapal Dr Y S Yadava	
1530-1600	<i>Coffee Break</i>	
1600-1730	<i>Concluding Session</i> Recommendations Vote of Thanks	 Mr S R Madhu Information Consultant, BOBP

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WORKSHOP SUMMARY

SRMadhu*

(Based on an article in the Bay of Bengal News, Vol.11 No. 18, September 2000)

“It’s in the same category as motherhood and patriotism,” said one delegate before the National Workshop started. “Everyone professes strong support. But when it comes to concrete action, it’s limited, few even attempt it.”

The delegate was talking about the Code of Conduct for Responsible Fisheries, and the occasion was a National Workshop **on the subject, hosted by BOBP** in Chennai from 29 to 30 September, 2000. As many as 43 delegates from the Union and State Governments, various fisheries institutions, NGOs, FAO and BOBP attended the Workshop. Incidentally, it was also the first occasion when the senior-most fisheries administrators from the Union and the coastal States and Union Territories had assembled to discuss the Code and arrive at an implementable plan of action.

For many of them, the Workshop marked the first systematic exposure to the Code of Conduct. “Five years after the Code came into being, there’s a Workshop on the subject. It’s late, but better late than never,” said John Kurien, fisheries activist and Associate Professor at the Centre for Development Studies, Trivandrum.

This summary is a round up of what happened at the Workshop. The full papers are presented in the succeeding chapters.

Mr Mohan Verghese Chankath, Tamil Nadu’s Secretary for Fisheries and Livestock, made a terse and well-worded welcome address. He said that thanks to BOBP, Tamil Nadu had taken early action on the Code by translating it into Tamil and distributing it to fishermen’s co-operative societies and other user groups. He expressed Tamil Nadu’s delight and enthusiasm at the prospect of BOBP emerging as an Inter-Governmental Organisation (IGO).

Mr M K R Nair, Fisheries Development Commissioner to the Government of India, warned of “death clouds” hovering above the seas if practices like overfishing, illegal fishing and dumping of wastes into the sea weren’t curbed. The Code was timely and should be taken seriously by one and all. He said the key factor today is to ensure sustainability and make all the stakeholders active partners in adopting the tenets of responsible fisheries.

Dr Y S Yadava, Interim IGO Co-ordinator, briefly described the nature, scope and objectives of the Code. He also highlighted the activities undertaken during the three phases of the BOBP and the Programme’s achievements during the last 20 years.

FAO Representative in India and Bhutan Mr Peter Rosenegger berated mankind for its thoughtlessness. “We try to outsmart nature, pollute the air, do everything we shouldn’t do,” he said. There were two reasons why such behaviour was obnoxious, “Our life span is at most 100 years, Nature goes on for hundreds of thousands of years. We have no right to make the world unlivable for our children and grandchildren. Second, in nature, when one person commits a crime, it’s others who suffer.” Mr Rosenegger read out a message to the Workshop sent by Dr R B Singh, FAO Assistant Director-General, from the FAO Regional Office for Asia and the Pacific in Bangkok.

Mr N K Sinha, Secretary in the Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India inaugurated the Workshop and delivered a thoughtful keynote address. He pointed out

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thai while demand for fish is growing, production is falling, on account of factors that cry out for a Code of Conduct. He traced the Code's **origin** and described its features. Since the Code is elaborate and complex, it needs to be simplified. It must be translated into local languages, workshops must be held, especially at the grassroots level, to explain the Code's provisions.

Mr Sinha cited some decisions taken by the Government of India recently to implement the Code. Efforts were being made to optimise the fishing fleet size. A move to impose a uniform ban on fishing during monsoon months had been initiated. An expert group had been set up to prepare a comprehensive policy for marine fisheries. A Working Group of experts had been constituted to reassess the 1991 estimates of the potential yield of marine fishery resources. The Ninth Five-Year Plan for the fisheries sector had focused on an integrated approach to sustainable development but management had received inadequate attention. He suggested that adequate funds be earmarked for fisheries management activities in India's Tenth Five-Year Plan

Complimenting the BOBP on its performance and its initiative in organising the Workshop, Mr Sinha said "the fullest and most effective implementation of the Code can only be through a viable partnership between the government, industry and society." He suggested that BOBP in its future role as an IGO should help the member-countries implement the Code.

After a coffee session, delegates reassembled to hear Dr. John Kurien talk about responsible fisheries and pose them the question: "Can it be achieved with a Code of Conduct?" He said that the movement of India away **from** responsible fisheries began with the neglect of the wealth of knowledge and technology that **numerous** traditional small-scale fishing communities possessed. The dominance of the state **in** setting the research agenda, choosing the technology and setting the administrative framework aggravated the problem. It curbed the initiative of the most important fisheries player, the fish worker.

Dr Kurien laid down a set of pre-conditions for responsible fisheries.

Dr V S Somvanshi of the Fishery Survey of India, Mumbai presented a useful and informative overview of marine fish stocks and their management in India. He said that annual marine fish production in India was **about** 2.7 million tonnes. while the maximum sustainable yield of fish stocks in the EEZ was estimated at 3.9 million **tonnes**. He suggested investigations **into** fish stocks and stressed the need for management regimes for various fisheries: Some recommendations: Legislation for coastal fishing craft and deep sea vessels should be compatible. Colour codes should be specified for every category of fishing craft and every fishing zone. Names of the craft and their registration numbers should be in large standard size to facilitate easy identification.

A long session of presentations by various coastal States and Union Territories followed. Representatives **from** **(U)jarat**. Maharashtra, Karnataka, Kerala, Tamil Nadu, Pondicherry, Andaman and Nicobar Islands, Andhra Pradesh, Orissa and West Bengal provided information and insights about their fisheries and their development and management problems. Most of them sought assistance from FAO and the Central Government.

Dr K Gopakumar, Deputy Director-General (Fisheries) in the Indian Council of Agricultural Research, described the role of fisheries research in supporting fisheries management. For example, **in** marine fisheries, R & D organizations had developed fishing vessel designs, standardised quality control of marine products for exports and organised fish inspection. They had undertaken research in mariculture, pearl culture, the setting up of shrimp hatcheries, the utilization of fishing wastes, the application of electronic equipment in fishing. He suggested the creation of a Ministry of Fisheries. Fisheries science should be declared a technical subject like engineering. A standard course and degree syllabus should be set up at the national level.

The State presentations concluded in the morning of the second day of the Workshop. Then followed a lively talk by Mr K Jose Cyriac, Chairman of the Marine Products Export Development Authority (MPEDA) on seafood quality assurance and labelling. Talking about international quality standards for fish and fish products, he outlined the role of the Codex Alimentarius Commission, the ISO 9000 series standards, the

Hazard Analysis Critical Control Point system. He also explained the role of eco-labelling and its role in promoting sustainably managed fisheries. He described MPEDA's work in promoting seafood quality.

Replying to questions, Mr Cyriac said that the Union Government could fund half the cost of turtle exclusion devices to be fitted on to trawlers for conservation of endangered marine turtle species. There were no national guidelines yet on eco-labelling, but it was a matter of time before they were formulated. He described as exaggerated the problems of women in fish processing units. More than 30,000 women from Kerala earned more than Rs 1 200* per month in fish processing units. Isolated and anecdotal issues had been blown up.

Mr Sebastian Mathew of the International Collective in Support of Fish Workers, Chennai made an enlightening presentation on the application of the Code of Conduct to small-scale fisheries. He pleaded for compatible legislative regimes on conservation and management at the national and state levels. He emphasised that it was essential to create a feeling of "ownership" of the Code among all players in fisheries. Only then would they take an active part in promoting the Code. Another important and urgent need was to address the numerous information gaps in fisheries. Better data collection tools were needed.

Dr Kee-Chai CHONG, SEAFDEC Consultant, presented and discussed a checklist of guidelines on operationalising the Code. He emphasised on the need for guidelines based on the Code that met individual country requirements. The guidelines should be practical, specific and legitimate in the eyes of the stakeholders.

The post-lunch session of the second day was devoted to a panel discussion of key points and issues that had emerged from the Workshop. It was chaired by Mr N K Sinha. The session led to a Plan of Action. Sample points: The Code should be simplified, condensed and translated into vernacular languages, it should be popularized through street plays and comic books, fishing capacity should be maintained at optimum levels, there should be a uniform ban on fishing during monsoon months.

The BOBP distributed a set of posters to every participant and a video film showing how a street play was used to popularise the Code in fishing villages around Chennai.

What did the National Workshop achieve? Better understanding. Vigorous interaction. Many new ideas and insights. Some useful recommendations. Most importantly, the Code of Conduct is now much more than a noble concept akin to motherhood and patriotism, it is a practical goal toward which all players in fisheries can constantly move.

PLAN OF ACTION

- The Code of Conduct for Responsible Fisheries (the Code) should be translated into vernacular languages. A simplified and concise version of the Code should be provided to the States/Union Territories on a priority basis for translation into vernacular languages.
- The Code should be popularised through street plays, comic books, audio-visual presentations, etc. The electronic media should be considered for the speedy dissemination of the Code.
- The coastal States and Union Territories should organise workshops/meetings with various user groups for better understanding of the provisions of the Code and its implementation.
- The fishing capacity should be kept at optimum levels, commensurate with sustainability. The practice of multi-agency registration of fishing vessels, prevalent in some States, should also be reconsidered.
- The coastal States and Union Territories should consider formulating a clearer definition of access rights to the territorial waters and harmonise their zonation policy for different categories of fishing vessels.
- There should be a uniform ban on fishing during monsoon months.
- Resource enhancement programmes, such as setting up of artificial reefs and ranching with restricted access, should be undertaken, especially for species under threat or subjected to over-exploitation.
- Every coastal State and Union Territory should consider setting up a Resource Management Wing in the Department of Fisheries
- The coastal States and Union Territories should consider setting up Awareness Centres to popularise the Code and other activities concerning fisheries development, conservation and management.
- The Government of India (the Centre) and the States/ Union Territories should consider laying more emphasis on post-harvest requirements of the fisheries sector, including quality control of fish and fish products for both domestic and export markets.
- The research institutions under the Ministry of Agriculture and the State Agricultural Universities should aim at providing adequate research support to the implementation of the Code.
- The Centre and the States should endeavour to set up a sound information data base to meet the implementation requirements of the Code.
- The States and Union Territories should be provided with special assistance for implementation of the provisions of the Code.
- The Centre and the States should consider laying more emphasis on fisheries development, conservation and management aspects in the future Five Year Plans.
- The *subsidiarity principle*, which takes management to the lowest meaningful level to enhance participation, should be encouraged.
- The Centre should consider introducing model bill(s)/legislation with the active participation of all stakeholder representatives for implementing those provisions of the Code, which are presently not covered by legislation.
- The Centre and the States/ Union Territories should consider instituting reforms in the existing legislation on fisheries to meet the requirements of the Code.

- The Centre should consider bringing all fisheries matters, now divided among various Ministries and Departments under one administrative umbrella.
- To check poaching/illegal fishing in the Bay of Bengal, FAO/BOBP may consider setting up a mechanism to enable the Bay of Bengal countries to interact regularly.
- A regional mechanism for study tours should be encouraged among countries around the Bay of Bengal to learn from one another's experiences in implementing the Code.

**MESSAGE FROM DR R B SINGH, ASSISTANT DIRECTOR GENERAL,
FAO REGIONAL OFFICE FOR ASIA AND THE PACIFIC, BANGKOK**

I'm very happy that the Bay of Bengal Programme is organizing a National Workshop on the Code of Conduct for Responsible Fisheries.

The Code of Conduct for Responsible Fisheries has been correctly described as one of the most important international instruments devised for management of our planet's aquatic resources. It is global and all-encompassing in scope, directed at everyone concerned with the conservation of fishery resources and the management and development of fisheries.

The Code sets out principles and standards of behaviour for responsible practices in fisheries.. It covers not merely the capture of fish and fishing operations, but the processing and trade of fish and fishery products, aquaculture, fisheries research, and integration of fisheries into coastal area management.

The FAO is happy to have brought the Code into existence in 1995. But its purpose can be served only when the Code is understood by all and given effect to by all – governments, international organizations, corporate firms, NGOs, officials, fishers and fishery-related individuals.

A special effort must be made to ensure that officials dealing with fisheries in the government are aware of the content, meaning and implications of the Code. Their ideas, inputs and advice are needed to propagate the Code. The present Workshop is therefore an essential and a very useful exercise.

The Code reflects the spirit, substance and effort of a number of FAO and United Nations initiatives, conventions and conferences. In organising this Workshop, the Bay of Bengal Programme not merely promotes the Code of Conduct, but furthers awareness and action on all these important global initiatives. Wider application of the provisions of the Code will promote sustainable and responsible fisheries and thereby help in achieving the goals of national and global food security.

I wish the Workshop and its organisers and all its delegates two days of constructive discussion and a lifetime of useful follow-up!

KEY-NOTE ADDRESS

N K Sinha*

Justice G Ramanujam, Chairman Aquaculture Authority, Shri Mohan Verghese Chankath, Secretary, Fisheries & Animal Husbandry, Government of Tamil Nadu, Secretaries and Commissioners of Fisheries from the coastal States and Union Territories, distinguished experts and resource persons, Dr Yadava, IGO Coordinator, Bay of Bengal Programme, Ladies and Gentlemen,

It is a great privilege to be invited here by the Bay of Bengal Programme of the Food and Agriculture Organization of the United Nations as the Keynote Speaker for the National Workshop on the Code of Conduct for Responsible Fisheries.



This Workshop is being organised at the most opportune time. Fisheries is facing a crisis all round the world and India is no exception. On one hand there is a growing demand for fish and fish products due to many reasons, on the other hand the fishers are having difficulty in meeting the demand because of depleting catches despite increasing efforts.

Over decades, maritime nations have pumped billions of dollars into expanding fishing fleets, subsidising everything from fuel costs to the construction of factory vessels. The open access nature of the fishery in a large part of the world, including India, has allowed unregulated entry. All these have led to extra fishing pressure, reducing fish stocks in many parts of the world to levels much below their sustainable yield.

Overfishing isn't man's only destructive act against nature. We have been continuously adding billions of tonnes of toxic substances into the sea. Habitat damage, industrial pollution, non-degradable effluents and wastes— all these have taken a heavy toll. About 97% of earth's living space is ocean. In other words, the sea is man's life-support system. But man's actions are fast destroying his own life-support system.

If we look at the world fin and shell fish production, there is a steady increase in production from 67 million tonnes (mt) in 1970 to 103.5 mt in 1990. The latest statistics for 1997 reveals that the world production from both capture and aquaculture reached the peak of 131 mt. During the period 1990 to 1997, a growth rate of 7.4% per year was achieved. However, the increase of about 27mt during this period was largely due to aquaculture and capture fisheries showed undisputable signs of plateauing. This has been true for both inland and marine capture fisheries.

In India the trend is no different. The total fish production increased from 1.76 mt in 1970-71 to 3.84 mt in 1990-91 and to 5.26 mt in 1998-99. During the period 1990-91 to 1998-99, an average growth rate of little over 4.0% was achieved. In the marine sector the production increased from 1.09 mt in 1970-71 to 2.3 mt in 1990-91 and reached a peak of 2.97 mt in 1996-97. Thereafter, it came down to 2.95 mt in 1997-98 and 2.7 mt in 1998-99. During the period 1990-91 to 1998-99, an average annual growth rate of 1.93% was recorded in the marine sector.

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Keeping in mind the annual marine harvestable potential of 3.9 mt, about 3/4th of the potential is being harvested, leaving a balance of about 1/4th. Since the present effort is largely restricted to the near-shore waters, it may be correct to say that further increments in marine fish production can only be achieved from the deep sea. As most coastal resources are being fished to their maximum sustainable limits, and optimisation of catches from deep sea still being a distant reality, we need to concentrate our efforts on the coastal resources and ensure that their sustainability is maintained.

The Code of Conduct for Responsible Fisheries or simply the Code, as it is popularly known, defines in the General principles that “The right to fish carries with it the obligation to do so in a responsible manner.” It sets out principles and standards of behaviour for such practices and aims at effective conservation, management and development of living aquatic resources. The Code covers not merely capture of fish and fishing operations, but the processing and trade of fish and fishery products, aquaculture, fisheries research, and the integration of fisheries into coastal area management.

The Code is global in scope. It is directed toward members and non-members of FAO, fishing entities, organizations of all kinds, fishers, people engaged in the processing and marketing of fish and fishery products - in short everyone concerned with conservation of fishery resources and management and development of fisheries.

The Code is an outcome of several contemporary global initiatives, wherein concern was expressed about the over-exploitation of important stocks, damage to ecosystems, economic losses, and issues affecting the fish trade. All these threatened the sustainability of fisheries. The 19th Session of the FAO Committee on Fisheries, held in March 1991, recommended that FAO should develop the concept of responsible fisheries and elaborate a Code of Conduct toward this end.

Subsequently the Government of Mexico, in collaboration with the FAO, convened a Conference on Responsible Fishing in Cancun in 1992. A declaration was passed at this Conference which developed the concept of responsible fisheries. The Cancun declaration was subsequently critically assessed, strengthened, refined, elaborated and fine-tuned at a number of conferences by various groups, and the Code of Conduct for Responsible Fisheries finally came into being on 31 October 1995 at the 28th session of the FAO Conference in Rome.

The Code reflects and includes major articles and provisions from a number of global UN conventions and agreements such as:

The UN Convention on the Law of the Sea, of 10 December 1982

- The 1992 Declaration of Cancun
- The 1992 Rio Declaration on Environment and Development
- Agenda 21 adopted by the UN Conference on Environment and Development, in particular Chapter 17 of Agenda 21.

The Code contains 12 articles plus two annexes. The resolution as contained in Annex 2 of the Code calls on everyone concerned with fisheries to collaborate in implementation of the Code; urges that the special requirements of developing countries be taken into account in implementing the Code; requests the FAO to advise developing countries in this respect; calls upon the FAO to monitor and report on the implementation of the Code; urges the FAO to strengthen Regional Fisheries Bodies to deal more effectively with fisheries conservation and management issues.

The Code calls on all members and non-members of FAO and everyone concerned with the conservation, management and utilization of fisheries resources to collaborate in implementing the Code's objectives and principles. It says that FAO will monitor the application and implementation of the Code. It calls upon all States and Organizations, government or non-government, to co-operate actively with the FAO in this work. The Code also notes the special needs of developing countries and urges financial and technical assistance, technology transfer, training and scientific co-operation to address these needs. The ability of developing countries to develop their own fisheries should be enhanced. Their access to high-seas fisheries should be improved.

On fisheries management the Code urges conservation and management measures based on the best scientific evidence available. Coastal states should co-operate in the management of transboundary, straddling or highly migratory fish stocks. Mechanisms should be set up for fishing monitoring, surveillance, control and enforcement. Excess fishing capacity should be prevented: fishing effort should be commensurate with sustainability. The precautionary approach should be a guiding principle for fishery management: the absence of scientific information should not be reason for inaction on conservation and management measures. States should regulate fishing in such a way as to avoid the risk of conflict among fishers. States should take measures to minimize waste, discards, catch by lost or abandoned gear, catch of non-target species. The Code also suggests integration of fisheries into coastal area management. It urges an institutional framework, policy measures and regional co-operation to facilitate sustainable use of coastal resources.

The Code has extensively dealt with post-harvest practices and trade. It upholds the right of consumers to safe, wholesome and unadulterated fish and fishery products. Minimum standards should be set up for quality assurance and international trade in fish and fishery products should not compromise the sustainable development of fisheries and the responsible utilization of living aquatic resources. The Code urges States to liberalize trade in fish and fishery products and eliminate barriers to trade such as duties, quotas and non-tariff barriers. Laws and procedures applicable to international trade in fish and fishery products should be transparent, simple, comprehensible, and where possible based on scientific evidence,

The Code is one of the most important international instruments devised for wholesale management of the living aquatic resources of our planet. The effort that has gone into the Code is perhaps its main strength. It is all-inclusive and all-encompassing. It belongs to all of humanity. It is an indispensable source of reference on good conduct in fisheries.

The main weakness of the Code springs partly from its strength. The Code is elaborate and complex. Its language is dry and legal. It doesn't make for easy reading or comprehension.

To be meaningful, the Code must be not merely understood by all but implemented by all. The Code has to be translated into local languages. It needs to be simplified for various groups, particularly fishermen. Workshops and consultations are necessary, particularly at the grassroots level, to explain and discuss the provisions of the Code. The present National Workshop is one step in this direction,

As regards implementation of the Code, let me share with you that the Government of India has taken some landmark decisions in the recent past to implement the Code of Conduct for Responsible Fisheries. To oversee implementation of the Code and other issues related with it, a National Level Committee has been set up under my chairmanship in the Ministry of Agriculture.

As we all are aware, the marine fisheries, more so the coastal fisheries in India has largely been an open-access fishery. Consequently no catch limits have been set on effort or the catch. To optimise the fishing fleet size, a National-Level Review Committee was constituted to study the size of the present marine fishing fleet in India *vis-a-vis* the harvestable, potential and give recommendations on the effort that need to be deployed. The Committee has concluded, after discussion with experts and with coastal States, that the mechanized fishing fleet, in the size range of 8 - 15 m OAL, has attained optimum strength. But 700 new-generation resource-specific vessels, about 18m OAL, including trawlers and gillnetters-cum-longliners, could be added to the fleet to tap resources in the exclusive economic zone beyond the 50 m depth zone.

Presently, there are about 200 000 traditional craft in the country, of which about 35 000 are motorised. It is believed that this figure could be increased to 50 000. Motorization will ease the drudgery of traditional fishermen and enable them to go further out, reducing pressure on near-shore waters.

On the issue of resource conservation, a move to impose uniform ban on fishing during monsoon months has been initiated. This ban will help reduce fishing pressure and stimulate rejuvenation of fish stocks. Most of the west coast States and Andhra Pradesh on the east coast have been enforcing ban on fishing during the monsoon period, although during different periods. I would urge all the coastal States to take early decision on the uniformity of the ban after taking into account the best scientific evidence available with us.

The Government of India has set up an Expert Group to prepare a Comprehensive Policy for the Marine Fisheries. The draft policy document is under finalisation and I believe the document has taken into account the requirements of the State towards implementation of the Code. Further, we have also constituted a Working Group of Experts to reassess the 1991 estimates of the potential yield of marine fishery resources, estimate the additional harvestable yield, and make suggestions about conservation of fishery stocks. The report of this Working Group is likely to be made available soon.

As regards popularisation of the Code and making it available in regional languages, the Tamil Nadu Fisheries Department with BOBP support has already translated the Code into Tamil. Street plays to popularise the Code have been organised in fishing villages. A video film has been made. More such initiatives are needed to make the Code a living instrument, a Code of action, rather than another document to be preserved in the library and shelved.

We believe these are major steps towards implementation of the Code, but more needs to be done. I urge the delegates present here, who together represent a formidable array of expertise on marine fisheries, to study the issue and come up with ideas and suggestions. Let this National Workshop move fisheries development and management forward on sound lines, in accordance with the principles of the Code of Conduct for Responsible Fisheries.

Ladies and Gentlemen,

The Ninth Plan for the Fisheries Sector has focused on an integrated approach to sustainable development and aims to optimise production and productivity, augment export of marine products, generate employment, improve socio-economic conditions of the fishermen and fish farmers, conserve aquatic resources and genetic diversity and increase per capita availability and consumption of fish. This focus shows that so far there has been emphasis on development, in other words more and more exploitation of the resources. However, the management which is often perceived as a response to development has not received the desired attention and most of us have been lagging in this aspect. The Code provides an excellent opportunity to integrate management with development. In this context, it would not be out of place to suggest that we incorporate suitable provisions in the Tenth Plan, preparations for which may begin soon, to earmark separate funds for activities relating to management of fisheries,

Fisheries management deals with multiple user groups, and sustaining a fishery resource requires the active participation of all user groups joining hands, agreeing on fisheries management plans and finally implementing and enforcing them. The concept of people's participation in natural resources management is being voiced and increasingly recognized in international fora. It is highly essential that management agencies, research and industry should be explicitly and directly associated in development of the resources,

The importance of local-level community management was the focus of BOBP in its Third Phase activities and has done good work on community-based fisheries management and participatory approach to fisheries management. I would suggest that the coastal States and Union Territories use the already tried models on community-based fisheries management and participatory approach to fisheries management in implementing the Code. The BOBP in its new role as an Inter-Governmental Organization should also take up major programmes on meeting the requirements of the member-countries towards implementation of the Code.

Largely arising out of global initiatives, there is now also a pronounced trend towards adoption of preventive approaches to management of renewable resources and such approaches are being increasingly used for fisheries. The wide adoption of such approaches will bring in the desired changes in the state of affairs in marine living resources conservation and could also offer opportunities to improve fisheries management and ensure sustainable fisheries development. However, care must be exercised to avoid indiscriminate application and ensure that any change does not lead to social or economic chaos.

In conclusion, I would like to reiterate that fisheries is vital to our economy as it provides food, creates jobs and generates foreign exchange. With fisheries under threat everywhere, so is economic well-being. We must change our behaviour so that fisheries has a tomorrow, so that future generations aren't deprived of

fish. Collective action is critical for survival. Hence the need for implementation of the Code of Conduct for Fisheries Responsible in true letter and spirit.

The National Workshop is an important step forward in our efforts to sustainably and equitably manage our fisheries resources. The renewable fishery resources, if properly managed, can produce long-term sustainable yields and thus support continuous economic activities and employment.

As we progress, the fullest and most effective implementation of the Code can only be through a viable partnership between the government, industry and the civil society.

I would once again like to thank **BOBP** for inviting me and I wish the Workshop a great success. I sincerely hope that the Workshop deliberations lead to a fruitful outcome, especially with regard to an action plan for implementation of the Code.

With this, I officially inaugurate the National Workshop on the Code of Conduct for Responsible Fisheries.

Thank you.

BACKGROUND AND PURPOSE OF THE NATIONAL WORKSHOP

MKRNair*

Mr Justice Ramanujam, Shri N K Sinha, Secretary to Government of India, Shri Mohan Chundath, Secretary of Tamil Nadu, Dr Y S Yadava IGO Coordinator, Ladies & Gentlemen.

I feel privileged to be here this morning when the galaxy of scientists, technocrats and policy makers are initiating a debate on the implementation of the Code of Conduct for Responsible Fisheries.

The earlier conviction that living resource being replenishable are inexhaustible is no more true. Any human activity can offset the sustainability of the resource if not carried out with a sense of responsibility. Human greed has inflicted serious dents on the nature, many of which are irreparable and irreversible.

In the fisheries sector we have seen decline in catch and disappearance of certain species in our coastal waters. Biological data also shows a drop in sizes of many commercial varieties of fish.

The common belief that the oceans could be a veritable dumping ground seems to have been accepted by the fishermen who make their living from these very oceans. He not only reacts to any action which pollutes his seas, but also contributes to the polluting activity through discards of his own abandoned fishing gear, debris and other non-biodegradable wastes.

In the absence of a concept of management and control, construction of new fishing vessels is rampant, fishing power in existing units is going up and catching efficiency of the gear is on the rise. We can boast of having unacceptable small mesh sizes in our fishing gear and a record for catching juveniles and non-targeted species. The compounded effect of all these is that the fishing operation is becoming uneconomic, and the fisherman who is slowly losing his lifeline is sighing at the barren sea.

As this phenomenon has manifested in many regions, the international community having concern about the future of fisheries have started actively debating on the issue in the hope of finding a lasting solution. The product of such a series of international consultations by FAO since 1992, which originated with Cancun declaration is the Code of Conduct for Responsible Fisheries. As the genesis and features of the Code would be elaborated in the presentations that are to follow, I only wish to state that the Code is right here for us to translate into action.

Looking at our preparedness for implementing the Code, we have adequate legal frame work on the EEZ, on the fishing regulations for each of our maritime States and also a Maritime Zones of India Act to regulate Fishing by Foreign Vessels. Legislation for regulating fishing by Indian owned deep sea fishing vessels is under preparation. A Committee appointed for drafting a comprehensive marine fisheries policy for the nation has almost completed its job. The work of the Committee for re-validation of marine fish resources is progressing. A report on the effect of fishing on endangered species of marine turtles has been received by the Government and its recommendations are being looked into. The Committee appointed to assess the



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requirements of fishing vessels of various classes as well as another Committee to assess the patrol boat requirements for implementation have also submitted their reports to **the Government. Action** is also through for introducing a Vessel Monitoring System in our marine waters.

In the international arena we are signatories to the UNCLOS. Currently we are examining the United Nations Agreement on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement) and the Agreement to Promote Compliance with International Conservation and management Measures by the Fishing vessels on the High seas (FAO Compliance Agreement). International consultations are also through on illegal, unregulated and unreported fishing. We are also examining the issues involved with the implementation of the - International Plan of Action for the Management of Fishing Capacity: for the Conservation and Management of Sharks and for reducing Incidental Catch of Sea Birds in Longline Fisheries

In the aquaculture front we are baffled with unauthorised introduction of exotic species and illicit cross border irade of brood stock and seed. A National Committee to deal with and regulate introduction of exotic species set up in the Ministry of Agriculture has cleared certain species for introduction on a case to case basis and orders banning culturing certain undesirable ones have also been issued.

Amidst all these happenings dense clouds are marring the hopes of a better tomorrow and the fisherman is sitting oblivious of the implications.

The key factor is ensuring sustainability of the entire fisheries activity, of which the Code of Conduct is all about. I would therefore urge that the deliberations be focussed on drawing up of an action plan to create increased awareness among the stakeholders, especially the fisherfolk.

Lades and Gentlemen, I conclude with this.. I thank the organizers for giving me this opportunity and also thank all of you for your patient hearing.

NATURE, SCOPE AND OBJECTIVES OF THE CODE OF CONDUCT FOR RESPONSIBLE FISHERIES

Yugraj Singh Yadava*

Introduction

Noting the significant developments in world fisheries during the seventies and eighties and the visible impact of uncontrolled exploitation and development of fisheries, especially in the marine sector, the FAO recommended the formulation of a global Code of Conduct for Responsible Fisheries (hereafter the Code). The Code, which was unanimously adopted on 31



October 1995 by the FAO Conference, provides a necessary framework for national and international efforts to ensure sustainable exploitation of aquatic living resources in harmony with the environment'. Presently, the Code is one of the most important international instrument devised for wholesale management of the living aquatic resources of our planet.

Nature and Scope of the Code

The Code sets out principles and international standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and bio-diversity. The Code recognizes the nutritional, economic, social, environmental and cultural importance of fisheries and the interests of all those concerned with the fishery sector. The Code takes into account the biological characteristics of the resources and their environment and the interests of consumers and other users.

The FAO Code is voluntary and in a non-mandatory manner, establish principles and standards applicable to the conservation, management and development of all fisheries. Many relevant regulations, principles and requirements under International Law, Agreements and Conventions are referred to in the Code. While some of them are restricted to fisheries objectives, others have wider objectives including maritime affairs.

The Code is global in scope, and is directed toward members and non-members of FAO, fishing entities, sub-regional, regional and global organizations whether governmental or non-governmental, and all persons concerned with the conservation and fishery resources and management and development of fisheries such as fishers, those engaged in processing and marketing of fish and fishery products and other users of the aquatic environment in relation to fisheries. The Code is presented under the following twelve articles and two annexes:

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*FAO. Code of Conduct for Responsible Fisheries. Rome, FAO. 1995. 41 p.

- Article 1 : Nature and Scope of the Code
- Article 2 : Objectives of the code
- Article 3 : Relationship with other International Instruments
- Article 4 : Implementation, Monitoring and Updating
- Article 5 : Special Requirements of Developing Countries
- Article 6 : General Principles
- Article 7 : Fisheries management
- Article 8 : Fishing Operations
- Article 9 : Aquaculture Development
- Article 10: Integration of Fisheries into Coastal Area Management
- Article 11: Post-Harvest Practices with Trade
- Article 12: Fisheries research
- Annex 1: Background to the Origin and Elaboration of the code
- Annex 2: Resolution

The Code is a guiding principle on how sustainable fisheries can be achieved at national, regional and international levels in all aspects of fisheries and aquaculture. To support implementation of the Code at national and local level, FAO has developed nine technical guidelines in collaboration with member-countries and various organizations on the following subjects:

- Fishing Operations
- Suppl.1 Fishing operations – Vessel Monitoring System
- 2. Precautionary Approach to Capture Fisheries and Species Introductions
- 3. Integration of Fisheries into Coastal Area Management
- 4. Fisheries management
- 5. Aquaculture Development
- 6. Inland fisheries
- 7. Responsible Fish Utilization
- 8. Indicators for Sustainable Development of Marine Capture Fisheries

Objectives of the Code

The objectives of the Code are as follows:

- Establish principles, in accordance with the relevant rules of international law, for responsible fishing and fisheries activities, taking into account all their relevant biological, technological, economic, social, environmental and commercial aspects;
- Establish principles and criteria for the elaboration and implementation of national policies for responsible conservation of fisheries resources and fisheries management and development;
- Serve as instrument of reference to help States to establish or to improve the legal and institutional framework required for exercise of responsible fisheries and in the formulation and implementation of appropriate measures;
- Provide guidance which may be used where appropriate in the formulation and implementation of international agreements and other legal instruments both binding and voluntary;

- Facilitate and promote technical, financial and other cooperation in conservation of fisheries resources and fisheries management and development;
 - Promote the contribution of fisheries to food security and food quality, giving priority to the nutritional needs of local communities;
 - Promote protection of living aquatic resources and their environments and coastal areas;
- Promote the trade of fish and fishery products in conformity with relevant international rules and avoid the use of measures that constitute hidden barriers to such trade;
- Promote research on fisheries as well as on associated ecosystems and relevant environmental factors; and
 - Provide standards of conduct for all persons involved in the fisheries sector.

Conclusion

Sustainable development continues to be a positive goal in all fisheries and aquaculture activities, and its achievement, is dependent on improved management. A greater understanding of the issues that confront the fisheries sector and wider application of the Code would be a major key to achieving successful fisheries management and food security in the years to come.

“RESPONSIBLE FISHERIES: CAN IT BE ACHIEVED WITH A CODE OF CONDUCT?”

John Kurien*

Introduction

When the era of freedom of the seas was about to end in the late 1980s, the FAO's annual publication called *The State of Food and Agriculture* made the following proclamation:

“The opportunity exists, as never before, for the rational exploitation of marine fisheries. Realization of the opportunity, however, will require major adjustments to the redistribution of benefits from the seas’ wealth and improvements in the competence of the coastal states to exercise their newly acquired authority. The 1980s provide the threshold for a new era in the enjoyment of the oceans’ wealth in fisheries.”



Twelve years later in 1992, the FAO made a review of the changes that had taken place in the decade following the above 1980 statement and the signing of the UNCLOS III in 1982. In this review, the optimism of the 1980s was replaced by careful introspection, recognising fully that progress on all counts was slow. The Declaration of Cancun in 1992 best expressed the reality by stating:

“[May] the next ten years be declared the decade of responsible fishing, so that by the turn of the century, the rich opportunities afforded by fishery resources will begin to be realised.”

We have now reached this watershed. The two decades before the arrival of this new millennium saw a tide of international conventions, agreements and codes rising in the disturbed sea of global fisheries. These international instruments were negotiated with a distinct hope that the opportunities for the enjoyment of the wealth from the oceans and seas would expand to ensure the greater good of society as a whole.

At this juncture two questions arise. Have we achieved a state of responsible fishing at the international, national or local levels? If not, is it due to the lack of conventions, agreements and codes?

As a social scientist, and also as an activist being involved in fisheries from the village to the global levels, my own answer to both these questions is a firm NO. There certainly have been many honest attempts at all levels to move towards responsible fishing. But we have a long way to reach our goal. However, lack of guidance in the form of conventions, agreements and codes is the least important of the reasons for not achieving our goals. Our non-performance is *despite* the availability of both legally binding and voluntary guides for action.

To talk about these issues of non-performance in the global context would be too general. Examining them at the local levels is too complex. Reflections at a national and sub-national level would be the most appropriate. The question before us today therefore is the following:

Why have we in India not been able to achieve “responsible fisheries” despite decades of our stated attempts to do so? Other than codes, conventions and agreements, what else is needed to achieve it?

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To answer these questions, it may be useful to first define what we mean by “responsible” fisheries. The Collins Westminster dictionary defines “responsible” with three words:

Accountable – being able to explain one’s actions

Rational – being sane, equitable and fair

Trustworthy – being reliable and accurate

Achieving responsible fisheries is therefore an ART! Why have we not been able to achieve this ART of responsible fisheries? This warrants a brief and selective review of the evolution of our fishery history and its present status.

Phases of Fishery History in India¹

A brief review of the history and the present status of Indian fisheries will show that our concrete actions in the sector have been far from being accountable, rational and trustworthy. My focus here is on the marine sector, however I do not think the inferences drawn are significantly different in regard to inland fisheries or aquaculture.

I try to identify three phases in the movement from the “initial” state of the fishery sector to its present “less than responsible” state of affairs. It is from this juncture that we wish to move towards responsible fisheries. I try to show the prime contradictions that arose in each phase and finally suggest some measures we may adopt to resolve them. Let us face it, fishery was never the hot favourite subject of the development planners in our country. It still is not, But what we need to remind ourselves is that the future need not be so.

The First Phase

Pandit Jawaharlal Nehru, when he constituted the National Planning Committee (NPC) prior to independence wished that the problems and prospects of all the sectors of the economy be closely examined and suggestions for a strategy for development be made. Given Nehru’s broad modernist and socialist leanings, the role of modern technology and an important role for the state are a salient feature of all NPC recommendations. Consequently in 1945-46 a sub-committee did look into fisheries and along these broad lines they provided two perspectives that marked a turning point in the direction taken by the sector in the post-independence phase. The first perspective was the condemnation of the status of the existing industry expressed in the following manner by the General Secretary of the NPC:

though the fishery resources have been exploited from time immemorial, they lack scientific utilisation and development. Certainly, in the case of coastal and still more, as regards deep-sea fishing, the occupation is large/v of a primitive character, carried on by ignorant, unorganised and ill-equipped fishermen. Their techniques are rudimentary, the tackle elementary, the capital equipment slight and inefficient. (Shah, 1948:118)

The second perspective was the plan for the development of the industry that was a three-pronged state-led modernisation strategy. It was composed of (i) institutionalisation of the knowledge of fishery related activities (ii) introduction of technologies being used in the developed maritime countries and (iii) creation of a fishery bureaucracy.

It is interesting to note that there were contrary opinions to these perspectives even at that time. The NPC Sub-Committee on Fisheries report contains the dissent note of one of its members Dr C C John. He was an eminent fishery scientist and fishery development adviser to the State of Travancore and Government of Ceylon. Dr John was known for his pragmatic approach to introducing change in the fishing industry in Travancore. He stated his differences thus:

¹ All the statements made in this review can be substantiated with references and/or data.

"Though I fully agree that technological and biological researches are essential for providing technical and scientific advice to the fishing industry, I feel that the most fundamental need is the development of the industry itself on the basis of sound commercial principles with a view to eliminate waste, increase production and ensure proper distribution, without overlooking the interests of those engaged in the industry and their urgent problems. (emphasis ours)" (C C John in Shah, 1948:137)

Dr. John was of the opinion that we should learn from the experiences of the 1880 to 1940 period which proved that the Departments of Fisheries in the Provinces and some States

fell far short of the expectations and so they were, by degrees, relegated to positions of minor importance or allowed to exist under sufferance evoking little or no public interest. There is no doubt that India has spent so far a few crores of rupees on the upkeep and maintenance of fisheries departments and the publications of reports and scientific papers which none but the experts themselves understand... Recently when India found herself suddenly faced with the serious problem of food shortage... the fisheries departments were hapless: not a fish more could they catch from the sea or even distribute the available quantities to the best advantage" (ibid. 138).

With regard to imposition of new technologies such as the sporadic attempts to introduce the trawling techniques practiced in the North Atlantic regions, Dr. John was of the opinion that,

"these experiments were not based on scientific data and were doomed to failure and proved nothing more than the futility and absolute wastefulness of blind imitation of foreign methods on the random suggestions of foreign experts who had no knowledge of Indian fisheries. (ibid: 138).

Dr. John was of the opinion that the yardstick of success and responsibility for an industrial department like fisheries was,

'not merely the number of new fishes which they have christened or the number and bulk of reports produced but by the extent of their usefulness to the industry in terms of new ideas or suggestions calculated to promote efficiency and expand scope and possibilities. - (ibid. 138)

In my understanding this was the starting point of our movement away from "responsible" fisheries. That momentous decision to totally ignore what was the backbone of the fishing activity in the country and replace it with a new state-sponsored scientific, technological and bureaucratic framework was hardly an accountable, rational or trustworthy action. We are still paying for this today.

First, I would argue, the neglect of the rich diversity of knowledge, technology, knowledge and institutions (rules and norms) which were the hallmark of our numerous traditional, small-scale fishing communities scattered around the coastline of the country, are at the root of their continued low economic position even today. Fishing communities continue to be the socio-economic "outliers" of society in most maritime States. This includes Kerala, a State which has been heralded world over for the success of its overall social development (See Kurien. 2000a for details). If fishing communities in the maritime States are destitute and hellingeren today, the root cause is to be found in the historic blunder of moving to build a "modern fishery" without basing it on the strengths of what existed in the "traditional fishery" of that time,

Secondly, the dominant role given to the state for setting the research agenda, deciding on the choice of technology and setting out the administration framework for dissemination of the same had a negative side to it. It curbed most of the avenues for initiative from the actors in the sector and the rudimentary industry below. One important result of this, which has been rarely highlighted, is the *de facto* change in the institutional ownership arrangement vis-a-vis the fishing communities and the fishery resources that they had harvested from time immemorial. Most fishing communities had a clear conception of their "community rights and duties" with regard to the resource. None of this was of course in the form of any title deeds or written claims. The mere fact that for centuries, the others in society who did not relate to the fishery resources, stood by the fishing communities implicit ownership stakes, was sufficient proof of the latter's property right claims.

The state **rode** roughshod over these historical rights. What was once a mosaic of community property rights was first promulgated as state property. Thereafter it was relegated to become a realm of “open access” In open access there are no property rights – only *possession* rights. Anyone can have access to the resource as a matter of right. Today’s overfishing problem and the excess capacity problems, even in the small-scale fishery, have their roots in this transition. In hindsight, this was certainly an action of the state that fostered and promoted irresponsible fishing.

The Second Phase

The next stage in the movement away from responsible fishing came with the larger national economic crisis of the early 1960s. This can be traced back to two important happenings in Kerala State in the 1950s. The first pertains to the export of frozen shrimp to USA by a private entrepreneur and the second was the successful introduction of small trawlers by the Indo-Norwegian Project. These two initiatives in tandem highlighted that the fisheries sector was a great source of quick foreign exchange earnings. It brought the marine fishery, hitherto a State subject, into sharp focus at the level of the Central Government. The forced devaluation of the rupee in 1966 was another watershed in the policy directions taken for the fisheries sector. The great push for exports resulted in the larger allocation of plan funds for fisheries as well as the promotion of private initiatives into adopting bottom trawling for shrimp and freezing them for exports to the US and Japan. This period saw a big rush of “outside capital” into the hitherto “caste occupation” of fishing. With the huge amounts of money that could be made, it suddenly became socially respectable to say that you were in the fish export business! (See Kurien, 1985 for details)

Equally important in this phase was the direct entry of the state into the fish economy in a big way. The central government took on the onus of making the huge infrastructure investments in the form of major harbours and landing centres. Many State governments set up wholly owned fishery corporations to get involved directly in fishing, export processing and ancillary activities.. Fisheries development in India, and particularly in the southern maritime States, became synonymous with the “pink gold rush.” The state and unbridled market forces were very much in control. The fishworkers and the fishing community were largely out or remained at the periphery.

This phase, which lasted until the end of the Sixth Five-Year Plan in 1985, was also the period when the fishery sector in most of the southern States (Goa, Karnataka, Kerala, Tamilnadu and Andhra Pradesh) experienced sharp internal social conflicts. The external manifestations of this took the form of battles at sea between fishermen on trawlers and those operating artisanal fishing crafts. It became a case of one sea and many contenders (Bavinck, forthcoming). The visible consequences were stark contrasts. On the one hand the amassing of wealth by a few (the recent entrants into fishing, particularly those who only made capital investments) and on the other, the impoverishment of those who have been traditionally in fishing for centuries mainly as a source of mere livelihood. This was also the period when the social and political mobilisation of the fishworkers was most widespread. The formation at the national level of the independent National Fishworkers’ Forum and several State-level political party affiliated fishworker trade unions were also a salient feature of this phase.

The marine shrimp harvest in the country increased from 70000 tonnes in the period 1966-70 and stagnated at around 113 000 tonnes in 1981-85. The shrimp exports during the same period rose from 15000 tonnes and stagnated at around 53 000 tonnes respectively. Earnings from shrimp exports, due to the steady increase in the international prices of shrimp, rose from Rs 176 million* in 1966-70 (accounting for 51 percent of the total value of all marine products exported) to Rs 3003 million in 1981-85 (accounting for 86 percent of the total value of all marine products exported). In Kerala State, which accounted for over two-thirds of this value of export, the evidence is unequivocal that the plight of the fishworkers who laboured to produce and process the shrimp in fact deteriorated during this period (See Kurien, 1992). Yet the wealth generated by the sector was quite phenomenal.

* US \$ = 46.50 Indian Rupees

Another major realm of contention during this phase was over the appropriateness of the bottom trawling nets used to harvest shrimp in a tropical fishery ecosystem. There was evidence to show that the composition of the shrimp catch over the years, particularly in Kerala State, moved towards the smaller, less market-valued species (George, 1988). Consequently, though quantity exported may have increased, one major question still remains unscrutinised. If the catch composition of the mid-1980s (species—mix harvested using bottom trawls on a perennial basis) remained the same as that which we had in the early 1970s (species-mix harvested using passive gear on a seasonal basis) would India have earned more foreign exchange at lower capital and recurring costs? An examination of the data of Kerala and the whole of the southwest coast provide a positive answer to this question. Surely this is not an accountable action or sound economics!

In this period fisheries development could by no means be equated to fishworkers' development. Also fisheries development did not yield the optimum economic benefits. These were by no stretch of imagination rational consequences.

The Third Phase

The period after 1985, until the end of the century, can be considered as the third phase in the movement towards increasingly ART-less fishing. This phase is also co-terminus with the post-liberalisation of the Indian economy, which began gradually in the early 1980s and speeded up in the early 1990s. Three major new features can be identified during this phase.

- Firstly, following a liberalised import regime, there was the marked increase in the motorisation of artisanal fishing crafts by using outboard and inboard motors. This was combined with the successful introduction of small beach-landing boats made of new materials like marine plywood and fiberglass. This was a widespread phenomenon along the whole coastline of the country. Some maritime States encouraged this trend more than others.
- Secondly, under external and internal pressure, the central government permitted many new joint venture agreements for fishing in the Indian EEZ outside the 12 nautical mile territorial waters.
- Thirdly, there was the thrust to encourage industrial shrimp aquaculture in the coastal areas presumably to compensate for the stagnation in the marine shrimp harvest (mentioned above).

The most significant feature of this phase was a withdrawal of the state from making new financial commitments to the sector. Also, many regulatory regimes that once provided a frame of reference to the direction of development in the sector were grossly diluted in the name of national economic liberalisation and commitment to the global community. The focus of this period was for a greater role of the market that was actively aided, directly and indirectly, by this withdrawal of the state and its agencies.

There was a very unfortunate dimension to this *laissez-faire* (non-interference) approach by the state. In all the three features mentioned above, this withdrawal resulted in anarchy of sorts. It resulted in the free play for all and sundry. Unfortunately, the playing field was not level and there was no referee for the game.

- The motorisation and new craft designs of the artisanal, small-scale fishworkers led to severe overcapitalisation and excessive use of fossil-fuel energy. We are spending more and more to catch less and less fish per unit of effort. Kerala provided the classic example. (See Kurien, 2000b)
- The joint venture initiatives led to many unwise collaborations and would have resulted in a virtual sell-out of our fishery resources were it not for the united opposition to this policy from all the existing sub-sectors in the fish economy. This forced the government to retreat. Most of the foreign investors seem to have developed cold feet in the murky waters. (See Kurien, 1995)
- The export-led aquaculture “boom” was also short-lived. A combination of disease (caused by reciprocal externalities of the aquaculture units themselves) and protest from civil society to the uni-directional negative externalities of the activity, hastened its “bust.” (See Kurien, 1999)

In all the above we see the failure of both the market and the state—particularly when the two are totally divorced from each other. The state totally abdicated its role as a regulator and coordinator of economic

activity and was thus unable to ensure the larger interest of the society. The mindless encouragement of the logic of the market for short-run gains also alienated the fishery-related activities from the moorings of the larger community ethos in which it could have been situated.

Some Pre-conditions for Responsible Fisheries

The brief narrative of the three phases of fisheries development in India, leads me to conclude that if the Code of Conduct for Responsible Fisheries (CCRF) is to become an effective instrument in guiding Indian fisheries into an accountable, rational and trustworthy future, certain pre-conditions must be met. I shall enumerate below what I consider to be three of the most basic among them. I believe that they serve as the foundational building blocks for sustainable fisheries development and management into the future.

First, a clear definition of the nature of property rights to the resource should be spelt out. Who should be given access rights to the sea? Should these rights be assigned based on both socio-economic and techno-spatial criteria?

Secondly, the quantum of harvest of the fishery resource and the technology used for it should match the given bio-ecological realities of our aquatic terrain. Should our focus be on seasonal targeting of specific species or merely maximising the total volume of output? Can we blend time-tested craft and gear designs with new fabrication materials to obtain a proper mix of value and volume of output from the sea?

Thirdly, the role of community, market and state in the fisheries sector must be clearly delineated. Only such mutual interactions will develop trust between actors in the different realms. Should this be left to evolve with time or can institutional arrangements be crafted by a conscious exercise of the actors concerned?

In a way, these three pre-conditions reflect the important primary contradictions that surfaced during the three phases of fisheries history that were enumerated above. My contention is that Indian fisheries moved from one phase to the next without resolving these contradictions. Consequently, the problems have compounded themselves. As we enter the new millenium in Indian fisheries., we are confronted with a situation where we need to take steps to fulfill these pre-conditions *contemporaneous/v* if we are to move into a phase where accountability, rationality and trustworthiness are the key organising principles of the fishery. Codes and conventions become effective guidelines only if the above pre-conditions – which are largely socio-political in nature – can be met.

Moving Towards Responsible Fisheries

The first step to moving towards responsible fisheries is to incorporate recognition of these pre-conditions as part of an explicit government fishery policy. On this score, one hopes that the Government of India's recently constituted Expert Committee for the Formulation of Fishery Policy will take account of these issues and reflect upon them carefully.

The role of the state is paramount in giving *direction* to the steps that the sector will take and NOT in deciding the *pace* at which it will move. The latter will require the participation of all the stakeholders in the fishery. it is essentially a collaborative initiative that has to be undertaken by all those involved in the fishery sector. The CCRF attains its special relevance in this context. Unlike other international instruments it is addressed to all:

Members and non-members of FAO, fishing entities, sub—regional, regional and global organisation, whether governmental or non—governmental, and all persons concerned with the conservation of fishery resources and management and development offisheries, such as fishers, those engaged in processing and marketing qffish and tishcrv products and other users of the aquatic environment in relation to fisheries. (Article 1.2 CCRF)

To my mind the CCRF can become the rallying point around which we can get every category of stakeholder involved in fisheries to discuss both the pre-conditions for responsible fisheries as well as the direction and the pace at which we should move forward.

In our country the special emphasis, which must be given to the small-scale fishery, is adequately addressed in the CCRF. It is probably worth mentioning that many of the references to small-scale fishworkers in the CCRF are the direct result of the lobbying of an international non-governmental organisation.

The first step for ensuring this all-round participation will be to initiate a process to ensure that awareness about the CCRF spreads concurrently at all levels: politicians, policy makers, bureaucrats, scientists, entrepreneurs, fishworkers and others such as environmentalists with demonstrated interests in fisheries. To achieve this there has to be a conscious and committed process of making all stakeholders aware of the CCRF and its contents. A concerted Plan of Action that makes it possible to create awareness *simultaneously* from above and below must be initiated. It is gratifying that the FAO/BOBP is setting a good example in this direction. The main focus should be the maritime states. The Departments of Fisheries should initiate measures to translate the CCRF into their respective State language. This has been done in Tamil Nadu with the assistance of the BOBP. In Maharashtra, the National Fishworkers Forum translated a lengthy annotated summary of the CCRF into Marathi. Simplified and illustrated versions providing the essence of the CCRF should be distributed at the coastal panchayat level. Fishery Department Extension Services in all the maritime States should mobilise a variety of communication aids to get the message of the CCRF across in the fishing villages.

Agencies like the Marine Products Export Development Agency (MPEDA) have a major role to play. The MPEDA is the only agency with a legally mandated role for management (though technically only for the offshore and deep-sea) and the funds to finance such initiatives. [See MPEDA Act 1972 Section 9 (2a) and 17 (1 f)] Taking advantage of this hitherto largely unused provisions of the MPEDA Act, the MPEDA should take the initiative to ensure that all fishing vessels, aquaculture units and exporting firms registered with it are made aware of the implications of the CCRF and in particular the articles (such as Articles 7, 8, 9, 10 and II) relevant to their activities. Technical and financial assistance should be offered in making the necessary changes in their operations to meet with the requirement of the CCRF.

At the level of national governance of fisheries, there is need for much greater inter-State collaboration. This is particularly crucial if we are to move towards a sustainable management of our marine resources. It was recently suggested at a multi-stakeholder workshop in Gujarat that fisheries should move to the concurrent list in our Constitutional schedules (Mathew, 2000). Even if this may take time, it is paramount that we have more inter-State fishery coordination councils to deal with issues of resource sharing, harvesting and marketing. Issues pertaining to inter-State movement of fishworkers in the harvesting and processing sectors also merit greater collaboration by state fishery and labour departments. To facilitate such collaborative action in the future, agencies like the BOBP, in collaboration with the Government of India, should organise common training programmes for the State fishery department officials.

At the fishing village level a far greater role needs to be played by the panchayat raj institutions. The initiatives of the Government of Kerala in this regard are worthy of emulation by other States (Government of Kerala, 1997). A far-reaching legal measure on this account would be for maritime States (within the purview of existing Central/State legislation) to give coastal panchayats effective control over the landward coastal regulation zone and the seaward littoral regulation zone (Nandakumar & Kurien, 2000).

The formulation of an Indian Code for Responsible and Safe Fishing, Aquaculture and Exports (ICORSAFE) should be given priority. It should be a combined effort of the Government of India, the State governments, the MPEDA, the various boat owners associations, fishermen trade unions, shrimp-farmers and seafood exporters associations and the representatives of the workers in these units. This effort should have the backing of the numerous research organisations involved in fisheries in our country. Such an initiative will go a long way to create consumer confidence in Indian marine export products. This is a measure long overdue if we are to increase our share of the world market. This can also be a first step towards evolving a national eco-label on our terms rather than have standards dictated to us by First World multinationals and environmentalists (See Kurien 2000c).

The transition process to responsible fisheries is unlikely to be smooth and painless. There has been a mistaken **notion** that responsible fisheries can be achieved if we merely adjust the rates of harvest to the rates of resource rejuvenation. In other words it is a mere technological fix. What we need to constantly bear in

mind is that the transition is fundamentally a socio-political one. There will be winners and losers and therefore resistance to this change. Consequently, any transitional plans intended to meet any of the pre-conditions and measures mentioned above need to be handled with care and caution. A recently constituted independent global commission on fisheries resources (WHAT, 2000) examines this issue at the global level. Much of what is said in that report is applicable to the national level as well.

Conclusion

The millenium ahead calls for some radical changes in the manner in which we have been doing things so far in our fishery sector. This calls for a fresh commitment on the part of all the stakeholders in the sector. Over the decades we have overloaded our boat with a variety of cargo. Added to this, we have also often placed the cargo aboard in haphazard manner making our craft unstable and unsafe. The priority is to shed a lot of the dead weight, take on some new cargo and reorganise the lot on the deck in balanced fashion. Then we can reset the rudder to take a new course towards accountable, rational and trustworthy fisheries development and management with the codes and conventions as our navigational aids.

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OVERVIEW OF MARINE FISH STOCKS AND THEIR MANAGEMENT IN INDIA

V S Somvanshi*

Introduction

India has consistently conducted exploratory surveys for improving its knowledge and scientific data base on the marine fish stocks in the Indian Exclusive Economic Zone (EEZ). These efforts have culminated in estimation of the maximum sustainable yield of the fish stocks in the EEZ as 3.92 million tonnes per annum (Sudarsan et al., 1990).

The efforts put in by the fishermen, entrepreneurs and institutions dealing with fisheries research and development and export promotion and financing have largely contributed to the present annual fish production level of 2.7 million tonnes (MOA, 1996).

However, the effort expended in the coastal fishery in recent years has not been able to keep up the annual growth rate in fish production as compared to the previous two decades. This is largely ascribed to the situation where the fishers need to adopt modern fishing aids and technologies to extend their effort to deeper and distant waters and access partially fished and virgin fish stocks that are in abundance there. This paper examines the need for establishing various management regimes to ensure sustainable production from the marine resources and suggests actions to achieve the objectives of the Code of Conduct for Responsible Fisheries (CCRF).



Present Scenario of Marine Fisheries : A Retrospect

Marine fisheries progress in India is ascribed to the post-independence implementation of programmes under the Five-Year Development Plans. Under these programmes, major thrust was on achieving the objectives of increasing fish production, boosting export of seafood products and ameliorating socio-economic status of fishermen community. The schemes envisaged during the planned development period triggered the use of synthetic and modern fishing gear, motorisation and mechanization of fishing craft, electronic gadgets (fish finders, radars, etc., especially on board the large shrimpers), addition of modern fishing fleet, introduction of new technologies and innovations to the traditional fishing craft and gear. Consequently, the traditional fisheries have improved their capacity to fish and have also extended their operational zone considerably. The principal organised traditional fisheries in the coastal and offshore waters are those targeted on the stocks of the Bombay duck (*Harpodon nehereus*) along the northwest coast, oil sardine (*Sardinella longiceps*) and mackerel (*Rastrelliger kanagurta*) along the southwest coast of India, and the skipjack tuna (*Katsuwonus pelamis*) around the Lakshadweep group of islands. The modern fisheries in India are synonymous with trawl fisheries targeting on coastal shrimp stocks.

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These traditional and modern fisheries together with the other artisanal fishing activities mainly contribute to the current annual fish production of 2.7 million tonnes per annum. In view of the progress achieved so far in each of these fisheries, it is essential to review the present status and health of the fish stocks so as to harvest them within their sustainable levels. In some of commercial fisheries, the trends in landings have been showing fluctuations of wider nature, which point towards symptoms of over-fishing. The present status of these stocks vis-à-vis results of the investigations carried out by the research institutions and strategies for their management are presented below,

Thnnbav duck fishery

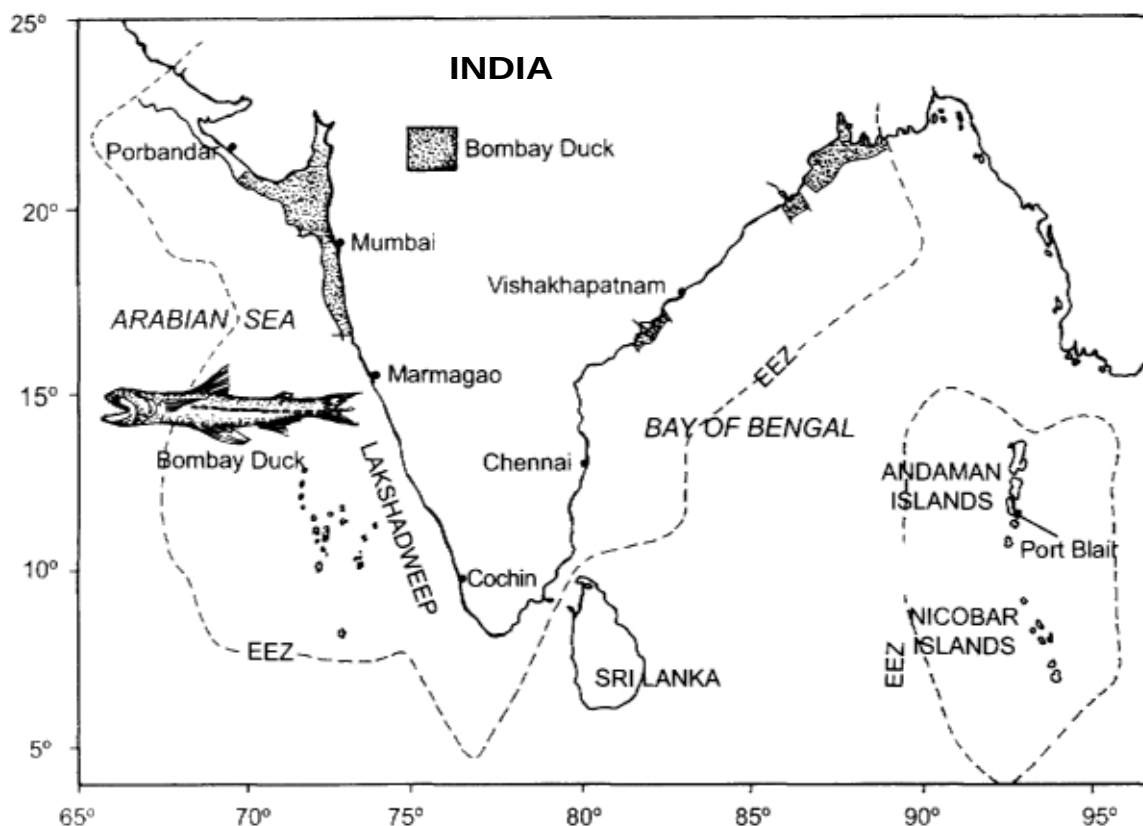
The Bombay duck, *Harpodon nehereus*, is known to have discontinuous distribution, relating to salinity and temperature preferences, along Maharashtra and Gujarat coasts on the west and Andhra Pradesh, Orissa and West Bengal coasts on the east (Fig. 1). However, the Maharashtra and Gujarat States are the main contributors of the Bombay duck production, together harvesting over 86% of the all India Bombay duck landings

(‘000 t)

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	Average
Landings	135	142	166	171	1627	138	88	92	104	134

During the period 1989 to 1997 the annual landings of the Bombay duck fluctuated between 88 000 and 1 77 000 tonnes as against the potential yield of 1 32 000 tonnes estimated earlier. They are caught in ‘dol nets’, which are essentially hag nets of conical shape. The fishing season starts in September and lasts up to May with a peak fishing activity during October–January. The fishery operates up to 70m depth along the coast.

Fig.1 Distribution of Bombay duck and operational zone of their fishery



Although 'dol nct' fishing is directed to catch the Bombay duck, often non—penaeid shrimps (*Acetes indicus*, *Hyppolysinata ensirostris*, *Palaemon styliferus* and *Palaemon tenuispus*) and pomfrets (*Pampus argenteus* and *Porastromateus niger*) form significant portion of the catches. Since the non—penaeid shrimps fetch better price, the cod-end mesh size is reduced to less than 2 cm., which is feared to be one of the reasons for fluctuations in annual landings of Bombay duck.

Investigations

- Bombay duck resources characteristics study
- Experimental 'dol net' operations to know escapement of juveniles.

Results and Management Strategies

- The Bombay duck is a prolific breeder and spawns almost throughout the year
- The reduction at certain centres could not be generalized throughout the area of operation of fishery and the distributional range of the species.
- If 'dol nets' having cod-end mesh size of larger than 2 cm mesh size are used, more number of Bombay duck juveniles will escape. But the catch of non—penaeid shrimps will be reduced.

Scientists have opined that the fluctuations are within the natural fluctuation limits in view of (i) the prolific breeding habit and continuous recruitment to the fishery, and (ii) since there is no fishing for the Bombay duck for 3 months in a year, i.e. June-August, other management measures except mesh size increase are suggested for regulating the fishery.

Kurran (1989) has ruled out chances of biological and economical overfishing for the Bombay duck stock off the Maharashtra coast. However, in view of the increasing number of conflicts between the fishermen from adjoining maritime states in recent years and differential average sizes of the fish landed at various centres, it is suggested that necessary management mechanism be established so as to ensure sustainability of the stocks.

Oil sardine fishery

The oil sardine fishery is supported by a single species, *Sardinella longiceps*. Annual production of oil sardine during the period 1989—1997 varied from 57 000 to 273 000 tonnes.

('000t)

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	Average
Landings	273	267	180	189	192	102	57	110	224	177

The fishing for oil sardine is carried out along the west coast of India extending from Quilon in the south to Ratnagiri in the north (Fig.2). Main fishing gear until the mid—seventies were shore seines, boat seines and a variety of traditional gear such as gill nets and rampani.

Through the Integrated Fisheries Project, Cochin and Fishery Survey of India (FSI) attempted exploratory fishing by purse seine in sixties, commercial purse seining for oil sardine and mackerel commenced during late seventies only. Introduction of purse seines extended the area of operation of the fishery to the offshore. The oil sardine fishery commences after the south-west monsoon i.e. September and extends up to March-April. During the 1990's introduction of ring nets created turmoil in the fishery. The competitive fishing gear and cyclic fluctuations in the stock abundance (Madhupratap et al., 1994) have brought in a host of uncertainties such as unsustainable fishing operations, etc.

Investigations

- Exploratory surveys by purse seining
- Resource assessment and monitoring

Management Strategies

- To work out alternate management options with various combinations of fishing gear competing with each other.
- Establish management regimes for each of the gear.
- State Governments to regulate fishing by purse seiners and ring seiners.
- Inter-maritime state management committee to determine quota to be harvested by each of the states concerned

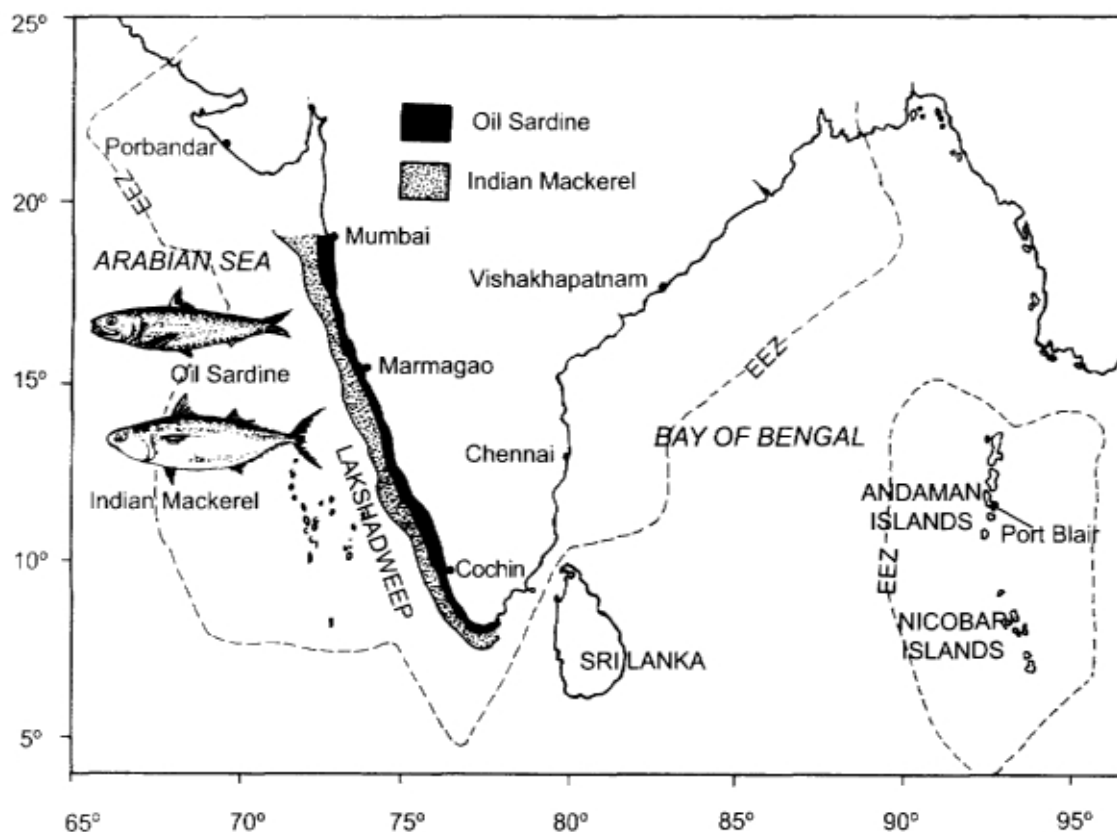
Mackerel Fishery

The traditional fishery for mackerel along the south-west coast is constituted by a single species, *Rastrelliger kanagurta* (Fig. 2). Besides along the east coast and around Andaman and Nicobar Islands, *R. brachisoma* along with *R. kanagurta* constitute the mackerel catches. Off Madras coast, *R. faughni* is also reported to occur. The mackerel constitutes one of the major fisheries and it forms the main dietary item of the people in the region. The traditional fishery for mackerel extends from Quilon in the south to Ratnagiri in north along south-west coast (Fig. 2) and the range overlaps the oil sardine fishery area.

'000 t

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	Average
Landings	156	122	95	87	95	168	177	276	224	156

Fig.2 Distribution of Oil sardine and Indian mackerel and operational zones of their fisheries



The annual potential yield of mackerel stock is estimated as 77 000 t. The mackerel landings during the period 1989-1997, ranged from 87 000 to 276 000 t. The fishery lasts from September to April with peak landings during November—December. Exploratory surveys conducted along the east coast revealed that mackerel forms one of the important components of the demersal trawl catches from areas as deep as 150 m. Increase in the catches of mackerel is expected from non—traditional fishing grounds extending across as well as along the coast (Sivaprakasam, 1986). The existence of offshore and deepwater mackerel resource, which is amenable for trawling, does exist along the east coast and its abundance increases with increasing latitudes and depths (Sivaprakasam and Somvanshi, 1983; Somvanshi and Joseph, 1983).

Investigations

- Resource characteristics study.
- Exploratory surveys by purse seining and high opening bottom trawls as well as by pelagic trawls,
- Location of new fishing grounds.

Results and Management Strategies

- Area of operation of fishery extended offshore.
- Alternate fishing options using different combinations of fishing gear.
- State Governments to regulate purse seine and ring seine units operating in the fishery.
- Location of fishing grounds in deeper water areas up to 150m depth along the east coast of India.
- Based on exploratory survey findings, shrimp trawlers could divert their effort for exploitation of mackerels amenable to high opening bottom trawls in the north east coast.

Skipjack tuna fishery

Skipjack tuna (*Katsuwonus pelamis*) is oceanic and is essentially a surface fish. Off Lakshadweep and Minicoy islands, fishing is done in waters extending up to 22 km around the islands (Fig.3). Oceanic tunas like the skipjack and yellowfin tunas are available in the Lakshadweep waters from October to May every year (Madan Mohan et al., 1985). The skipjack tuna and young yellowfin tuna are exploited by Pole and line fishing using live bait. The landings of skipjack tuna in Lakshadweep during 1989-97 is furnished below.

(000 t)

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	Average
Landings	642.9	6850	5803	6702	6057	5546	6349	6646	6243	6292

Production of skipjack tuna from Lakshadweep islands ranged from 5 546 to 6 850 t with an annual average of 6 300 t.

The annual potential yield of large pelagic stocks from the Indian EEZ is estimated as 246 000 t of which about 110 thousand tonnes comprises skipjack tuna. In the Indian Ocean, skipjack tuna is harvested along with young yellowfin tuna by purse seining using fish aggregating devices (FAD's).

Investigations

- Exploratory surveys by tuna long lining in the areas around the archipelago.
- Location of new fishing grounds.
- Use of new technologies

Results and strategies

- Tuna long lining surveys show abundance of skipjack and yellowfin tuna beyond the present zone of fishery.
- Extension of fishing activities in distant areas from the island,

- Use of mono filament long lining **from** suitable crafts,

Introduction of larger craft in the fishery) could be more remunerative for fishing in new fishing grounds using diversified techniques.

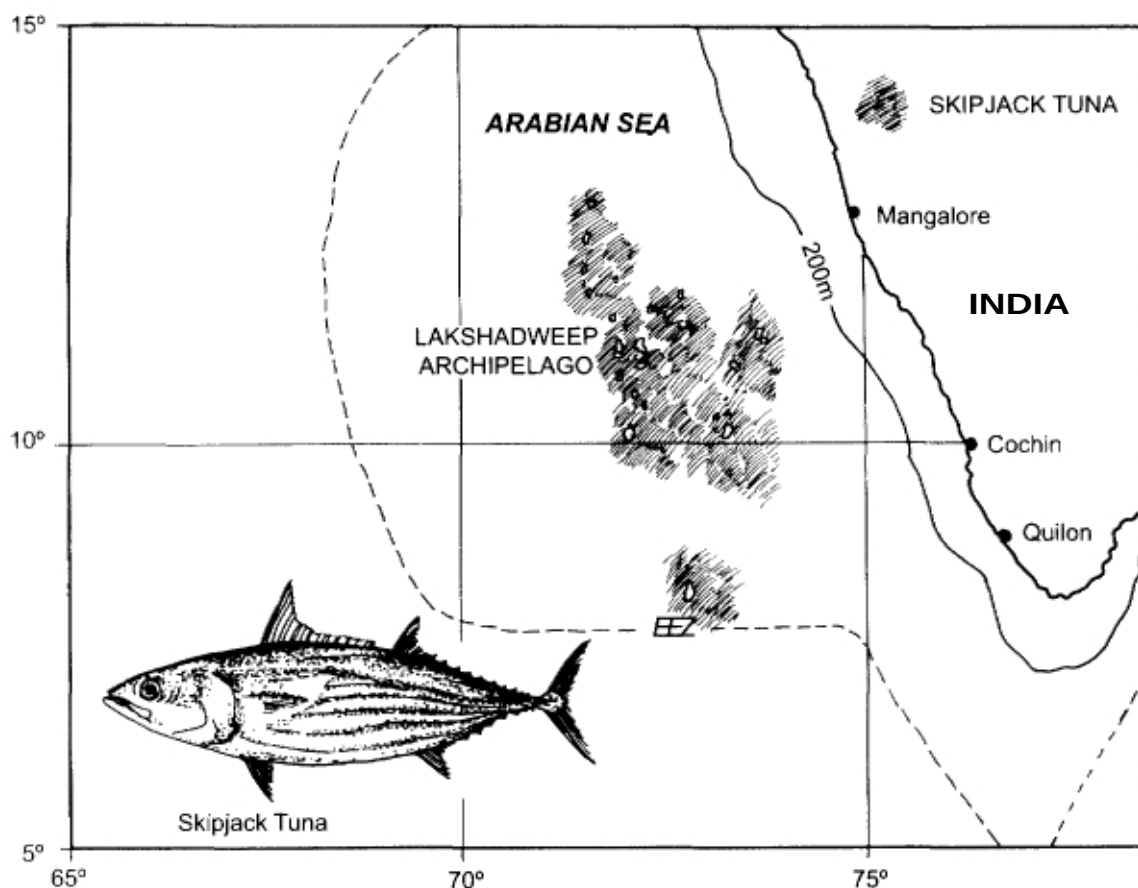
Modern/Industrial Fisheries

Trawl fishery has gained strength as an industrial fishery in India with the export of seafood during early 1960's. The trawl fishery is the first modern industrial fishery in India. Since, shrimps are the prime species in the catches, trawl fishing is economically most attractive venture. Stern trawlers initially introduced in the fishery sector were followed by out-rigger trawlers, thereby adopting an improved technology having an edge over the former. The fishing grounds off Sandheads, being rich in the penaeid shrimp stocks attracted a large number of such vessels. A new turn to the shrimp fishery was the switching back to the stern trawling with smaller vessels, namely mini trawlers (16m OAL) and sona boats (12m OAL). These fleets along with the ever increasing number of mechanized boats together harvest the penaeid shrimp stocks distributed in waters up to about 80m depth along the east and west coasts of India and around the Andaman & Nicobar islands. The present penaeid shrimp production by the industrial fishing vessels and the mechanised fleets together is about 171 000t. The production details are as follows

'000 t)

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	Average
Landings	110	123	155	166	189	218	179	188	209	171

Fig.3 Distribution of Skipjack tuna and operational zone of its fishery



The shrimp landings during the period 1989 to 1997 have been increasing. The production has almost doubled over the period (110 000 to 209 000 t). However, in certain fishing grounds symptoms of decline in the catch per unit effort, growth over-fishing and recruitment over-fishing of the shrimp stocks have been reported (Rao and Varma, 1999). The options for management mainly lie in limiting the effort with possibilities of different combinations of fleet strengths (Somvanshi, 1999), so as to maintain the sustainability of the shrimp stocks. In addition, the use of turtle excluder device (TED) in shrimp trawls is essential in areas where the shrimps and turtles exist together in the fishing grounds.

Partially Exploited and Virgin Fish Stocks in the EEZ

The 1.2 million tonnes of additional harvestable yield comprises stocks of fin fishes, crustaceans and cephalopods which have been either partially fished or are yet to be fished within the EEZ. Some of these stocks could be accessible to the coastal fishermen if they adopt modern fishing aids such as fish finders (echo sounders), global positioning system (GPS) and communication equipments and which have been demonstrated and tried on board some of the FSI fishing boats (FSI, 1996).

Another important sector in which India needs to enter is the oceanic fishing for tunas, bill fishes and pelagic sharks. The potential of these stocks is about 0.25 million tonnes. In this sector there is need to induct fleet of larger vessels having monofilament longlining technology and appropriate refrigeration facilities for sashimi grade tuna products. The tuna purse seining in the Indian EEZ needs to be experimented in view of large-scale application of this technology in the western Indian Ocean.

Need for Establishing Management Regimes

Considering the present marine fisheries scenario in India, there is a need for shift in the approach from development to management so as to maintain the sustainable levels of the stocks. To begin with, choice could be made of those fisheries which are directed or aimed to harvest particular species or species groups having their distribution range extended along the coasts of more than one adjacent maritime States. These stocks have also been showing symptoms of decline in the catch rate and biological over-fishing. Besides, the fishermen from the respective maritime states often do not restrict their fishing operations off the coast of the state to which they belong. It is therefore, imperative to think of exercising various management options and regulate the fisheries of these stocks by establishing the following regimes.

Biological regimes

Some of the biological management regimes are established considering the impact of fishing pressure which has resulted in either growth-overfishing or recruitment-overfishing as the fishing effort exceeds the Maximum Sustainable Yield (MSY) level. In such a situation, the size of the fish caught in the fishery is reduced. There could be another situation where the breeding stock is fished at higher rate and the recruitment does not commensurate with the harvested quantities. Under any of these circumstances, the management options are closed season for fishing, closure of fishing areas, increase in the mesh size of the fishing gear, restriction in the number of fishing units, etc.

Economic regimes

Economic regimes could be effective and beneficial to all the players participating in the fishery. However, in many developing fisheries, it is often difficult but not impossible to discern the state of the fishery to pinpoint the applicability of the economic regimes. At this stage, the law of diminishing returns starts exhibiting its symptoms. This being the reason, especially in the developing countries where open access system is followed with a focus on social endeavour, the economic sustainable limits of fishery are often crossed. Once the maximum economic sustainable yield (MEY) limit is reached but still the fishing effort in the fishery keeps continuing, the descending limb of the catch/value/returns and effort curve hits at a level where evidently lies the maximum social sustainable yield limit (MSoY). Thus the level of yield (catch! value!return) at MEY and MSoY remaining equal, the later mentioned yield is achieved by excessive capital investment and almost double the effort that the fishery needs. This is followed by introduction of new technologies and smaller units as the principle of scale of economy comes to play its role.

The shrimp trawl fishery along the northeast coast and the oil sardine and mackerel fisheries along the southwest coast are examples of such situations in the Indian waters. In the shrimp fishery, the situation is circumvented by introduction of the mini trawlers and sona boats whereas in the oil sardine and mackerel fisheries, the purse seining is outwitted by ring seining. In view of these circumstances, the fisheries practiced on the stocks of shrimps, oil sardine and mackerel qualify for shifting the emphasis from mere developmental activity to management regimes so as to retain their sustainability.

Social regimes

Besides the subsistence and economically driven fisheries development and investments, the governments have social considerations such as employment generation, socio-economic upliftment and social security to fishermen as integral part of the fisheries development policy. As could be deduced from the Gordon – Schaefer model of over-capitalization and the open access fishery, the total effort keeps increasing under social objectives until the fishery expands to the point at which resource rent is fully dissipated (Greboval and Munro, 1999). Unlike the industrial trawlers, the vessels in the tropical artisanal fisheries have a reasonably high degree of malleability in terms of physical capital. However, considering the human capital involved, the reverse is often observed, with most artisanal tropical fisheries actually showing a lack of malleability in the form of a strong asymmetry between the people's ability to enter and exit the fishing sector. As the physical and human resources capital overflow the fish resource sustainability, the case becomes piquant for introducing resource management for achieving the optimum. This underscores the bionomic equilibrium and corresponding maximum economic yield, which does not encourage further entry of either physical or human capital. Thus, the social regimes need to be essentially governed by the sustainability of the fishery and the regulatory measures thereof. In view of past experiences in the coastal fishery, there is a need to establish optimum level of social yields, in terms of optimum employment and measures for regulating the entry in the fishery. While considering future entries in new fisheries, especially in deep sea and far sea sectors it would be prudent to limit the entries and prescribe the extent of participation of various players and their obligations.

Market regimes

In the international markets, there is a shift in the demand governing criteria from mere quality of the seafood products to safety of health on consumption of these items. With the liberalization of trade world over, the WTO restrictions in terms of tariff and non-tariff barriers are also expected to play vital role in the seafood trade. These developments would not only have impact on supply of the seafood products but also on the production activity. The regulations/measures together are fortunately associated with conservations and sustainability of the fish stocks,

Some of the restrictions provided in Part II of the Export and Import Policy (GOt, 1997), on the exports of seafood products permitted from India are

- (i) Beach-de-mer of sizes below 3 inches.
- (ii) Fresh and frozen silver pomfrets of weight less than 300g.
- (iii) Sea shells, excluding polished sea shells and handicrafts made out of sea shells, of all species, except those of the under-mentioned species the export of which shall not be allowed in any form;
 - (a) *Trochus nioticos*
 - (h) Turbo species
 - (c) *Lambis* species
 - (d) *Tridacna gigas* and
 - (e) *Xancus purus*,
- (iv) Seaweeds of all types, excluding brown seaweeds and agarophytes in processed form.

Similarly, there are a few provisions under the Indian Wildlife (Protection) Act, 1972, banning the catching of certain protected species of aquatic animals. The species relevant to aquatic habitat are dugong (***Dugong dugon***), fishing cat (***Felis silvestris ornata***), crocodiles (both estuarine and marsh crocodiles) (***Crocodylus porosus*** and ***C. palustris***), gharial (***Gavialis gangeticus***), Ganges softshelled turtle (***Trionyx gangeticus***),

green sea turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), Indian flapshelled turtle (*Lissemys punctata*), Indian tent turtle (*Kachuga tecta tecta*), leatherback turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*), olive ridley turtle (*Lepidochelys olivacea*), peacock marked! softshelled turtle (*Trionyx hurum*) and water lizard (*Varanus salvator*). However, these restrictions under the Export Policy and the Wildlife Act are far from adequate and are limited to export and catching. What is required is restriction of species of fishery as well as non-fishery significance in catching of the individuals only on attaining certain size (by length and weight) based on the biological principles, both for exports as well as for domestic consumption either in fresh or processed form. Such type of restrictions can be formulated and implemented by establishing appropriate marketing regimes, which would go a long way in sustainable fishing and conservation of the fish stocks in the EEZ, as enshrined in the FAD's CCRF. Use of turtle excluder device for shrimping, non-use of gill nets in catching tunas are a few non-tariff restrictions that can be used against the exporting nations by the importers of sea food products as has been done in the recent past.

Craft and gear regimes

The coastal fish stocks, such as shrimps, oil sardine, mackerel and Bombay duck around mainland India, as mentioned earlier, are harvested optimally in recent years. With the anticipated withdrawal of developmental activities, these fisheries will have to adopt various management measures including standardizing the type, size and efficiency of fishing gear and craft. Each fishery should have its standardized fishing gear and craft considering the operational range of the fishery, along and across the coast in shelf waters.

Another set of management measure which need to be adopted are (i) demarcation of fishing zones with reference to distance/depth and (ii) adoption of the colour codes for the fishing boats. These measures would help avoid conflicts between the fishermen of the adjoining maritime states as well as those fishing in different zones meant for each type of fleet belonging to the same state and the adjacent states.

Conclusion

The marine fisheries based on the coastal fish stocks have to be brought under various management regimes through the adoption of certain provisions under the CCRF. Thus, there is need to bridge the right of fishing of the fishermen with the obligations to use and conserve the fish stocks in a responsible manner. They should be promoting diversity of the species stocks and their availability through precautionary approach based on the best scientific data obtained through monitoring and control measures. There is a distinct possibility of diverting effort to harvest the deep-sea resources albeit through adoption of modern fishing aids such as fish finders, GPS and communication equipments. The oceanic sector calls for induction of new technologies and larger vessels with appropriate on board freezing and processing facilities on priority basis.

Following suggestions emanate from the overview of the marine fish stocks and their management in the Indian EEZ towards addressing various objectives of the CCRF and providing means and ways, and necessary platform to implement them.

- The legislation for coastal fishing vessels and deep sea fishing vessels should be compatible with each other so as to bring effectiveness in conservation and management measures and to ensure sustainable fisheries.
- The legislation should, in addition to closed season, restrictions on mesh size and fishing practices, provide for flexibility in quantum of fishing effort commensurate with the year's crop in the fishery.
- For convenience of implementation of these measures, these should be uniform zones for each category of fishing craft and the colour code specific to the crafts fishing in each zone. The name of the craft and its registration number should be in larger and standard size so that these crafts will be easily identified by the agency monitoring the fishing activities.
- Stocks of certain fish species should be restored and rebuild through short-term and long-term rehabilitation measures.
- In each coastal district a "Marine Responsible Fisheries Agency" (MRFA) should be established to implement the CCRF.

The above suggestions will go a long way in conservation and management of fish stocks through establishing various management regimes for sustainable fisheries. The proposed MRFAs should have advisory scientific groups to provide technical support on continuous basis,

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FISHERIES RESEARCH TO SUPPORT MANAGEMENT OF INDIA'S FISHERIES : PAST, PRESENT & FUTURE

K. Gopakumar*

Background

The need for establishing fisheries research institutes in India was first raised by Sir Frederick Nicholson, a British civil service officer. Sir Nicholson is also considered as the father of fish processing research in India. He worked in the Madras Presidency of the British India. Fisheries research was earlier attached with the Zoological Survey of India. The need for setting up independent fisheries institutes in India was raised by Dr. Bains Prasad, an eminent Indian Fisheries Scientist. Based on his report, submitted to the Government, action was initiated for setting up of a sub-committee (Policy No. 5).



The recommendations of this sub- committee resulted in the setting up of two research institutes, the Central Marine Fisheries Research Station for marine fisheries on February 3, 1947 and the Central Inland Fisheries Research Station for inland fisheries on March 17, 1947. Both the stations were later elevated to the status of research institutes.

Subsequently two more institutes were set up, the Central Institute of Fisheries Technology (1957) at Cochin and the Central Institute for Fisheries Nautical and Engineering Training (CIFNET) in 1963 also at Cochin. This was followed by some other organizations. A list of the fisheries institutes in India as on today is furnished in Tables I & II.

Present Set-up

Reorganisation of the Fisheries Research Institutes

The administrative control of all the fisheries research was transferred to the Indian Council of Agricultural Research (ICAR) during the year 1967 by the Ministry of Agriculture. Subsequently in 1987, ICAR re-organised its fisheries research institutes, resulting in the creation of four more establishments namely:

- Central Institute for Freshwater Aquaculture at Bhubaneswar
- Central Institute for Brackishwater Aquaculture at Chennai
- National Bureau of Fish Genetic Resources at Lucknow
- National Research Centre for Coldwater Fisheries at Bhimtal

At present ICAR has 8 research institutes with distinct mandates. Besides, ICAR has now 30 State Agricultural

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Universities (SAUs) and 12 of them have fisheries colleges. **ICAR** also has one Central University and one deemed university under its umbrella. Together they cater to the fisheries R&D activities in India.

The Agricultural Ministry has four R&D establishments under its management. The organizational set up of fisheries in Agriculture Ministry is presented in Fig. 1. The details of all R&D establishments under Agriculture Ministry are presented in Table I & 2.

Besides ICAR fisheries institutes, limited research and developmental activities on fisheries and aquaculture are also undertaken by the Department of Ocean Development and the Council of Scientific and Industrial **Research (CSIR). The latter have two R&D centres, the National Institute of Oceanography at Goa and the Central Food Technological Research Institute (CFTRI) at Mysore.**

The export of marine products from India is controlled by the Ministry of Commerce and its field set up – the Marine Products Export Development Authority (MPEDA). Hence, it can be seen that Fisheries Research and Development in India is managed by a number Ministries/Departments/Agencies with independent mandates.

Contributions of R&D Organisations to Fisheries Research and Management

1. Marine

- Development of designs for fishing vessels of OAL upto 50 ft
- Introduction of trawling and several designs of gear
- Standardisation of quality control of marine products for export
- Processing and value addition
- Resource assessment of commercially important fish stock
- Mariculture
- Pearl culture
- Setting up of shrimp hatcheries
- Utilization of fishery wastes
- Application of electronic equipments in fishing
- Human Resource Development

2. Inland

- Introduction of induced breeding techniques in fin fish, prawns and ornamental fishes
- Design of hatcheries for different fishes
- Development of fish feeds
- Commercialisation of aquaculture techniques for many species
- Optimization of fish yield in reservoirs
- Freshwater pearl culture

Future Needs

Fisheries Research is presently managed by a number of institutions in the country. State Fisheries Departments, State Agriculture Universities and a number of other agencies are engaged in research activities. This had led to some duplication of work. National research funding agencies such as ICAR, DBT, DST, CSIR, DOD also find it difficult to coordinate. As research is highly expensive, even developed countries are converging their establishments to conserve resources.

The following measures are suggested to avoid duplication and provide adequate research support to national developmental agencies for implementation of the CCRF.

- Creation of a national coordinating mechanism to avoid duplication in funding for fisheries research
- All colleges imparting fisheries education should be brought under the national agricultural research system under the control of ICAR. Fisheries Science should be declared as a technical subject like Engineering and a unified course, degree and syllabus should be drafted at national level.
- Creation of a Ministry of Fisheries

Future Thrust areas in Fisheries Research

A. Reservoir Fisheries

- *Increase productivity by adopting best management strategies*
- *Use of cage culture*
- *Pearl Culture*
- *Conservation of endangered fisheries*
- *Mitigate environmental problems*

B. Coldwater Fisheries

- *Resource enhancement*
- *Popularise trout fisheries to generate more income*
- *Develop packing, transport and marketing*
- *Search for high income generating species*

C. Brackishwater Aquaculture

- *Introduction of HACCP in coastal shrimp farming*
- *Fish disease management, use of vaccines and antimicrobials and pro-biotics.*
- *Crop rotation in shrimp farms*
- *Seabass, groupers farming*
- *Mitigate social and environmental issues*

D. Marine Fisheries

Harvest

- *Design of crafts of OAL 50-60ft having high endurance in sea with capability to fish up to 300 meters*
- *Fuel efficient vessel and low energy fishing techniques*
- *Resource specific vessels*
- *Distant water fishing techniques*

Farming

- *Develop packages for farming of crustaceans, molluscs, fin fishes*
- *Pearl culture*
- *Seaweed farming*
- *Use of artificial reefs, fish aggregating devices, etc*
- *Resource enhancement by ranching*

Post-Harvest

- *Reduction of post-harvest losses*
- *Utilization of low-value fishes*
- *Value addition in export*
- *Quality control*
- *Standards for internal marketing*

(Figure 1)

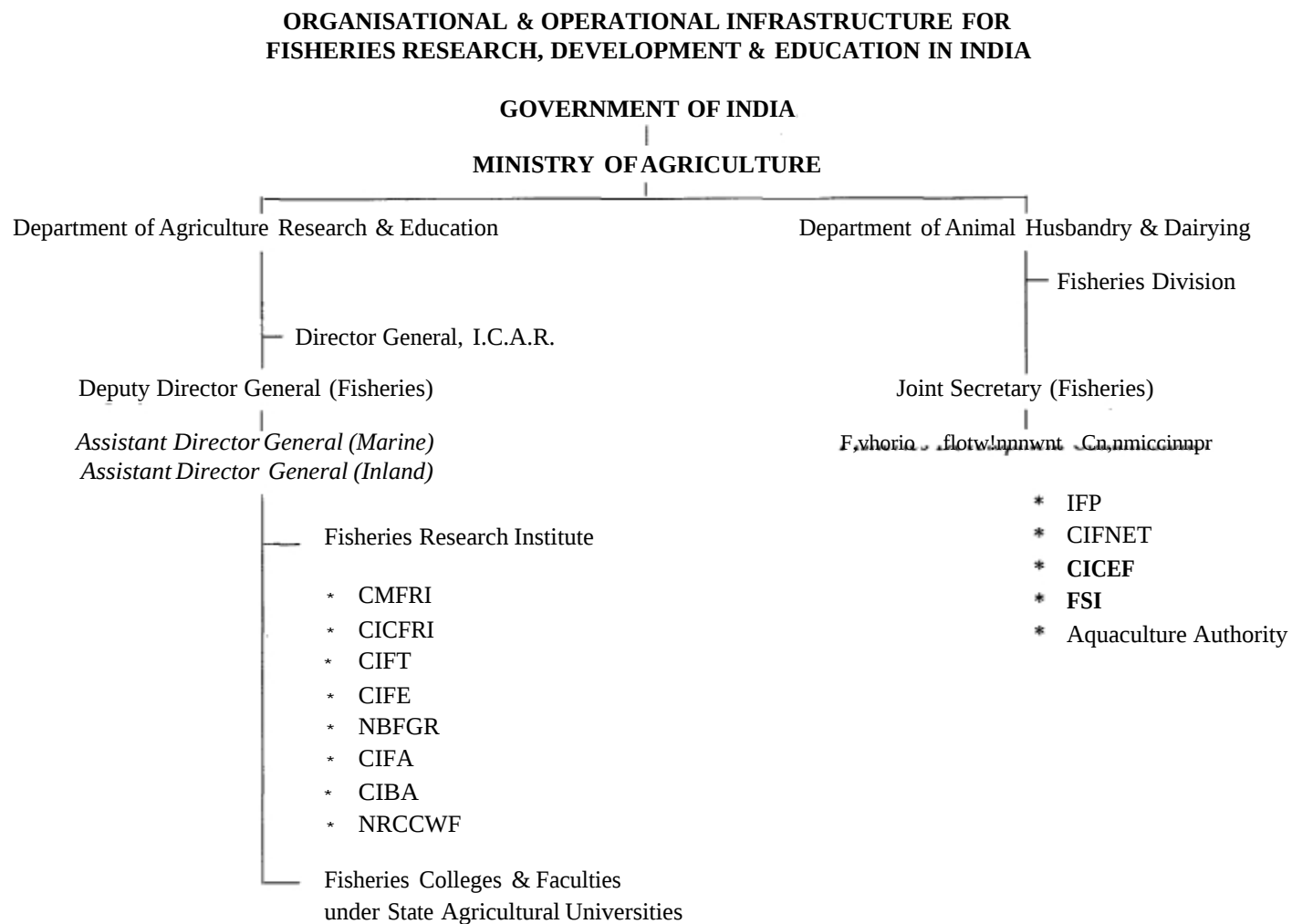


Table 1. Infrastructure for Fisheries Research

Indian Council of Agricultural Research

Name of the Institution	Mandate
Central Marine Fisheries Research Institute (CMFRI) Kochi, Kerala <i>(Established in 1947)</i> Phone No.: 00 91(0)484 394 798 Fax No.: 00 91(0)484 394 909 EMail: cmfri@x400.nicgw.nic.in mdcmfri@mdz.vsnl.net.in * 12 Research Centres * 28 Survey Centres * 11 Fish Farms * 11 Research Vessels *01 KVK/TTC	* Capture fisheries data base, assessment & management of marine fishery resources, fishery forecasting, monitoring fishery environmental characteristics, mariculture technology for finfish and shellfish technology, transfer of technology and consultancy services.
Central Inland Capture Fy. Research Institute (CICFRI) Barrackpore, West Bengal <i>(Established in 1947)</i> Phone No.: (0) 91(0)33 - 560 0177 Fax No.: (N) 9 1(0)33 - 560 0388 EMail: cicfri@x400.nicgw.nic.in * 11 Research Centres * 06 Survey Centres *01 KVK/JTTC * 01 Fish Farm * 02 Research Boats	* Conservation and sustainable development of open water ecosystem and study on population dynamics of exploited inland water bodies for developing fishery management system for their optimum utilization, transfer of technology and consultancy services.
Central Institute of Fisheries Technology (CIFT) Kochi, Kerala <i>(Established in 1937)</i> Phone No.: 00 91 – (0)484 667 039 Fax No.: 0091 – (0)484 668 212 EMail: cift@x400.nicgw.nic.in root@cift.ker.nic.in * 05 Research Centres * 04 Research Vessels	* Development and standardization of harvest and post-harvest technologies, package of practices for extraction of biomedical, pharmaceuticals and industrial products from aquatic organisms, transfer of technology and consultancy services, fish inspection and quality control, electronic instrumentation, fishing boats and gear design.
Central Institute of Fisheries Education (CIFE) Mumbai, Maharashtra <i>(Established in 1961)</i> Phone No.: 0091(0)22 636 3404 Fax No.: 00 91(0) 22636 1573 E-Mail: cife@x400.nicgw.nic.in * 03 Research/Edit. Centres * 04 Fish Farms * 03 Research Vessels	* Conduct education and research programs leading to post-graduate (M.F.Sc.) and doctoral (Ph.D) degree in specialized disciplines of fisheries science and technology. Serve as a repository of information on HRD in fisheries including database on available manpower resources.

National Bureau of Fish Genetic Resources (NBFGR)
Lucknow, U.P.

(Established in 1983)

Phone No.: 0091(0)522 442 403

Fax No.: 0091 (0)522 442 403

E.Mail: nbfgr@x400.nicgw.nic.in

nbfgr@ 1wl.vsnl.net.in

- * Management and conservation of diversity of the vast and diverse fish genetic resources and quarantine.

Central Institute of Freshwater Aquaculture (CIFA) Bhubaneswar, Orissa

(Established in 1987)

Phone No.: (X) 91(0)674 465 421

Fax No.: 0091(0)674465 407

EMail: cifa@x400.nicgw.nic.in

- * Basic and applied research on seed production and culture of commercially important fin-fish and shellfish in freshwater system, transfer of technology and consultancy services.

* 06 Research Centres

* 10 Field Centre,c

* 04 Fish Farm

Central Institute of Brackish-water Aquaculture (CIBA)
Chennai, Tamilnadu

(Established in /987)

Phone No.: 0091(0)448554851

Fax No.: 00 91 (0)44 855 4851

E.Mail: ciba@x400.nicgw.nic.in

- * **Seed** production and culture of finfish and shell-fish in brackishwater system, transfer of technology and consultancy services.

* 03 Research Centres

* 0/ Field Centre

* 02 Fish Farm

National Research Centre on Coldwater Fisheries (NRCCWF)
Bhimtal, U.P.

(Established in 1988)

Phone No.: 00 91(0)594247279

Fax No.: 00 91(0)594247279

- * Assessment of cOidwater fishery resources in the upland areas and formulation **of** strategies **for their** sustainable exploitation.

* 02 Field Centres

* 02 Fish Farms

* **02** Research boats

Table 2. Infrastructure for Fisheries Development

Ministry of Agriculture

<i>Name of the Institution</i>	<i>Activities</i>
Fishery Survey of India (FSI) Botawala Chambers Sir P.M. Road Mumbai —400 001, Maharashtra <i>(Established in 1946)</i> Phone No.: 0091(0)22 261 7101 261 7144 Fax No.: 0091(0)22 270 2770 * 07 Zonal/Base Offices in Maritime states	* Marine fisheries resources survey of the Indian EEZ. * Chartering of potential fishing grounds.
Integrated Fisheries Project Foreshore Road P.B. No. 1801 Kochi – 682 016, Kerala <i>(Established in 1952)</i> Phone No.: 0091(0)484 361317 Fax No.: 0091(0)484 373516 EMail: ifp@ker.nic.in * 01 Research Centre * 05 Fishing Vessels	* Development of marine fisheries harvest and post-harvest technologies & products development with value addition. * Marketing infrastructure support to fishing industry.
Central Institute of Fisheries Nautical & Engineering Training (CIFNET), Dewan's Road Kochi-682016, Kerala <i>(Established in 1963)</i> Phone No.: 00 91(0)484 351107 Fax No.: 00 91(0)484 370879 E.Mail: L cifnet@ker.nic.in * 03 Research Centre * 04 Training Vessels	* Create technical manpower for operation of ocean-going fishing vessels. * Support shore-based infrastructure establishment for the effective operation of fishing vessels.
Central Institute of Coastal Engineering for Fishery (CICEF) 64, Palace Road Bangalore – 560 052, Karnataka <i>(Established in 1968)</i> Phone No.: 0091(0)80226 7841 Fax No.: 0091(0)80225 8945	* Engineering and economic investigation & techno-economic feasibility reports for development of fishery harbours and brackishwater shrimp farms in the country.

SEAFOOD QUALITY ASSURANCE AND ECO-LABELLING

K Jose Cyriac*

Introduction

Seafood is a nutritious and relatively high protein food, but highly perishable in nature. The extensive use and utilization of fish as food raises public health concerns common with any other food item and with the same risk of product being contaminated with pathogenic organisms or toxins. In the past, fish has been associated with outbreaks of food borne diseases. The lack of adequate infrastructure and technical expertise often lead to quality defects which, in turn may result in heavy losses due to rejection and/or low prices for the products.

The main problem facing the governments and the fish processing industry in the developing countries (who have export trade with the developed nations) is to comply with the consumer expectations, particularly on quality aspects. Therefore, there has been a shift in the approach to quality assurance from end product sampling, inspection and testing to prevention and elimination / reduction in the level of health hazards. The “Seafood Quality Assurance” can be defined as all activities and functions connected with the attainment of quality of the product that influence its acceptability. Quality assurance includes technical operations such as inspection, testing and quality control and the functions of administration and management. All steps taken to prevent the deterioration of fish quality are significant. These steps are applied from the moment fish is caught, through the handling, processing, manufacture, storage and distribution phases and include the measures taken to prevent contamination and adulteration of the product.



Factors influencing the quality

The quality of seafood is influenced by the following factors:

- The environmental conditions from where the fish is caught
- Transmission of pathogenic micro-organisms like *Vibrio*, *Listeria*, *Salmonella*, *Staphylococcus*, etc. from the natural environment and human and animal sources
- The catching methods and landing operations
- Aquaculture practices - usage of pesticides, chemicals, etc.
- Handling, transportation, processing, packing and packaging and storage practices

Seafood is presented to the consumer in live, fresh-chilled, frozen, salted and dried, canned and ready to eat forms. The technical, hygienic and sanitary conditions where the seafood is handled and processed to achieve

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its commercial form will greatly influence its quality and wholesomeness. The quality of the seafood is greatly affected while it is unhygienically/improperly handled onboard fishing vessels, landing and market places, transport vehicles and processing plants. Health hazards, which may contaminate the seafood, will invariably exist at various points mentioned above, but preventive measures can control the hazards. The final quality of fish and fishery products will be the result of the sum of factors that have affected them during each one of these stages. Once quality is lost, nothing can be done to improve it.

The significance of seafood quality control and quality assurance is very important to ensure:

- that the product has been prepared from quality raw material and it has never been grossly contaminated
- that the product has been processed under ideal conditions
- that the product is absolutely free from pathogens or toxins of public health significance
- that the product would have a reasonably extended shelf life

National and International Quality Standards for Fish and Fishery Products

Food standards have been introduced on a national/international basis to protect the consumers' health and ensure fair practices in food trade. Many fish producing countries have their own standards and code of practices for fishery products. The Bureau of Indian Standards (BIS), the national standards organization in India, has brought out over 50 standards for fish and fishery products. These standards prescribe detailed requirements of processing, packing and methods of analysis for evaluation of quality of the product.

The Codex Alimentarius Commission (Codex Standards) (FAO/WHO body)

The Codex Alimentarius Commission is the main international organization for food standards that develops the food standards to be used worldwide with a view to protect consumers' health and ensure fair trade practices. Member countries use these standards, which include provisions in respect of products, hygiene, food additives, contaminants, labelling and presentation, methods of analysis and sampling, as a basis to formulate their own standards. The work of the Codex Alimentarius Commission was well-received after the successful conclusion of the Uruguay Round of multilateral trade negotiations resulting in the establishment of the World Trade Organization (WTO) and its Agreements on the Application of Sanitary and Phytosanitary Measures (SPS) and on Technical Barriers to Trade (TBT). Under the WTO Agreements, WTO member countries involved in food trade agree to accept the international standards and codes for food safety set out by the Codex Alimentarius Commission as the benchmarks against which national measures and regulations are evaluated.

The ISO 9000 Series Standards

The International Organisation for Standardisation (ISO), Geneva is the federation of national standards bodies represented by about 100 countries including India. The ISO 9000 is a series of standards applicable to any industry that aims to provide a guarantee of quality at any specified level. Quality planning and quality assurance are envisaged in ISO 9000. There are 20 elements of quality requirements in the various standards – ISO 9000 to ISO 9004. The standards that will apply to fish production is ISO 9002 – Quality System Model for quality assurance in production and installation' which give increased responsibility to the industry for self-certification of quality using an established quality assurance system.

The Bureau of Indian Standards (BIS) has adopted the ISO 9000 series of standards as the Indian Standards (IS) 14000 series.

The Hazard Analysis Critical Control Point (HACCP) System

The HACCP concept proposed by the US FDA has been taken as a standard process control system for assuring food safety by international bodies. Many fish producing countries including India, Canada and the European Union have accepted the HACCP as a food safety standard. The HACCP has now been identified as the global unified quality assurance system for producing safe and quality fish products. FAO's Codex Alimentarius Commission has formulated guidelines for implementation of HACCP system in the food

industry. The HACCP system, which is based on preventive strategy, aims to identify food safety problems before they occur and establish measures for their control, at all stages from production up to the point of consumption, that are critical in ensuring the safety of food.

The HACCP-based quality system involves the following steps:

- Systematic Analysis of hazards
 - *identification of hazards*
 - *assessment of the severity of the hazards*
- Determination of Critical Control Points
 - *which will assure the control of a hazard or minimize a hazard*
- Determination of preventive measures
- Establishment of critical limits for each control point.
- Establishment of monitoring procedures
 - *Visual inspection*
 - *Sensory evaluation*
 - Physical, chemical & biological aspects*
- Corrective actions
- Documentation of the activities and results
- Verification and review of procedures and results

The HACCP is not a stand-alone programme, but is only one part of a larger system of control procedures. For HACCP to function effectively, it should be accompanied by certain pre-requisite programmes. Or in other words, the HACCP system must be built upon a firm foundation of compliance with Good Manufacturing Practices (GMPs) and acceptable Sanitation Standard Operating Procedures (SSOPs). The GMPs and SSOPs affect the processing environment and are considered as pre-requisite programmes to HACCP,

Role of Export Inspection Council

Quality assurance in respect of the products being exported from India was introduced with the enactment of the Export (Quality Control and Inspection) Act, 1963. The Export Inspection Council (EIC) of India established under this Act is to approve the facilities in the factories/establishments for processing of fishery products for export. Such approved units are regularly monitored by the Export Inspection Agencies (EIAs) to ensure that they comply with the requirements. Each approved processing unit is allotted a distinct approval number that is required to be marked on the export package for identification.

Eco-labelling

Eco-labels are seals of approval given to products that are deemed to have fewer impacts on the environment than functionally or competitively similar products. The information furnished in labels helps to link fisheries products to their production process. It is a growing concept in the promotion of sustainable fisheries around the world. The goal of eco-labelling initiatives is to promote sustainably managed fisheries and highlight their products to consumers.

The potential usefulness of eco-labelling schemes is to create market-based incentives for environmentally friendly products. At Rio, Governments agreed to “encourage expansion of environmental labelling and other environmentally related product information programmes designed to assist consumers to make informed choice”. Another basis for international eco-labelling efforts is also provided by the FAO Code of Conduct for Responsible Fisheries. The FAO Code of Conduct for responsible fisheries is as under:-

Article 11.1.11.

States should ensure that international and domestic trade in fish and fishery products accords with sound conservation and management practices through improving the identification of the origin of fish and fishery products treated.

Article 11.1.12.

States should ensure that environmental effects of post-harvest activities are considered in the development of related laws, regulations and policies without creating any market distortions.

Article 11.2. 3.

States should ensure that measures affecting international trade in fish and fishery products are transparent, based, when applicable, on scientific evidence, and are in accordance with internationally agreed rules.

Article 11.2.4.

Fish trade measures adopted by States to protect human or animal life or health, the interests of consumers or the environment, should not be discriminatory and should be in accordance with internationally agreed trade rules, in particular the principles, rights and obligations established in the Agreement on the Application of Sanitary and Phytosanitary Measures and the Agreement on Technical Barriers to Trade of the WTO.

Article 11.2.13.

States should cooperate to develop internationally acceptable rules or standards for trade in fish and fishery products in accordance with the principles, rights, and obligations established in the WTO Agreement.

Article 11.3.2.

States, in accordance with their national laws, should facilitate appropriate consultation with and participation of industry as well as environmental and consumer groups in the development and implementation of laws and regulations related to trade in fish and fishery products.

Eco-labels generally rely on life-cycle assessment to determine the environmental impact of a product ‘from cradle to grave’. Usually claims appearing on a product must be preceded by a chain of custody exercise that documents that the product was derived from a fishery certified as being sustainably managed. Eco-labelling programmes usually fall into one of the following categories.

First party labeling scheme:

These are established by individual companies based on their own product standards. This form of eco-labeling can also be referred to as ‘Self declaration’.

Second party labelling schemes:

These are established by industry associations for their members’ products.

Third party labeling scheme:

These are usually established by a private initiator independent of the producers, distributors, and sellers of labelled products. Products supplied by organizations or resources that are certified are then labelled with information to the consumers that the product was produced in an environmentally friendly fashion. It is hoped that in the fisheries sector, eco-labelling will help to provide information about the environmental impact of products, opportunity to consumers to express their environmental/ecological concerns through their purchasing behaviour, to encourage retailers and consumers to buy only fishery products that come from sustainably managed resources, etc.

The identification labels can be used to trade fisheries products and isolate those deemed to be caught illegally or in a fashion that undermines national or international management efforts. Labelling can be designed to be completely compatible with international trade regulations.

Article IX of the GATT explicitly accommodates national provision for a mark of origin – such as label identifying the country of origin – on imported products. So long as the origin of like domestic products is equally identified, then the requirement for a mark of origin on all the imported fisheries products should not constitute discrimination under WTO rules due to preferential treatment of national products.

The labels should give certain information like the name of the product and the sender, The labels should not be misleading. The ingredients have to be listed in descending order of weight, date of minimum shelf life, special storage conditions or conditions of use, and instructions for use also have to be included in the label. Information must be given in the language of the region in which the product is to be sold. In short the labelling must not be misleading.

Packaging

Packaging plays a key role in the commercialisation of food products. Packaging ensures product safety and freshness. Packaging in seafood industry ranges from the coarse bamboo baskets to more convenient and attractive trays. When fish is to be transported in fresh form to a short distance baskets are still used as packaging material. With the introduction of freezing technology to the seafood industry, packaging also has undergone changes to suit the products to be packed. Thus we have cardboard carton either laminated/wax coated or without any coating, polythene sheet and bags, trays, etc. Most of these packaging materials have their use till they reach the destination where these have to be disposed. Such disposal has often led to environmental problems. Most of the countries now prefer the packaging materials to be recyclable, though no legislation has been adopted in this regard. But the importers have become more and more conscious of the environmental aspects and are demanding plain cardboard cartons without wax coating or lamination. Even some of the manufacturers of the packaging materials are putting the recycle logo on the packages.

EU requirements of labelling of foodstuffs (related to marine products)

As per the directive 2000/13/EC of the European Parliament and of the Council, the food stuffs placed in the EU must exhibit the labels containing the particulars pertaining to the food stuff. The labels should not mislead the purchaser as to the characteristics of the food stuff such as its nature, properties, composition, quantity, durability, origin, method of manufacture or production. It should not attribute to the foodstuff, the properties it does not possess.

The following particulars shall be compulsory on the labelled foodstuff:

- (1) The name under which the product is sold;
- (2) The list of ingredients;
- (3) In the case of packaged food stuff, the net quantity;
- (4) The date of minimum durability or, in the case of foodstuff which, from the microbiological point of view, are highly perishable, the 'use by' date.
- (5) Any special storage conditions or conditions of use;
- (6) Name or business name and address of the manufacturer or packager, or of a seller established within the community;
- (7) Particulars of the place of origin or provenance where failure to give such particulars might mislead the consumer to a material degree as to the true origin or provenance of the food stuff;
- (8) Instructions for use when it would be impossible to make appropriate use of the foodstuff in the absence of such instruction;

The other provisions of the EU Directive are as follows:

- a) The name under which a product is sold shall include or be accompanied by particulars as to the physical condition of the foodstuff for the specific treatment, which it has undergone (e.g. powdered freeze dried, deep – frozen, etc). In all such cases omission of such information could create confusion in the mind of the purchaser.
- h) "Ingredient" shall mean any substance, including additives, used in the manufacture or preparation of a food stuff and still present in the finished product, even if in altered form.

- c) Where a solid foodstuff is presented in a liquid medium, the drained net weight of the foodstuff shall also be indicated on the label.
- d In the case of foodstuff which, from the microbiological point of view, are highly perishable and are therefore likely, after a short period, to constitute an immediate danger to human health the date of minimum durability shall be replaced by the 'use by' date. (The date shall be preceded by the words 'use by'.)
- e) The date shall consist of the day, the month and, possibly, the year, in that order and in decoded form.
- f) Member states (of EU) shall ensure that the sale is prohibited within their own territories of foodstuff for which the particulars provided in the labels do not appear in a language easily understood by the consumer, unless the consumer is in fact informed by means of other measures determined,

Barcoding

Barcodes are a series of bars and spaces printed/labelled on a product/service package which enable automatic data capture of information for identifying it using barcode scanners.

Bar coding facilitates automatic data capture of product information in an accurate, quick manner and hence find wide application related to inventory control, sales forecasting, work-in-progress, product track and trace, supply chain management, consignment clearance, etc.

The National IT Task Force, has recommended adoption of Bar coding for all Indian products within five years. It is the endeavour of the Central Government to enhance export competitiveness of Indian products and to promote compliance with prevalent international practices. As per the Export and Import Policy 1997-2002 of India, all exports of finished and packaged items meant for retail sale shall incorporate barcodes following international symbologies/numbering system from a date to be notified by Director General of Foreign Trade. In addition to the above, exports at carton/consignment level in the sector of food products shall adopt bar coding using international symbologies/numbering systems. Directorate General of Foreign Trade would issue a separate notification specifying the export items with the date of implementation.

MPEDA and the Seafood Quality Assurance

The MPEDA has taken several steps to achieve the Seafood Quality Assurance, Quality control or quality assurance is ensured by the following activities of MPEDA.

1. MPEDA follows the national standards for registration of fishing vessels, pre-processing centres, processing plants, conveyances and cold storages.
2. MPEDA is a member in the following organisations responsible for quality assurance:
 - Bureau of Indian Standards
 - National Codex Committee
 - Export Inspection Council of India
3. MPEDA takes timely steps to resolve the quality problems of the fishery consignments exported from India and also arranges seafood delegations to negotiate the quality issues.
4. Collection and dissemination of quality standards and regulations from the importing countries to the seafood processors.
5. Arrange visits and meetings of health officials from importing countries.
6. Organising training for QC personnel abroad and in India.
7. Extend financial assistance to fishery research institutions to carry out special research projects in quality aspects.
8. Establish an HACCP cell to assist and guide the entrepreneurs to implement and comply with the HACCP system in the processing plants.

9. Render laboratory support to the industry through the full-fledged quality control laboratory at Cochin with sophisticated instruments for analysis of the environmental contaminants like mercury, cadmium, nickel, pesticide residues, etc. in the fishery products.
10. Extend financial assistance for:
 - (a) providing fish hold in fishing vessels
 - (b) setting up mini laboratories in processing plants
 - (c) establishing captive and independent pre-processing centres and
 - (d) upgrading the processing facilities in the processing plants.
11. Conduct extension training programmes to the fishermen and workers in the pre-processing and processing plants on hygienic handling.
12. Extend financial assistance to promote bar coding in seafood packages.
13. Organise studies to improve the seafood packaging materials.

The objectives of MPEDA ensuring Seafood Quality Assurance and Eco - labelling

- To reduce post-harvest losses
- To ensure that fair trade practices are observed which prevent fraud and deception
- To improve fish handling, fish processing, storage and distribution systems
- To create confidence in the consumer (importing) countries by providing good quality fish products
- To guarantee a high reputation for India's marine products and promote fish industry as a whole
- To enhance the production of quality fish products and achieve higher value realization
- To achieve the overall development of fisheries in the country and improve the earnings of the fishermen and industry

Conclusion

The legislation on quality standards and eco-labelling at national or international levels can make only limited influence in maintaining/achieving the quality assurance; the management and staff of a company must realise the importance and co-operate for identifying and solving the problems. For a 'Quality Assurance Plan' to work, it is extremely important to have the support of top company officials (management). The quality assurance plan can be implemented only when quality becomes a company's priority and policy.

APPLYING THE CODE OF CONDUCT FOR RESPONSIBLE FISHERIES TO THE MANAGEMENT AND DEVELOPMENT OF MARINE SMALL-SCALE FISHERIES IN INDIA

Sebastian Mathew^t

Introduction

If you do a search for 'code of conduct' on the Internet most of the hundreds of references you will come across will be those related to conduct in educational institutions, public life, sports, humanitarian assistance and arms trade — activities that always have a moral plane. A code of conduct attempts to bring ethics into a professional act. Once adopted, it proclaims that an individual or a group (or a government) agrees to practice a profession according to the principles and standards that are laid down in it. The Code in its essence is thus a *standard-setting* exercise with ethical connotations. Fishing is an act based on taking aquarian life. One may wonder about the appropriateness of using a concept with moral and ethical connotations to set standards for such an activity. In this sense, there may not be any other parallel to the Code of Conduct for Responsible Fisheries. But it certainly wishes to rein in the homocentric Judeo-Christian philosophy of life and it is part of a growing ecosystem perspective that human species is an interdependent part of a series of complex biotic communities.



The first code of conduct developed by the FAO was the International Code of Conduct on the Distribution and Use of Pesticides in 1985, which “set forth responsibilities” and established voluntary standards of conduct for all public and private entities. It was developed to address the concerns arising from the export to developing countries of pesticides that have already been banned in several countries. It was to serve as a point of reference until such time as countries have established adequate regulatory infrastructures for pesticides. The overall responsibility was that of the government and the industry was expected to adhere to the provisions of the Code (FAO 1990). This Code was adopted by the

25th Session of the FAO Conference (1985), which ~~recommended~~ that all FAO member Nations should ~~promote~~ the use of the Code.

The Fisheries Code

The Code of Conduct for Responsible Fisheries (hereafter the Code) was the second of FAO's involvement in developing a Cod& (FAO 1995a). This is also a voluntary, standard-setting code with the main objective

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1 The FAO was also involved, together with UNIDO, UNEP, WHO, in developing the 1991 Voluntary Code of Conduct for the Release of Organisms into the Environment (including fish), which “outlined” general principles governing standards of practice for the introduction of genetically modified organisms (GMOs). There is, however, no mention of its adoption. This was also intended to serve as a general model that could be adopted in countries that had no regulations. It was also intended to facilitate safe application of biotechnology in an orderly manner.

to establish principles and standards of behaviour for responsible fishing and fisheries practices after taking into account relevant biological, technological, economic, social, environmental and commercial aspects. It was developed through a consultative process involving States, representatives of the industry and NGOs (FAO 1995b).

The need for a Code of Practice for Responsible Fishing was first raised at the Nineteenth Session of the FAO Committee on Fisheries (COFI) in April 1991 during discussions on large-scale pelagic drift net fishing. COFI noted that “the FAO had an important role to play in promoting international understanding about the responsible conduct of fishing operations and recommended that FAO should strengthen its work on gear selectivity particularly, but not exclusively, those types of fishing gear which are used in high seas fishing. It also noted that “such a technical work could result in the elaboration of guidelines or a code of practice for responsible fishing which would take into account all the technical, socio-economic and environmental factors involved”.

Although the focus is mainly on fishing operations, especially aspects relating to fishing in the high seas, the scope of the Code includes capture, processing, and trade of fish and fish products, fishing operations, aquaculture, fisheries research and the integration of fisheries into coastal area. It includes, in other words, all aspects of fisheries straddling from the fishing ground to the final consumer.

The FAO Conference adopted the Code at its Twenty-eighth Session in October 1995 and called upon States, International Organizations, whether Governmental or Non-Governmental, and all those involved in fisheries to collaborate in the *fulfillment and implementation* of the objectives and principles contained in the Code. Unlike in the case of the Pesticide Code, the Fisheries Code thus had a wider scope since the Conference appealed to all stakeholders and interested parties and since it sought not just *promotion* but *fulfillment and implementation* of the objectives and principles of the Code.

The Code is, in fact, more than just standard-setting in the sense that certain parts of it, unlike the Pesticide Code, are based on rules or agreements of international law such as the 1982 United Nations Convention on the Law of the Sea (UNCLOS), the 1995 United Nations Fish Stocks Agreement, the 1992 Rio Declaration and the provisions of the Agenda 21 of UNCED that are already adopted by the international community. The Fisheries Code thus seems to be unique for more than one reason. In addition to setting standards, the Code also reminds member countries of their international obligations, especially their duty towards conservation and management of fisheries resources.

At first glance it may seem ironic that the Code in almost all its provisions addresses mainly the State and not all the stakeholders, unlike its predecessor the Pesticide Code, which has sections addressing the industry as well. This canalisation of all responsibilities through the State is consistent with the UNCLOS, which recognises the sovereign rights of coastal States in their exclusive economic zone to explore, exploit, conserve and manage both living and non-living resources. It is assumed that the State will take the leadership role in putting all stakeholders together and act as an agent for responsible fisheries.

The unanimous adoption of the Code by the FAO Conference, more than anything else, is a recognition of the fact that member States, both developed and developing, acknowledge the *finiteness* and *exhaustiveness* of fisheries resources and that they agree on the need for adopting a conservation and management approach in matters of fisheries resources. This is contrary to the thinking that prevailed for a very long time, that marine fisheries resources are inexhaustible and that States only had to worry about how to develop these resources. The fact that the scope of the Code eventually got widened from the original concept of *responsible fishing to fisheries* also recognises the inter-relationship between production, processing and trade as well as between fisheries, aquaculture and coastal area management. It also shows the importance that the international community attaches to the need for habitat protection. Perhaps this is an opportunity that the coastal States might want to use to shift gear—to move from an exploitative to a conservation and management regime in their coastal fisheries, a responsibility undertaken willy-nilly by the ratification of the UNCLOS and by adopting it into the national law. As far as India is concerned, it is constitutionally binding since Article 51 (c) of the Constitution of India states that the Indian State shall endeavour to, “foster respect for international law and treaty obligations in the dealings of organised people with one another”

Problems and Prospects of Applying the Code

Adopting the Code is one thing but applying it to the fisheries sector is indeed an onerous task, especially when the adoption is done at a level which is not structurally linked to the base. States may reveal the best of their intentions, especially when the negotiation is for producing a non-binding legal instrument like the Code but often these commitments are not necessarily followed up in practice for several reasons.

Even legally binding instruments like the UNCLOS are yet to be fully implemented. The right to explore and exploit, for example, is upheld but the duty to conserve and manage the resources is often not taken up. There is thus a visible asymmetry between rights and duties of the State. A similar asymmetry exists between the rights and duties of fishers as well.

So far, only rich coastal nations such as the United States, Canada and Australia have decided to implement or apply the Code. In the United States the initiative has come from the State and in Canada and Australia, from the industry. The United States has prepared an implementation plan for provisions of the Code that address the key elements of sustainable marine fisheries. While the Australian Code applies to aspects of the seafood industry like production, processing, and marketing, that of Canada applies only to fishing operations that will contribute to sustainability in marine and freshwater fisheries. Both United States and Australia have attempted to bring in limited entry systems to reduce the "open access" feature of conventional fisheries. The Australian fishing industry would even consider "secure access rights" as an important principle of their responsible fisheries management².

The fisheries and fisheries resources of these countries are often confronted with problems of distant water fishing fleets in their exclusive economic zone (EEZ) or in the high seas adjacent to their EEZ. Given the Code's emphasis on fishing operations in the high seas, and given that the UN Fish Stocks Agreement is yet to be ratified, the implementation of the Code could be of immediate interest to these Coastal States.

It is five years since the Code has been adopted and so far we have not heard of any developing country that has applied the Code to its marine fisheries, let alone its industry. On the contrary, we hear of the Southeast Asian Fisheries Development Center (SEAFDEC) expressing some concern about the Code for being 'formulated based mainly on situations more relevant to the developed countries'. SEAFDEC, therefore, is in the process of producing an Asian Code for coastal fisheries. It has prioritised some of the areas of the Code for the regionalisation exercise, viz., Fishing Operation, Aquaculture Development and Fisheries Management, in that order. Once this process is completed, it expects the member countries to initiate a nationalisation process of the Code. The whole process should be completed by the year 2005.

Conservation and management do make better business sense in terms of accessing international markets and the recent spate of debate around eco-labelling is sufficient proof of this. As resources come under increasing pressure the market for eco-labelled fish is bound to expand from its current sliver. Those countries in the forefront with better conservation and management regimes are bound to benefit from better marketing opportunities. Consumers of fish and fish products in rich countries are likely to express a greater desire to consume fish that are produced under better conservation and management regimes. The origin of eco-labelling schemes like the Marine Stewardship Council is based on these expectations.

There is a tremendous opportunity for developing countries in adopting conservation and management measures because most of the fish that the rich countries would like to consume are increasingly produced by the developing countries. The market in rich countries is likely to pay a higher price for fish that are responsibly produced. This calls for a proactive engagement with fisheries conservation and management issues both by the State and the industry. To set national product and process standards to access lucrative markets would imply co-ordinated action, especially implementation of principles and standards that the global community would approve of. Applying the Code should also be seen from this perspective. Countries like Norway, Canada, Australia and New Zealand have already demonstrated that effective management is

2 NMFS 1997. Implementation Plan for the Code of Conduct for Responsible Fisheries: Canadian Code of Conduct for Responsible Fishing Operations (1998); and A Code of Conduct for a Responsible Seafood Industry (1998).

a good business proposition. By minimising economic waste and by enhancing the value of fish production through post-harvest activities, they have demonstrated that effective conservation and management could fetch long-term returns to the fishery.

Adapting the Code to the Indian Small-scale Fisheries

Dynamism of the small-scale sector

‘Small-scale’ sector is not a category described in any fisheries legislation in India. Before we discuss the need or scope of adapting the Code to Indian small-scale fisheries it is, therefore, important to attempt an understanding of this sub-sector in a dynamic sense. It is difficult to have an elegant definition of small-scale fisheries³. The understanding that we have of different sub-sectors, especially of categories like “traditional” and “mechanized”, is based on conventions when there was a neat division between mechanized and non-mechanized fishing vessels. Small-scale fisheries most often meant unmechanized fishing units, irrespective of size and quantum/kind of gear. The polarisation of Indian marine fisheries into mechanized and non-mechanized, which prevailed until the early 1980s. however, has since broken down. With the advent of affordable new technology and introduction of new materials for construction of boats and gear, the traditional/artisanal/small-scale fisheries are going through unprecedented changes with mixed consequences. In some instances, for example. the investment in a “traditional” pelagic fishing unit using purse seines now exceeds that of a 12m. bottom trawler. The advent of OBMs, the use of FRP and plywood boats, the use of GPS and even cell phones, are significantly redrawing the fisheries profile of the small-scale sector in India⁴ and contributing to a growing differentiation within the sub-sector.

The small-scale sub-sector is so much more diversified and it is difficult to recognise it as a homogenous category anymore even in terms of propulsion techniques. It is, however, difficult to beat the conventional usage of the term. A trawler whether it is 8m. or 80m. will always be seen as a ‘large-scale’ and a traditional canoe whether it is 5m. or 15m., whether it is motorised or not, would always be seen as a ‘small-scale traditional craft’. This ‘bias’ would still hold even if the trawler is built in wood and the canoe is built in FRP.

In the cut-rent scenario that prevails in India one would tend to argue that most, if not all, fishing vessels that operate within the territorial waters would qualify to be called ‘small-scale’ and this would include all fishing methods that are employed by these vessels including trawling, purse-seining, gill-netting and long-lining and any other forms of fishing. The nuances that one may associate with ‘small-scale fisheries’ may vary from state to state and one may particularly single out bottom trawling as the most destructive among these, from a biological, economic, social and an environmental point of view.

Organisations of small-scale fishermen are even getting into trade arrangements with countries in the European Union. The South Indian Federation of Fishermen Societies (SIFFS), for example, is negotiating the terms of entry into the German Fair Trade market through its biggest super market chain, *Deutsche Sea*. There also seems to be significant improvement in fish handling practices with iced fish travelling great distances to reach markets offering the best price. The quantity of fish travelling the length and breadth of the country also seems to have increased tremendously. The ‘revolutionary’ implications of these dynamic changes in the spheres of production, processing and marketing remain largely unexplored even today.

Worrying Signs of Overfishing

According to the *Handbook on Fisheries Statistics 1996*, after eggs, chicken and potatoes, fish was the fastest growing item in the food sector in India since 1950-SI, thanks to the phenomenal growth of small-scale fisheries in India. The largest share of marine fish production now comes from the mechanized sector using inboard or outboard engines in the territorial waters under the jurisdiction of maritime States.

For a detailed discussion on the characteristics of the small-scale fisheries, see Kurien, 1. 1996, where he attributes twelve characteristics to the small-scale fisheries.

⁴ *Economic Times* (10 September 2000) recently carried a story on how fishers form a significant segment of the cell-phone market of north Kerala. The South Indian Federation of Fishermen Societies (SIFFS) is supplying affordable GPS handsets to help fishers go to deeper fishing grounds.

This rapid increase in production in response to market demand from within and outside the country has come at a price. It has led to an anarchic growth of the fisheries sector with too many boats chasing a shrinking resource base. Coastal fishing vessels registered with respective maritime States, are moving into waters beyond the territorial sea as well as moving from the waters of one maritime State to another – all signs of an exhausted home fishing ground and excessive fishing capacity. Gujarat trawlers, for example, fish beyond the territorial sea and also in the waters of Maharashtra. The long line fishermen of southern Tamil Nadu, fish for shark all over the country. The *teppa* fishermen of northern Tamil Nadu, using gill-nets, fish in waters of Andhra Pradesh. The plywood boat fishermen of Kerala using purse-seines fish in Karnataka and Goa. Trawlers from Kakinada, Andhra Pradesh, catch shrimp in Orissa and West Bengal. The Central Marine Fisheries Research Institute (CMFRI) has observed that the potential of the current fishing grounds in India has already been crossed (CMFRI 1995). The FAO Fisheries Country Profile of India (FAO 2000) talks about how “India’s marine fisheries production has reached a plateau...” In the current scenario and in the absence of effective conservation and management measures, any attempt to enhance exploitation of fishery resources in the light of strong market incentives will lead to over-fishing pressures if we go by the example of countries like China and Thailand and the recent experience of Gujarat.

Gujarat, which is in the forefront of market-led development, and currently the biggest producer of fish in India, is now facing a major crisis in its marine fisheries with economic and biological over-fishing. After a phenomenal run almost unbroken, the marine fish production in absolute terms suddenly dropped by over 27 per cent to 552 000 tonnes in 1998-99, from a peak of 702 000 tonnes in 1997-98. Since the formation of the State in 1960 until 1998-99, when its total marine fish production increased seven-fold, the size of its mechanized fleet (both IBM and OBM-powered vessels) expanded 50-fold, and the value of fish production increased by over 500 times. There were about 17 0(X) mechanised fishing vessels on the register in 1998-99, of which over 14000 vessels were IBM-powered vessels (Mathew 2000).

Clearly, the stage is now set for conservation and management and if there is sufficient will and imagination this could be achieved. Adapting the Code to the national fisheries should be considered in this context. Once conservation and management could be recognized as priority areas by the Union and the State Governments then there will be an emerging context to its adaptation. The Code then could act as a checklist for setting up a management plan. It could then provide the management architecture.

Conservation and management: problems with current fisheries legislation at the national level

Applying the Code to national fisheries cannot be in a legal vacuum and framework legislation is essential for that purpose. There should also be collective responsibility of, and co-ordination between, the provincial and the central governments.

The Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Act, 1976 of India, for example, recognizes (Section 7 Para(4) (a)) the sovereign rights to conservation and management of living resources in the Indian EEZ in addition to their exploration and exploitation. Section 15 (c) further gives power to the Central Government to make rules, *inter alia*, for conservation and management of the living resources of the EEZ and Section 15 (e) for the protection of the marine environment. The basic fisheries legislation that followed this Act, *sic*, the Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981 and the Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Rules, 1982, however, do not make any mention of conservation and management and it is high time to amend these legislation to bring in these measures.

The only Indian legislation, which talks about “undertaking measures for the conservation and management of offshore and deep-sea fisheries”, is the Marine Products Export Development Authority Act, 1972 [Section 9(2)(a)]. The Act, however, does not define what it means by ‘conservation and management’. It also has a provision to meet the costs of conservation and management of waters beyond the territorial sea from the Marine Products Export Development Fund [Section 17.2 (c)]. Marine Products Export Development Authority (MPEDA), however, has never invoked this legal provision.

Conservation and management: problems with current fisheries legislation at the State level

The above legal instruments only apply to the EEZ, which is the marine area beyond and adjacent to the territorial waters and which contributes only negligibly to the total marine fish production of India (about 0.01 per cent!). According to the Seventh Schedule, Article 246 of the Constitution of India, fisheries within the territorial waters of India are under the jurisdiction of the State Government and fishing and fisheries beyond territorial waters are under the jurisdiction of the Central Government. The pressures of over-fishing are felt most acutely within these waters and the most important requirement towards conservation and management, therefore, would be to reform the State-level conservation and management regime.

As far as the State Governments are concerned, the most significant drawback in the legal system for marine fisheries is that, in spite of the resources being over-fished they are yet to introduce conservation and management measures. Nor is there any legal mechanism to address inter-State movement of fishing vessels. The main emphasis of the Marine Fishing Regulation Act of the maritime States of India (except for Gujarat, which is yet to have a legal instrument for its marine fisheries) is on regulating fishing vessels in their respective 12-mile territorial sea mainly to protect the interests of fishermen on board traditional fishing vessels.

The Act was based on a model piece of legislation prepared by the Ministry of Agriculture, Government of India, more than two decades ago. The Act was drawn up at a time when the coastal fisheries were mainly divided into mechanized and non-mechanized fishing units and when there were tremendous conflicts between the two sub-sectors over access to fishing space and resources, sometimes even leading to destruction of life and property (Kurien, 3 and Mathew, S. 1982). It has been primarily used to separate trawlers from other gear groups. In this sense, the Act has been mainly used for the purpose of maintaining law and order at sea rather than for fisheries management. In the light of developments in the traditional sector over the past fifteen years, this Act looks very much outdated today and needs to be urgently amended.

Conservation and management: need for compatible legislative regimes at the national and State levels

The Indian fisheries legislation, in general, seems to target the fishing vessel rather than the fishery *per se*. This is true of Merchant Shipping Act 1958, MPEDA Act 1972, the Maritime Zone of India (Regulation of Fishing by Foreign Vessels) Act 1981 and Rules 1982 as well as the Marine Fishing Regulation Act of the Maritime States. What seem to be essentially regulated are access to fishery resources in time and space. Technical specifications for the fishery are sometimes prescribed but they do not seem to be followed up in strict implementation (Mathew op. cit.).

The need for *conservation and management* of marine fisheries should be seen in proactive terms and consistent with the UNCLOS and other international legal instruments that India has acceded to. They should refer to all of the rules, regulations, conditions, methods, and other measures, which are required **to rebuild, restore, or maintain any fishery resource and the marine environment**, as qualified by relevant economic and social factors specific to the Indian States and taking into account fishing patterns- the interdependence of stocks⁵. It is also important that conservation and management are made the collective responsibility of the Union and the State Governments in an integrated manner.

The emphasis has to be on the fishery rather than on the fishing vessel. The above focus would help us look at the impact of a particular fishery on associated and dependent species of the target stocks. It will further give room to address issues of social dimension within the scope of fisheries management. It would also allow for bringing into the scope of conservation and management, not only the supply-side, but also the demand-side of fisheries.

Adopting the proactive principles to rebuild, restore, or maintain any fishery resource or the marine environment will be a major step ahead of the reactive principles to *regulate, restrict and prohibit fishing by*

⁵ See Article 61 of UNCLOS.

fishing vessels, as currently emphasised under the Marine Fishing Regulation Act of the maritime States. It is high time now for the Ministry of Agriculture of the Union Government to draft and circulate a model fisheries conservation and management bill amongst the littoral States and Union Territories.

The dynamism of Indian small-scale fisheries also clearly highlights the need for greater co-ordination between States and between States and the Union Government. Towards this, it will be better if marine fisheries move from the State and Union List respectively into the Concurrent List. This could facilitate the maritime States of India and the Union Government to work in a co-ordinated fashion towards conservation and management. This could also mean setting up, like in several other countries, a coordinating body for the fisheries resources of the country with representatives of all stakeholders. A similar model already exists in MPEDA. This could perhaps be set up under Article 263 of the Constitution of India, which makes provisions with respect to an inter-State Council, which could be set up to make recommendations on any subject especially for better co-ordination of policy and action with respect to a particular subject.

Conservation and management of fisheries resources should, needless to say, go hand in hand with the protection of fish habitat. Measures are thus needed to protect the marine environment from pollution. The Water (Prevention and Control of Pollution) Act, 1974 has provisions to protect the coastal sea from land-based sources of pollution but subject to the discretion of the State Government. This Act, in conjunction with the Coastal Regulation Zone Notification of 1991 under the Environment (Protection) Act, 1986, could contribute to regulating land-based sources of pollution in the coastal waters up to a maximum distance as decided by the State Government. So far, using this measure, no known attempt has been made in any maritime State of India to protect the coastal waters from land-based sources of pollution.

Adapting the code: the need to engender 'ownership'

(1) Engendering 'ownership among State departments offisheries

The interlocutors of conservation and management in international conventions and agreements are not necessarily those who are the actual practitioners of the profession. In some cases they are not even the responsible Government agency. In India's case, for example, the Union Ministry of Agriculture is the nodal agency for FAO and it represents India in all FAO processes and this included the process that led to the development of the Code. State Governments that have greater jurisdiction over fisheries within the territorial waters, where the largest share of India's marine fish production originates from, never participated in the process. This is because participation in international conferences and implementation of treaties, agreements and conventions are designated by the Constitution of India to the Union Government⁶. State Governments can participate in such processes only if they are part of the national delegation. Since an effort was not made at the outset to ensure their participation in the development of the Code it may not be that easy to foster 'ownership' amongst these governments. This can be overcome, however, with initiating a process for the development of a national Code with the participation of all maritime State governments and other stakeholders,

Discussing the 1994 Code of Conduct for the International Red Cross and Red Crescent Movement and NGOs in Disaster Relief, Lancaster (1998) points out

advancing practice in the manner envisaged in the Code is not as simple as merely the adoption of the Code by agencies. This is because the practice only changes when practitioners themselves acknowledge that change is essential and accept that the 'old ways of doing things is over'. Urea! life practice is to change to reflect the standards espoused in the Code, then the 'belief, vision and values of agencies and their practitioners individually, must confirm to these standards (emphasis-ours).

For meaningful application of the Code of Conduct for Responsible Fisheries the State Governments should develop a sense of 'ownership' of the Code, which should then further go down to the level of the producer, processor and trader/exporter and the fishing community. Even if the Code is a prescriptive instrument,

⁶ Union List, Seventh Schedule of the Constitution of India.

ownership could gradually percolate down. India, historically, has a tradition of starting on the prescriptive plane and then moving down. What is most significant is to have the consultative approach with all stakeholders to build up this sense of ownership at the grass roots. A time frame should be set to achieve this goal.

(2) Engendering 'ownership' in the fishing industry

A sense of ownership amongst the practitioners of marine fisheries could also be better engendered if the State fisheries departments and the Union Ministry of Agriculture publicly defend the interests of the sector. The fisheries departments, for example, are not known to take any position in India on the importance of protecting coastal habitats, which are very significant for the regeneration of fish, especially when they are young. The quantity and quality of nutrient-laden freshwater discharged into the coastal areas are quite significant for regeneration of fish. In various debates on dams, when engineers lament water being 'wasted' or drained out to the sea, no fisheries department has ever cared to explain the importance of this discharge to maintain the appropriate salinity regime for the regeneration of fish, which is crucial for the fishing industry that provides a livelihood to millions of people and which brings foreign exchange in millions of US dollars to the national exchequer.

It is the duty of the State fisheries departments and the Union Agricultural Ministry to defend the interests of this sector and to make sure there is sufficient recognition of the pre-eminence of this sector because of its historic rights to the coastal waters and because of the Constitutional obligations arising out of Article 39 (a)⁷. A degraded coastal habitat certainly will impinge upon means livelihood of the participants in the fishing industry. In Japan, for example, property rights are given to fishing communities and any industry that would like to set up a unit in the coastal area has to first negotiate with the community and buy this right.

Protecting the rights of the coastal fishing communities is an important requirement since, in most parts of India, they are fully dependent on fisheries for their life and livelihood. Even in situations where fishing communities' benefits from an increase in disposable income, levels of education are generally low and very few alternative jobs exist for fishworkers⁸. It is therefore paramount for the fisheries administration to defend the larger interests of the fisheries sector against other conflicting interests from outside. This is necessary to build up a relationship of trust between the State and fishing communities, which is essential to introduce a sense of ownership for legislative and prescriptive measures amongst fishing communities—a significant requirement if the Code is expected to be adopted.

(3) Engendering 'ownership' amongst fishing communities

There are hardly any tangible incentives for the fisheries practitioners to move to a management mode as long as open access regimes exist. This is another area, which is linked to the issue of 'ownership'. Unless there are recognised rights that are granted to the fisher and his/her communities, it is difficult to expect him or her to act responsibly towards the resource. This underscores the importance of recognising existing access regulation regimes as well as the need to move towards rights-based fisheries, which are equitable and conservation-oriented in nature. Since India has a large coastal population, sustainable and labour-intensive gears and techniques should be promoted within a rights-based regime.

The Code in the entire text makes only three references to the notion of 'access' to fishery resources in waters under national jurisdiction and all these are in the context of small-scale fisheries or coastal fishing communities. The most important of these is under Article 6 on General Principles (para. 18) where the

7 Which states that The State shall, in particular, direct its policy towards securing (a) that the citizen, men and women equally, have the right to an adequate means of livelihood'.

8 This is true of both developed and developing countries. According to an OECD study, "Fishers and fish processing workers typically have low levels of formal education, putting them at a disadvantage against other workers competing for the same jobs. In general the percentage of people of working age living in rural areas who are college or university graduates is one-quarter to one-half that of those living in and around cities; the relative proportion of college graduates within the fishing industry is probably even less. Tradition and strong roots to the community, further contribute to the low level of labour mobility." (OECD 1997).

Code talks about protecting the preferential access of small-scale fishers and fishworkers to traditional fishing grounds and resources in the coastal waters⁹:

6.18 Recognizing the important contributions of artisanal and small-scale fisheries to employment, income and food security, States should appropriately protect the rights of fishers and fishworkers, particularly those engaged in subsistence, small-scale and artisanal fisheries, to a secure and just livelihood, as well as preferential access, where appropriate, to traditional fishing grounds and resources in the waters under their national jurisdiction.

The second reference in the Code to access is in the context of aquaculture development where article 9.1.4 talks about the need to protect the access of local communities to fishing grounds while developing aquaculture. The third reference is under the Article on Integration of Fisheries into Coastal Area Management, where the States are asked to take into account the rights of coastal fishing communities while determining access to coastal resources.

The historic rights principle thus seems to be recognized under the Code within waters under the national jurisdiction. The Code also implicitly seems to recognize the vulnerability of coastal small-scale fishing communities to several conflicting activities in the EEZ and the coastal zone and seems to suggest that some form of ‘protection’ through State intervention may be warranted. The vulnerability factor is accentuated by the absence of property regimes, the absence of a legally recognized exclusive form of property right to the marine waters to coastal fishers and their communities. Many of them have historically been making a living from fisheries. A similar history of engagement with agriculture, for example, would have automatically led to exclusive possession rights.

The ‘preferential access to small-scale fishers’ theme is embodied in Christy’s notion of creating territorial use rights in fisheries or TURFs, as they are popularly called (Christy 1982). Within this framework, Kurien proposes the need for an aquarian reform to bring in the notion of equity in a labour-intensive fishery, especially in a labour-intensive, tropical context. These are (i) to restrict the right to fishing assets for use in coastal waters exclusively to those who fish and (ii) to have a ceiling on the number as well as the scale of fishing assets (Kurien op.cit.). Specific measures could include a ceiling on the number of boats that could be actually owned by one individual or family¹⁰.

There could also be non-transferable boat quotas that can be introduced into the fishery to prevent concentration of wealth from a public property in the hands of a few. Both these measures could be consistent with Article 39 (b) and (c) of the Constitution of India, which has already been adopted by the Tamil Nadu Marine Fishing Regulation Act¹¹.

Limited access regimes are the fence within which responsible fisheries can reasonably expect to be institutionalized. The basic fisheries legislation should, therefore, allow for these access rights to be defined and legitimised in a consultative manner and also to allow for their devolution down to the *panchayat* level within the framework of rights and duties (Article 6.1 of the Code). Rather than reinventing the wheel what is required is the creative adaptation of existing arrangements, which generally are strong on distribution but weak on conservation and management (Mathew 1990). They are also more cost-effective and would therefore be of greater relevance to countries like India¹². An equitable rotational access system or a similar arrangement,

The language of Article 6.18 was a contribution of ICSF to the Code process. It was accepted after a heated debate because of the reference to “preferential access”. This was strongly objected to by the New Zealand delegation. It got accepted, thanks to the invaluable support that the ICSF proposal received from the Peruvian delegation, headed by the highly respected veteran of the UNCLOS process, Ambassador Arias Schriber of Peru. The price to pay to New Zealand of course was the clause “where appropriate”

10 See, for example, the Fisheries Development and Management Policy (1994) of the Government of Kerala.

11 Article 39: “The State shall, in particular, direct its policy towards securing

(b) that the ownership and control of the material resources of the community are so distributed as best to subserve the common good;

(c) that the operation of the economic system does not result in the concentration of wealth and means of production to the common detriment;”

12 See Willmann (2000) for a summary of Group and Community-Based Rights systems.

should not be one where the practitioners of the system get an equal chance to wastefully accumulate fishing assets' and to contribute to overfishing pressures. In such situations the State should help redefine the objectives to bring in the notion of conservation and management.

Addressing Information Gaps

To have relevant information that will help us plan our fisheries in a meaningful fashion is an important requirement. We also need to have better tools for gathering information. To give a few examples, we do not yet know how reliable our stock assessment estimates are since they are based on a model developed for the temperate ecosystem. We have no idea about the impact of fisheries on associated and dependent stocks. We have no way to find out the relative impact of fishery-dependent and natural factors on our fish stocks. Is it El Nino or is it excessive fishing pressure that is responsible for decrease in production of some of our pelagic species? How much do we know about the impact of habitat degrading activities like pollution, reclamation, mangrove deforestation, and dams on the biological productivity of fisheries resources? What is our understanding of our marine and coastal ecosystem?

The reliability and comparability of our fisheries data needs to be improved and raised to international standard. We have no reliable information except for our export statistics. We do not even have a fisheries census for India. The categories, 'full-time', 'parttime' and 'occasional' fisherfolk used by the Ministry of Agriculture seem to serve only a limited purpose in planning for fisheries management and development. We have no real data on women, men and children, gainfully employed in fisheries-related activities. We need a standardisation of terms, to begin with. To describe fish stocks, for example, several terms like 'standing fishable stock', 'marine fishable stock', 'maximum sustainable yield', 'total potentiality' and 'total potential yield' are interchangeably used,

The craft-gear combinations currently in use in India are not classified according to any recognised system and it urgently needs to be done based on fishing power and the employment potential. Once such information is generated it will be easier to objectively identify which are the small- and which are the large-scale categories. This would be a vital piece of information to take management decisions.

We have no clear picture of the level of investment in our fisheries, either aggregate or sub-sector wise. Although we have a rough picture about the quantity of fish that is produced—India is the eighth largest fish producer in the world (1998 figures of FAO)—we do not have a clear understanding of the total value of fish that is being produced and marketed within the country. We have no idea about trans-border trade of fish within India. We have no reliable information on fishing capacity by number of fishing units and their fishing power, including the specifications of craft, gear and engine.

We have no clear understanding about the extent of migration into fisheries from other sectors and vice versa. The system for collecting basic statistics also seems to be quite inadequate. There are conflicting figures on fish production. In an annexe, for example, we have shown the fish production statistics of Gujarat as compiled by the State Government and CMFRI respectively. There is considerable divergence between the two sets of figures. The functions of some of the national agencies also seem to overlap. Assignment of responsibility to a particular official/scientist in various ministries and departments does not seem to match his/ her technical competence. Fisheries matters also receive very low priority in a country, which does not yet have a strong maritime perspective.

The absence of proper co-ordination and lack of incentives seem to prevent the large number of marine research centres - one of the highest amongst developing countries in the world - from bringing out quality information in a timely and complementary fashion. These centres employ some of the most well qualified personnel in fisheries in the country, especially biologists. There has, however, to be more hiring of ecologists, economists, sociologists, political scientists as well as those trained in business administration. Unlike countries like China, the links between these research centres and the industry, however, are very weak in India.

Coming to terms with this shocking lack of information is perhaps the first step required to move towards responsible fisheries. From an employment, income, foreign exchange and national security points of view,

marine fisheries are a significant sector and the economic profile of this sector demands generation of more diversified, reliable and accessible information towards a common set of objectives and goals. This would call for developing a national marine fisheries policy through a truly consultative process.

Conclusion

Over and above political considerations, the countries that have adopted the Code are the ones that have reliable information about their fishery resources and fishing fleets. In India, we still have to base our understanding of our fisheries on surmises or outdated pieces of information. Moving towards a knowledge-based system for fisheries management and development is the first step towards applying the Code, whether or not we talk about large-scale or small-scale fisheries. And while deciding to apply the Code, we should avoid compartmentalisation of our approach. Selective application of the Code to a particular group of fisheries may prove to be counter-productive. What we need is a holistic perspective and a mechanism to arrive at collective responsibility, compatible between different user groups. This also raises questions about political will. In a country where fisheries contribute to a little over one per cent of the GDP (at current prices) and where export earnings from the sector are a little over three per cent of its export earnings, it may be difficult to generate sufficient political will to undertake all the changes that have been proposed. A concerted effort in this direction certainly needs to be made.

Once the central goal of conservation and management and the role of a consultative mechanism to achieve this goal are recognized and once the importance of limited access regimes is accepted in principle, the marine fisheries sector could move towards responsible fisheries, based on the principles and standards of the Code. Almost the entire fish production of India comes from the small-scale sector and adapting the code to small-scale fisheries is tantamount to adapting the Code to Indian fisheries. The pressures of over-fishing are most severe in the territorial waters, and small-scale fisheries are the most significant presence in these waters.

One of the important peacetime tasks of the United Nations and its agencies is to help set priorities and standards. In a world where member nations and peoples are too preoccupied with a multitude of issues, it brings to the attention of the global community the need to do something different, to change tack, on issues that may have a bearing on our future. The overwhelming concern that the UN generated for environmental issues since the 1972 Stockholm Conference is **an eloquent example. The UNCLOS is another of those** "success" stories. The decision-making process, which is very often through an elaborate consensus-generating exercise, gives an opportunity to bring in a sense of urgency to issues that are often not systematically addressed under existing national arrangements. Such a process also helps to influence and be influenced.

More than standard-setting, **one would argue that the greater relevance of the Code is in making us think** about the state of our fisheries resources **and in putting some pressure on us to set our priorities right. When** we read the Code and look at Indian fisheries it shocks us. **Can the Code help us set down our main priority** as conservation and management? **Could we then prime up our fisheries to make it more responsible within** a reasonable time frame?

To revamp a mind-set, which is orientated towards 'development' through production and marketing, to one that is orientated towards development through conservation, management, habitat protection and value addition requires a radical change in our thinking. It calls for a multi-dimensional perspective, a 'cubist' approach to fisheries management and development issues.

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Marine Fish Production
(Figures of CMFRI and the Gujarat Government)

Year	CMFRI	State Govt.	Difference
1999	580,774		
(98-99)		(551,660)	
1998	542,696		
(97-98)		(702,355)	
1987	574,774		
(96-97)		(660,08)	
1996	572,055		
(95-96)		(598,351)	
1995	531,646		
(94-95)		(645,261)	
1993-94		619,836	
1992-93	4,27,330	6,09,103	1,81,773
1991-92	4,64,465	5,30,017	65,552
1990-91	3,64,369	5,00,462	1,36,093
1989-90	3,44,281	4,32,364	88,083
1988-89	2,21,380	4,14,075	1,92,695
1987-88	2,02,699	3,27,560	1,24,861
1986-87	2,49,025	3,15,942	66,917
1985-86	2,75,275	3,06,577	31,302

(Source: CMFRI and Gujarat Fisheries Department)

OPERATIONALISING THE CODE

Kee-Chai CHONG*

Purpose: **To promote and guide/facilitate/moderate** discussion on the preparation of guidelines to the Code of Conduct for Responsible Fisheries: Fisheries Management - Coastal Fisheries. ***Undoing past less responsible practices in fisheries.*** Not necessarily new ways to improve practices but more responsible practices to harvest fish to promote and ensure conservation and sustainability. As a corollary, what prevents end-users from adopting the *regionalized* guidelines from the Code and promote their greater and wider adoption at the local level.



Myth: Need to disabuse the myth that fisheries management is only carried out at sea while they are fishing and thus require a large number of expensive patrol boats and lots of enforcement staff. Nothing is further from the truth. Fisheries management activities can be wholly shore-based and carried out on land before the fishers leave the fishing port for their fishing grounds or on their return from fishing. Of course, patrolling at sea (when the government can afford it) strengthen further compliance of fisheries management measures.

Constraints to Implementation: Emphasis is on constraints inhibiting or preventing greater and wider implementation at the local, national and regional levels.

Guidelines Formulation (food for thought)

Orientation of Guidelines: Who are the guidelines prepared for? For whom and at what level? Bear in mind that responsible behaviour is not automatic. That is to say people do not automatically fall in line, for example to queue unless instructed to do so. How can the guidelines proposed be made a part of good practice? Note that it is good practice and not responsible or good behaviour? Guidelines are prepared, taking into account the very opposite of what is done wrongly, among others to induce change from bad or wrong to good or correct practice.

A way is needed to get fishers and other stakeholders to become involved, nay more involved and to take more responsibility to manage the fisheries on which they depend for their food and livelihood security. This is because past government-led effort has not worked, resulting in overfishing and degraded habitats and environment. New government-led initiatives must be more inclusive and more participatory in orientation from decision-making to implementation. Give fishers and stakeholders a voice and choice. Develop guidelines with this in mind.

[NOTE: The Code and Guidelines based on the Code must meet YOUR COUNTRY's requirements/needs. In other words, the Code from the view of your country. Emphasis must be placed on SOLUTIONS more than Stating Problems again and again. Turn solutions to problems into guidelines].

Practical

Doable! actionable

Simple and straightforward

Not expensive to adopt/implement

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Must be accompanied by supplemental livelihood options

Income generating activities to diversify sources of present income from (mainly) fishing. This is partly because guidelines may propose restrictions on fishing. If they are restricted from fishing, another source of livelihood must be provided.

Must be accompanied by funding to encourage adoption of guidelines (who will pay for adoption or management?)

Build and integrate budgetary requirements into government budget

Fund raising at local level

Evolve self-financing mechanism, if possible and practical

Must be provided or accompanied by alternative(s) proposal

Not enough to say or tell the people don't do this or don't do that

Must provide and tell them what to do in place of the don't do this and that – provide alternative “do”

Must be very specific

Not enough to talk about overfishing – identify what it is

What species in coastal waters (up to 3-5 nautical mile or 50 fathom)?

Catch composition

Size composition

Reproductive condition

Endangered species (if any)

What stocks?

Different species or stocks have different population dynamics and production potentials

What areas?

Nearshore

Offshore

Within 12 mile territorial seas

Within 200 mile EEZ

Is it growth overfishing?

Is it recruitment overfishing?

[Note: Unless we are more specific, guidelines will also be generalised and be of little use to the end-users]

Today fisheries management is no more solely about fisheries biology and stock assessment/population dynamics of the fish stocks BUT more on the human factor. Human over-population and management of fishers more than anything else – therefore guidelines must be tailored to responsible behaviour to prevent misconduct of the fishers and other resource users.

So far, management is a response to development gone wrong. Because of overfishing due to over-crowding, over-capitalisation, habitat degradation from pollution and other destructive activities, we are only now responding through proposing management of development. This is a wrong approach. Management should

has e been precautionary and pro—active. Manage before problems arise. So our guidelines must consider these past lapses of the government and resource users as well as non—users.

In preparing guidelines, existing fisheries acts and legislations, laws and regulations – and measures must be consulted to develop the guidelines. So also the Code of Conduct for Responsible Fisheries and its various articles, provisions and technical guidelines produced by FAO as well as those by SEAFDEC and other institutions. Revision and amendment to existing laws, rules and regulations can be proposed. Our guidelines must be as comprehensive and realistic as possible for them to be effective.

Guidelines proposed must address the salient key issue: What is the value or worth of the fisheries to the people? Management will be carried out **only** if it is beneficial or economical and worth their effort. Fishers are not irrational!

Proposed guidelines must also address to the extent possible the costs and benefits of adoption and non—adoption and other consequences of non—compliance of management. Emphasize Benefits:

- Less Waste

 - Less Resource Waste

 - Less Energy Waste

- Less Costs Higher Returns and Profits

 - More Fish in the Future and Future's Future

 - “Green” Fish from Managed Fisheries

For guidelines to be adopted and implemented, some coordinating mechanism vested in an institution at the national, State, district and local level to promote their adoption must be present. Without this coordinating function, cooperation among all the stakeholders may not be forthcoming or easy. The need for a close coordinating and cooperative working arrangement among all the stakeholders cannot be over—emphasized.

It is very important to integrate proposed guidelines into existing system of governance, administration and management of the coastal areas (e.g. integrate fisheries into integrated coastal zone management).

What incentives or disincentives can be provided for greater and wider adoption? implementation of proposed guidelines you are preparing? What about disincentives for non-adoption? Again the costs and benefits of adoption!

Proposed guidelines must be prioritised and not a shopping list of guidelines.

Local Priorities and Needs

Proposed guidelines must deal with conflict resolution among the different stakeholders, HOW? Key to our guidelines

legal basis and legitimacy of management. Without legitimacy in the eyes of the stakeholders, i.e. for example fishers, as well as sufficiently severe penalty or punishment for violation, compliance may not be high.

Classification or categorisation of guidelines according to or relating to:

- Applicable to Fishers

- Applicable to Government (policy, programme, other instruments)

- Applicable to Technology

- Applicable to Resource Base (habitats/ecosystems)

- Applicable to Other Stakeholders

Market Intermediaries

Input Suppliers

Consumers

Disinterested/Remote/Bystander Stakeholders

Reduction of Capacity – how to go about it?

Capacity defined – criteria

Unit of Measure/Unit of Analysis – in terms of:

Crude Measures

Number of Fishers

Number of Boats

Number of Nets/Harvesting Equipment

Others

Refine Measures (more objective?)

Tonnage (GRT)

Others

What do Guidelines Mean?

Personalising responsibility or expected to take more personal responsibility to act or do something about conservation and management.

Example:

Principle fishers will take appropriate measures to pursue the ecological sustainability of (your country) fisheries

Guideline: ... develop protocols (including when practical and appropriate, the use of selective fishing gears and practices) regarding the catch of targeted (and non-targeted?) resources which n-ray jeopardise the health of the fisheries stocks

Method:

Principle is “what is needed?”

Guideline is “how to do it to achieve need?”
(to operationalise principles)

Last Word: Prepare guidelines to meet and serve your country's need for responsible fisheries.

STATE - GUJARAT

General Information

Gujarat is the northern-most maritime State on the west coast of India situated between 20.1 and 24.7 degrees latitude and 68.4 and 74.4 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 area of the State is 195 984 sq. km and the population 41.3 million. The population density is 211 persons per sq. km according to the 1991 Census. The effective literacy percentage was 52.21. In the case of males it was 64.13%, while it was 39.29% for females. The urban literacy rate was 73.08% and the rural 44.69%.

The State is presently divided into 25 revenue districts of which 13, Kutch, Rajkot, Jamnagar, Porbandar Junagadh, Amreli, Bhavnagar, Kheda, Anand, Bharuch, Surat Navsari and Valsad, are coastal districts.

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 Khambhat and the Gulf of Kutch, are the characteristic of coastal Gujarat.

The coastline of Gujarat is 1 600 kms long and salt marshes, sand-belts and gravel patches mark the topography. The southern coast of the Gulf of Kutch is characterised by innumerable coral reefs tidal mud flats and coral islands. The Rann of Kutch is a vast expanse of tidal mud flats flaked with saline efflorescence.

The district-wise distribution of the seacoast is as follows:



District	Coastline (km)	Share (%)
Kutch	406	25.4
Rajkot	26	01.6
Jamnagar	343	21.4
Junagadh (including Porbandar)	26	16.3
Amreli	62	03.9
Bhavnagar	152	09.5
Anand (including Kheda)	51	03.2
Bharuch	127	07.9
Surat	83	05.2
Valsad (including Navsari)	90	05.6

Fisheries Resources

The Gujarat coast, including the two Gulfs, is blessed with physical features congenial to the development of fisheries. The 1 600 km long coastline accounts for 19.79% of the total coastline available to the country.

The area of the continental shelf of Gujarat is estimated at 184 000 sq km and it is 34.07% 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 gradient of the **shelf** is estimated at 1: 1769 at the maximum width point and 1:537 at the minimum width point. It is estimated that out of 2.02 million sq kms of the Exclusive Economic Zone (FEZ) available to the country, the west coast accounts for 860 000 sq km. The FEZ off Gujarat coast is estimated at 214 060 sq kms (12.80%).

There are 82 river systems passing through the State. Out of these, Narmada (916 kms), Tapi (321 kms), Mahi (916 kms), Sabarmati (310 kms) and Banas (260 kms) are the most important. The total river length available to the State is estimated to be 3 685 kms with an estuarine area of about 21 230 sq kms,

Fishing villages

There are 851 fishing villages and towns and 286 marine landing **centres** in the State. A large number of villages in the State fall under Kutch and Valsad district. The total fishing population, according to the 1997 Census, is about 4.49 lakhs of which there are about 2.75 lakhs in the marine sector. Of this about 1.57 lakhs are active fishermen.

Fishing crafts

The type and design of the fishing crafts deployed by the fishermen vary according to the local conditions of the fishing area and the type of fishery engaged in.

The main categories of fishing crafts deployed for the marine fish capture are:

- **Trawlers varying in overall length (OAL) from 14.8 meters onwards**
- **Wooden dhows with gill netters varying in OAL from 10 to 14.8 meters**
- Wooden dug-out canoes with **outboard** motors
- Wooden Bag **netters** (DOL) with inboard engines
- Traditional non—mechanised boats **like the** flat bottom canoes
- Wahans, Lodhiyas, machhwas, hodas and so on.

During the formation of the State in 1960, the strength of the fishing **fleet** was 3 531 consisting of 314 mechanised and 3 217 **non-mechanised boats and canoes**. **The size of these boats did not exceed 12 meters OAL.** The motors/engines were of small horsepower not exceeding 30 hp. The fishing area covered was **not beyond 25 meters depth.** **The fishing methodology was predominantly surface and bottom set gill netting, bag (DOL) netting and hooks and line fishing.**

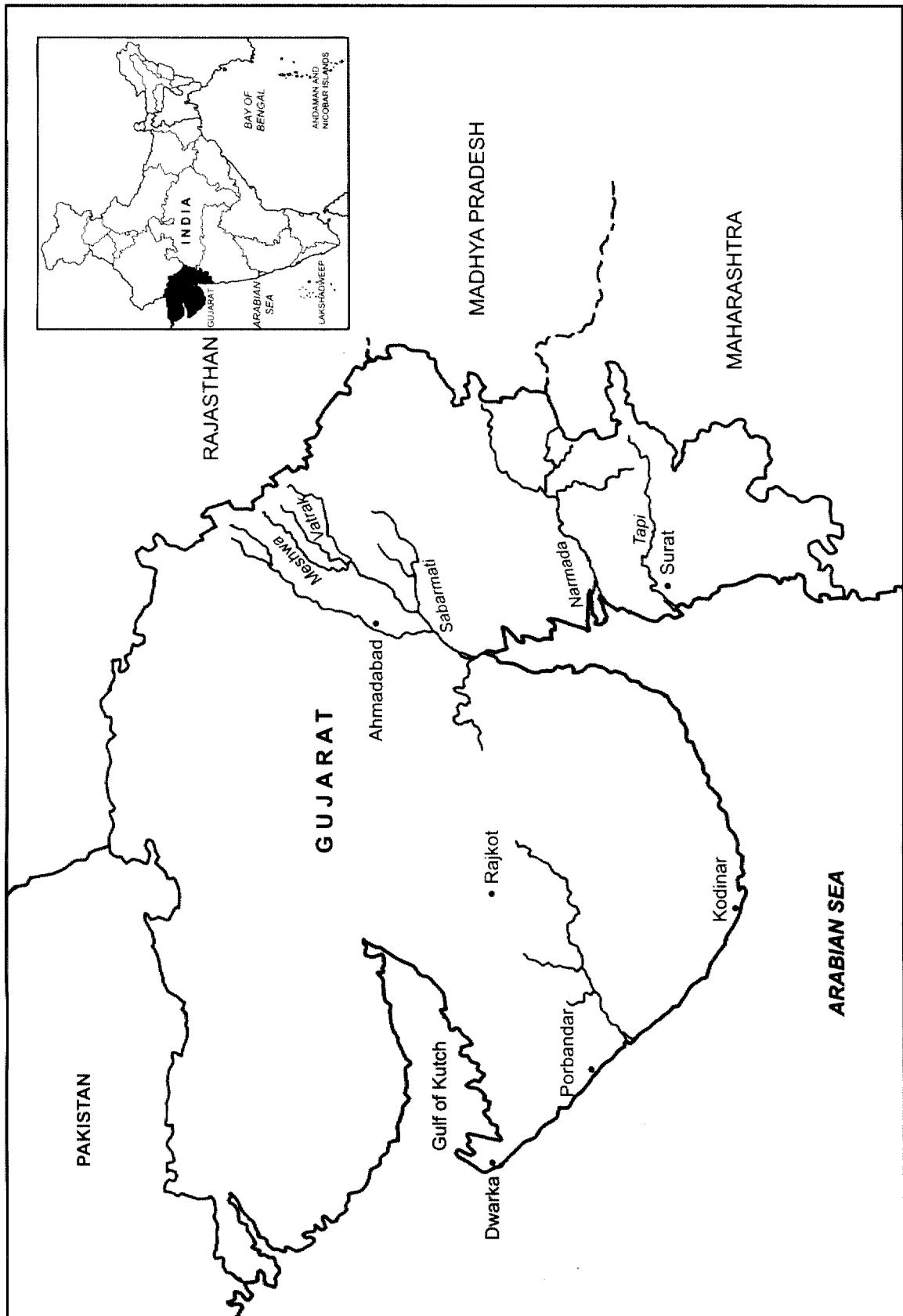
The trawling operations for demersal fish were introduced by the State Fisheries Department in 1962 through demonstration—survey operations. This is mainly responsible **for the** induction of trawlers to **the fishing fleet of Gujarat.**

Presently (1999-2000) the fishing fleet of the **State** is 26 275 strong and the category-wise split up is as follows:

Mechanised Boats

Trawlers:	6 787
Gill Netters:	3 764
Bag (DOL) Netters:	663
FRP Motorised Boats:	4 347
Wooden Motorised Boats:	1 895
Total Mechanised:	<u>17 456</u>
Non-mechanised:	8 819
Grand total:	<u>26 275</u>

GUJARAT



Fishing gear

The fishermen in the State deploy different types of fishing gear varying from the fixed engines to modern trawl nets. Excepting the trawl nets, all the fishing gear operated in Gujarat are artisan. They are staked bag net, surface drift gill net, bottom-set/ anchored gill net, anchored bag net and stake net.

The Livestock Census (1997) has estimated that Gujarat operates more than 14 lakh units of fishing gear including the trawl nets.

Infrastructure facilities

The important infrastructure in the fisheries sector are the landing and berthing facilities and fishing harbors. Terminal Divisions and supportive facilities include boat building yards, freezing/processing Plants, ice and cold storages and the drying and fish meal plants.

Fishing Harbors

There was no fishing harbor in the strict sense in Gujarat till the Veraval Fishing Harbor was developed according to a construction plan of the Food and Agriculture Organisation of the United Nations in the early 1960s. The facilities provided at that time were:

- a 18m long and 6m wide quay
- a basin of 5 meter draft with a capacity to accommodate 15 vessels at a time
- a boat wharf of the same length to accommodate 15 vessels
- a landing wharf of 300 m length and 2.5 m draft with 30 ft wide channel to accommodate 25 vessels

However, after the Fifth Five Year Plan period, adequate stress was given to this area and more fishing harbors were developed. Mangrol and Veraval were subsequently developed as full-fledged fishery harbors under a World Bank project and commissioned in 1985 and 1986 respectively. Subsequently in 1991 another full fledged fishing harbor was commissioned in Porbandar also. Fisheries Terminal Divisions were set up in all the three Fishing Harbors to carry out functional activities.

The State Fisheries Department has drawn up a Perspective Planning for Fishing Harbours development for a period of 25 years. According to this plan, 215 landing centres (including 4 seasonal centres) are to be developed. Out of the total, 25 have already been completed and 190 are yet to be taken up. Dhalai and Umergaon are being upgraded as Minor Fishery Harbours.

Processing Facilities

The major processing facilities in so far as the fishery sector is concerned are the ice and cold storages, freezing/value addition plants and storages, fish meal/pulverising units and fish transport facilities. The facilities presently available are as follows:

Type of Facilities	Units (in numbers)	Capacity (tonne)
Ice Factories	673	8 880
Cold Storages	239	21 509
Freezing Plants	60	2 413
Frozen Storage	03	30 801
Fish Meal Plant	51	43
Fish Pulversing Units	06	958
Net Making Plant	163	1 722
Insulated Vans	163	1 305
Open Trucks	326	2634
Three wheelers	898	911
Others	625	396

Ancillary Support

The State has 35 Boat Building Yards with a production capacity of about 460 boats/year. The serving facilities for these boats are offered by 61 service stations of which five are government units,

The State Fisheries Commiissionerate distributes sales tax free diesel to the mechanised boats of the fishermen through co-operative/corporate diesel outlets. The details of tax relief given to mechanised boats of the State for the past 5 years is tabulated below.

Year	Beneficiaries (In numbers)	Diesel Supplied (Kilolitres)	Tax benefits Given (in Lakh Rs.)
1995-96	6442	1,26,900	148185
1996-97	6934	1,31,628	1908.00
1997-98	6841	1,26,601	1835.00
1998-99	8127	1,26,760	1838.00
1999-00	7592	1,21,883	3412.00

A total of 1200 K Its of kerosene also was distributed amongst the OBM operating fishermen in the State. The kerosene distribution is presently limited to 250 litres/boat/month.

Present Status of Marine Fisheries

The maximum sustainable yield of fishery resources along Gujarat Coast is given below:

(‘000 tonnes)

Resources	MSY
Demersal Fin-Fish	392.4
Crustaceans	36.0
Cephalopods	26.0
Pelagic Resources	248.0
Total	703.3

Source - Fishery Survey of India, March /1995

It is estimated that 3.92 lakh tonnes of demersal resources can be harvested annually. Of which 81.6% would be from 0-50 m depth, 14.2% from 50-100 m depth, 3.9 % from 100-200 m depth and 0.3% from 200-300 m depth. The demersal resources consist of scianoids, ribbon fishes, elasmobranchs, cat fishes, perches, pomfrets, threadfin breams, horse mackerel, bulls eye, etc.

The major components of pelagic resources are Bombay duck, ribbon fishes, anchovies, seer fishes, pomfrets and clupeids within 50m depth and horse mackerel, ribbon fishes, sharks, Coastal tunas and pomfrets beyond 50m depth.

Brackish water fish resources:

As per the report of the National Commission on Agriculture (1976), Gujarat State has about 3.76 lakh hectares of coastal fallow land with varying degrees of potential for brackishwater culture fisheries, The State ranks second only to the State of West Bengal in the vastness of the brackishwater area. The State Fisheries Commissionerate has also conducted Macro and Micro surveys for the potential brackishwater fish culture in Gujarat

It is estimated that about 3(X) species of fin fish and shell fish are available along the Gujarat coast. The Fishing season is very much inter-related to the climatic conditions. By and large the fishing operations are

confined to the period from mid-September to mid-May. From mid-May onwards the sea becomes very rough and hence fishing is suspended. The maintenance works of the boat hull engines, gear and related accessories are carried out during this off-season.

The general pattern of fishing season of different fisheries in the State is as follows:

Fishery		Fishing Season	
	Saurashtra	Gulf of Kutch	South Gujarat
Bombay Duck	October-February	November-February	October-April
Pomfret	October-April	July-august	October-April
Hew Fish	October-April	March-May	October-April
Prawn	October- April	July-September October-March	October-April
Hilsa	October-April	February-April	July-September

At the time of the formation of the State, the fisheries operations were confined to the marine sector and the inland sector consisted only of some subsistence-oriented activities. The fish production therefore was mainly from the seas amounting to 79 412 tonnes. Subsequently, on account of intensification of the mechanisation programmes and the introduction of trawl fishing, the marine fish production rose to a level of 6 80 951 tonnes in 1999-2000.

The catch composition of the marine landings is as follows:

Variety	Landing (tonne)	Percentage
Crockers	224417	33.45
Bombay Duck	88 166	13.14
Ribbonfish	59616	08.89
Prawn	56 443	08.42
Pomfret	14622	01.18
Squid/Cuttle Fish	23 423	03.49
Cat Fish	24 526	03.66
Clupeids	12 733	01.90
Seer Fish	7133	01.06
Lobster	511	00.88

The catch composition of the marine and inland fish landing for past five years is given in Tables I & 2.

Brackishwater Shrimp Production

Out of the total brackishwater area available to the State amounting to 3.76 lakh hectares, the potential area is estimated at 1.87 lakh hectares. Of this about 50 000 ha could be made available for immediate development. In this connection, it is worthwhile to point that in conformity with the directives of the Supreme Court, this activity has presently slowed down considerably and CRZ regulations are hampering the development in this field.

Exports

As in many other parts of the country, the marine fishery export trade of Gujarat State has undergone a great change over the years. In the initial stages, surplus fish was mainly sun dried and salt cured and sent to Bombay, from where it was exported to the near-east countries like Sri Lanka, Singapore, Malaysia and Hong Kong. The product consisted mostly Bombay duck, golden anchovy jew fish, thread fin, brown shrimp, ribbon fish at fish, fish in maws, etc. The quantity exported or their value is not available as the dry fish

used to be sent by Country crafts to Bombay before the actual export. As the local consumption of fish in those days was hardly 7 to 8% it should be construed that more than 92% of the fish landing used to be delivered to Bombay as dry fish.

The system underwent some change by 1970, when the trawl fishing had fully established in the State. The shrimp and quality fishes used to be sent to Bombay, where the Shrimp used to be processed and exported. The details of such exports are difficult to obtain. The picture of the exports became somewhat clearer by 1972, when the Reefer vessels started calling at Gujarat Ports and many Freezing Plants started coming up in the Veraval area in Junagadh district. The figures of marine products export from Gujarat State, therefore, are somewhat clear only from the year 1972-73, when the exports were to the tune of 208 tonnes valued at Rs 0.40 crores. The marine products export in Gujarat reached to 1.23 lakh tonnes valued at about Rs. 571 crores in 1997 when Gujarat's share to the national export of marine products was 32.48% quantity-wise and 18.34% value-wise.

In the initial days, frozen shrimp used to occupy the major chunk of the exports. However, presently frozen shrimp has been pushed down to about 20% and frozen fish forms the hulk,

The marine products export from Gujarat are channeled mainly through three Ports — Veraval, Porbandar and New Kandla. Since the vessels cannot come along side the port of Veraval, the exports have since been routed through Porbandar and New Kandla Ports. Recently seafood export has started also from Pipava port.

Development Prospects and Future Projections

The fishing industry plays an important role in the economy of Gujarat. Gujarat ranks very high in respect of marine fish production amongst all maritime States of India since 1987-88. The contribution of fisheries sector to the total Domestic Products (SDP) of Gujarat is about 2%.

The projections set with regard to key aspects of fisheries sector for the years 2010 and 2020 are as follows:

- The population of fishing community, which was **3.60 lakhs in the year 1992, increased to** about 4.50 lakh in 1997 and will be 6.60 lakh in 2020 and 8.60 lakh in 2020.
- The number of fishing boats, which was 18 000 in 1992, increased to 26 000 in 2000 and it is expected to reach 36 000 in 2010 and 48 000 in 2020 respectively.
- The State has enough resources for marine as well as inland fish production. The fish production in 1999-2000 was estimated to be 6.70 lakh tonnes in marine sector and 0.70 lakh tonnes from inland sector. Keeping the present growth rate in view, the projected fish production in 2010 and 2020 is expected to be as follows:

S.No	Year	Marine Production (in lakh tonnes)	Inland production (in lakh tonnes)	Total fish production (in lakh tonnes)
1	2010	10.00	1.50	11.50
2	2020	13.50	2.25	15.75

The export of fish products from Gujarat for 1999-2000 was to the tune of 74.618 tonnes worth Rs.389 crores. This is projected to be 1.25 lakh tonnes worth Rs.750 crores in 2010, and 2.00 lakh tonnes worth Rs. 1300 crores in 2020.

Recommendations and Suggestions

Fish production and exports can be further increased through preparation and implementation of master plan on a State basis. However, it will be essential to pay attention to the following aspects in order to attain the projected production levels.

1. Suitable legislation for the protection and conservation of fish resources.
2. Exploitation of offshore and deep-sea fisheries resources. Measures like provision of artificial reefs, diversification of fishing practices and sea ranching should be taken.
3. Promotion of cage culture in enclosed water such as coves and off-shore waters for producing exportable species such as perches, groupers, breams and even tuna as is being done in Australian waters.
4. Amendment in CRZ Rules by India Government to provide for more fisheries activity contributing to the GDP of the country.
5. Promotion of Marine Ornamental Fish Culture for domestic and foreign market.
6. Aerial survey of pelagic fishery resources.
7. Breeding and rearing of Sea Bass for introduction in coastal farms.
8. Satellite imagery of sea surface characteristics for pin pointing areas of surface shoaling of skipjack tuna, yellowfin and albacore tuna.
9. Assessment and monitoring for regulation and conservation of fish population.
10. Special banking facilities to meet the needs of small-scale fishermen.

Table I. Item-wise Marine Fish Production of Gujarat for last Five Years
(in metric tonnes)

S.No	Name of Fish	1995-96	1996-97	1997-98	1998-99	1999-2000
1	SilverPomfret	10933	9810	11098	9122	11133
2	Black Pomfret	2 432	2 252	3 342	1 888	3 489
3	Bombay duck	73194	106055	114704	90493	88167
4	Thread Fin	2 128	1 916	2 258	2 138	1 937
5	Jew Fish	9 178	8 207	8 285	7 664	9 538
6	Hilsa	1576	2598	2556	1516	1710
7	Clupeids	13207	12690	15835	10066	12733
8	Coilia	19694	19355	15132	14788	16651
9	Shark	19422	15256	21387	14702	16589
10	Mullet	4170	4829	6990	5041	5377
11	Cat Fish	23570	17832	21 109	21111	24526
12	Eel	4369	3470	4948	3390	3346
13	Leather jacket	813	913	1171	963	2207
14	Seer Fish	7937	8705	7269	6278	7133
15	Indian Salmon	1 034	969	1 048	736	1 647
16	Ribbom Fish	46925	90518	78768	29691	59616
17	SilverBar	5342	5161	5366	3412	3636
18	Perch	5503	6732	6881	4757	7156
19	Small Scienids	203807	192275	216890	178442	224417
20	Shrimp	35 096	39 096	36 676	39 038	48 033
21	MediumPrawns	9711	13049	11147	10711	7284
22	Jumbo Prawns	2 333	1 225	1 000	878	1126
23	Lobster	592	542	479	442	511
24	Crab	2 082	1 403	1 707	1 205	1 657
25	Mud Skipper	1 736	1 649	1 432	1 501	204
26	Squid/CuttleFish	24079	20285	24122	18250	23423
27	Miscellaneous	67 488	73 269	80 756	73 437	85 705
	Total	598 351	660 069	70235	551 660	670 951

Table 2. Item-wise Inland Fish Production of Gujarat for last Five Years
(in metric tonnes)

S.No	Name of fish	1995-96	1996-97	1997-98	1998-99	1999-2000
1	Catla	6753	7653	8329	13115	11091
2	Rohu	7870	9351	10048	12707	9021
3	Mrigal	5 094	5 883	6 322	8 236	7 396
4	Calbasu	91	133	140	667	617
5	MinorCarp	116	147	161	140	107
6	<i>Wa//ago attu</i>	1 657	2 167	1754	2930	3 172
7	<i>H. fossilis</i>	194	165	175	167	252
8	Murrel	1383	1646	2330	2051	2747
9	<i>M.seenghala</i>	3 590	5 146	5 577	5 628	6 119
10	Feather back	480	5162	625	568	495
11	Hilsa	9346	582	9514	9673	7579
12	Mullet	2260	8849	2811	3143	2804
13	Eel	850	2626	447	271	494
14	Shrimp small	6 984	445	2 568	6 043	2 595
15	Shrimp Midurn	1143	6 373	6 848	1 753	3 023
16	<i>Macrobrachiurn rosenhergii</i>	600	475	512	764	101
17	<i>Bhetki (L.calcarzfer)</i>	26	32	56	30	52
18	Crab	133	53	645	104	75
19	Mud Skipper	333	203	35	507	726
20	Mahseer	649	603	218	10	189
21	Miscellaneous	10606	10339	11335	11561	9675
	Total	60158	65278	70450	80 068	70330

Strategy for Development
Gujarat Fisheries Vision : 2010-2020

S.No	Aspect	Vision 2010-2020	Strategy
1	Marine Fisheries	To increase marine fish production from 6,70 lakh tones to 10.00 lakh tones and 13.50 lakh tones in 2010 & 2020 respectively	1. Implement Gujarat Fisheries Act, even by ordinance, to regulate cod and mesh size in trawling; to stop killing brooder fish in monsoon by declaring close season; to stop overfishing of a particular variety of fish or in a particular fishing area. 2. Sea ranching as a pilot project to increase commercial fish population; providing artificial reefs in selected areas. 3. Deep sea fishing fleet development to tap off shore tuna fish, deep sea prawns and lobster, cephalopods. 4. More use of satellite remote sensing for potential fishing zones information 5. Mari culture/Cage Culture - groupers, perches, breams sea bass oyster, sea cucumbers, etc. 6. Infrastructure development and modernisation of fishery harbours 7. Marine ornamental fish culture for domestic and foreign markets.
2	Marine Fisheries	Fishing craft, gear and equipment modernisation; increase the number of mechanised boats	1. to modernise existing trawlers by FRP, refrigerated fish hold, fish finder, GPS, VHF radio sets, etc. 2. Converting existing boats to multi purpose fishing vessels 3. Introducing GRP boats in the fleet 4. Encouraging deep sea fishing fleet and offshore multi purpose fishing fleet 5. Demonstration of Tuna long line fishing 6. Increase the diesel/kerosene quota 7. Encourage mid waters trawls/pelagic fishing gear.
3	Marine Fisheries	Infrastructure development	1. Provide water, drainage, enough landing/berthing space at fishing harbours 2. Developing cold chain 3. Providing enough diesel outlets 4. VHF communication net work - earth station 5. Modernisation of present harbours 6. Developing dry docks at all major fish landing centers for boat repairing facilities.
4.	Marine Fishenes	To increase fish/fish product export	1. To increase catch and culture of exportable varieties 2. To encourage diversification in fish/fish products being exported from Gujarat 3. To locate new markets for export 4. To encourage processors to produce processed fish products of International Quality/Standards - to provide infrastructure facilities required for the purpose.

(Continued)

S.No	Aspect	Vision 2010-2020	Strategy
5.	Brackishwater Culture	To increase brackishwater prawn/fish culture	1. Extensive prawn farming to be encouraged 2. To encourage establishment of P.monodon hatchery in the State 3. To encourage production of prawn/fish feed in the State 4. Establish fishery estates providing all required infrastructure facilities for prawn culture farm 5. Increase extension activities in the field 6. Establish a quality control laboratory in the State
6	Inland Fisheries	To increase inland fish production to 1.5 lakh and 2.25 lakh tones in 2010 and 2020 respectively	1. To increase production from reservoirs by cage culture, pen culture, stocking advanced fingerlings using modern gears. etc. 2. Stocking yearlings in smaller water sheets as ponds tanks, etc. 3. Diversifying freshwater fish culture. 4. Developing freshwater pearl culture 5. Establishing hatcheries for giant freshwater prawn, increasing the area under freshwater prawn culture, cultivating freshwater prawns by scientific methods 6. Establish feed factory for fish/prawn in the state 7. Establish cold storage/ice factories at reservoir side to maintain quality and fetch good price for the catch. 8. Fisheries Act/Ordinance to be implemented to prevent the destruction of mature fishes in monsoon by declaring and imposing closed season; to give powers to Fisheries Department to take action against the poachers. 9. To cover Sardar Sarovar Dam and its command areas/canals under fish culture 10. To increase per hectare productivity in FFDA covered areas. 11. To develop scientifically nutritious feed for fish/prawns, etc from indigenous ingredients 12. Develop more rearing spaces and hatcheries as per BOT Policy and hand over to private parties/ Coop. Societies

STATE - MAHARASHTRA

General Information

Maharashtra, the third largest State in the country, in terms of area and population, appears as a huge irregular triangle with its base on the western coast of the country facing the Arabian Sea. The coastal region is about 720 km in length and 80 km in breadth, known as Konkan. On the eastern side, the Sahyadris or the Western Ghats flank the coastal region parallelly.

The State covers an area of 307 690 sq. km with a population of 789 lakh. The population density of the State according to the 1991 census is 256 persons per sq.km. Maharashtra accounts for 9.2% of the total population of the country. The total literacy rate is 63.10%. In the case of males it is 74.80% and females it is 50.50%.

The State is divided into 33 districts of which Thane, Mumbai, Raigad, Ratnagiri, and Sindhudurg come under the coastal region.

About 70% of the population in the State depend on agriculture and 22% of the income comes from this.

Fisheries Resources

The State has a vast coastline of 720 km and continental shelf area of over 0.11 million sq km that offers rich resources for the marine fish production in the State. The State has a total number of 184 landing centres and 395 fishing villages.

The State is endowed with rich fish and crustacean fauna comprising pomfrets, prawns, Bombay duck, mackerel and ribbon fish, which are exportable varieties. However 60% of the catch comprises low priced fish that is equally proteinous as high priced varieties. The low priced varieties are mainly dried or consumed by low-income group. The State contributes about 15% of the total marine fish production of the country (520 380 tonnes) and stands fourth in marine fish production. The foreign exchange earning from the export of marine products from the State has also reached a peak of about Rs.750 crores.

The total fishermen population engaged in fishing directly or indirectly is over 0.3 million. Besides this, over 0.2 million people get employment in the ancillary activities connected with fisheries. Thus the natural fisheries resource potential of the State enriches its economy by generating employment for the rural masses.

There has been a continuous increase in the number of mechanised boats in the cooperative and private sector also. As of today there are about 20 000 boats including 10 000 motorised and mechanised boats resulting in decrease in the per unit catch.

Present Status of Marine Fisheries

Maharashtra Marine Fishing Regulation Act, 1981

For the purpose of delimiting the fishing zones for different types of fishing boats, the Government of Maharashtra has enacted the Maharashtra Marine Fishing Regulation Act, 1981 in September 1981.



Implementation of this Act has started with effect from August 1982. Some of the important provisions of the Act are as under:

- Registration of fishing boats
- Issue of license for fishing
- Appointment of District Advisory Committee to suggest the limits.
- Issue of orders regarding limits after considering the suggestion of the District Advisory Committee
- Implementation and punishment
- Hearing appeals, etc.

For effective implementation of this Act, four patrolling boats have been introduced since October 1998. So far 770 cases have been filed against the fishing boats/traulers for violation of the Act.

Ban on Fishing During Rainy Season

The State government, as per the Marine Fishing Regulation Act, has been imposing a ban on fishing in monsoon season from 10th of June to 15th August or Narli Poornima whichever is earlier. This helps to conserve the fish fauna of commercially valuable species, to protect breeding and to safeguard the fishermen from any hazards during rainy season. The results of the ban for the last few years are encouraging.

The State Government has imposed a ban within the territorial waters of the State. However, it is not within the purview of Government to ban fishing beyond 12 nautical miles that has resulted in the violation of the Act by the fishermen. Hence it is necessary to issue specific guidelines and uniform policy by the Government of India.

Deep-sea Fishing

The fish production trends show an increase or decrease by 10% every year, which can be attributed to the natural conditions and hydro-biological changes taking place in the sea. On the whole the production trend has been stable for the last few years. As such, in order to exploit the deep-sea resources, the State Fisheries Department has introduced a scheme called 'introduction of intermediate craft'. This craft is in the range of 16 to 16.5 mOAL having modern equipment like echo sounder, GPS, etc. Walkie-talkie radio based telephone on fishing boats will facilitate the fishing operations.

Regulatory Fishery Measures

There has been a general decline in some of the economically important species. Sea ranching of these species will not be a feasible venture. Therefore, regulatory fishery measures need to be adopted for rational fisheries of such species. CMFRI and FSI should take up the studies and suggest remedial measures for improvement of the stocks and fisheries.

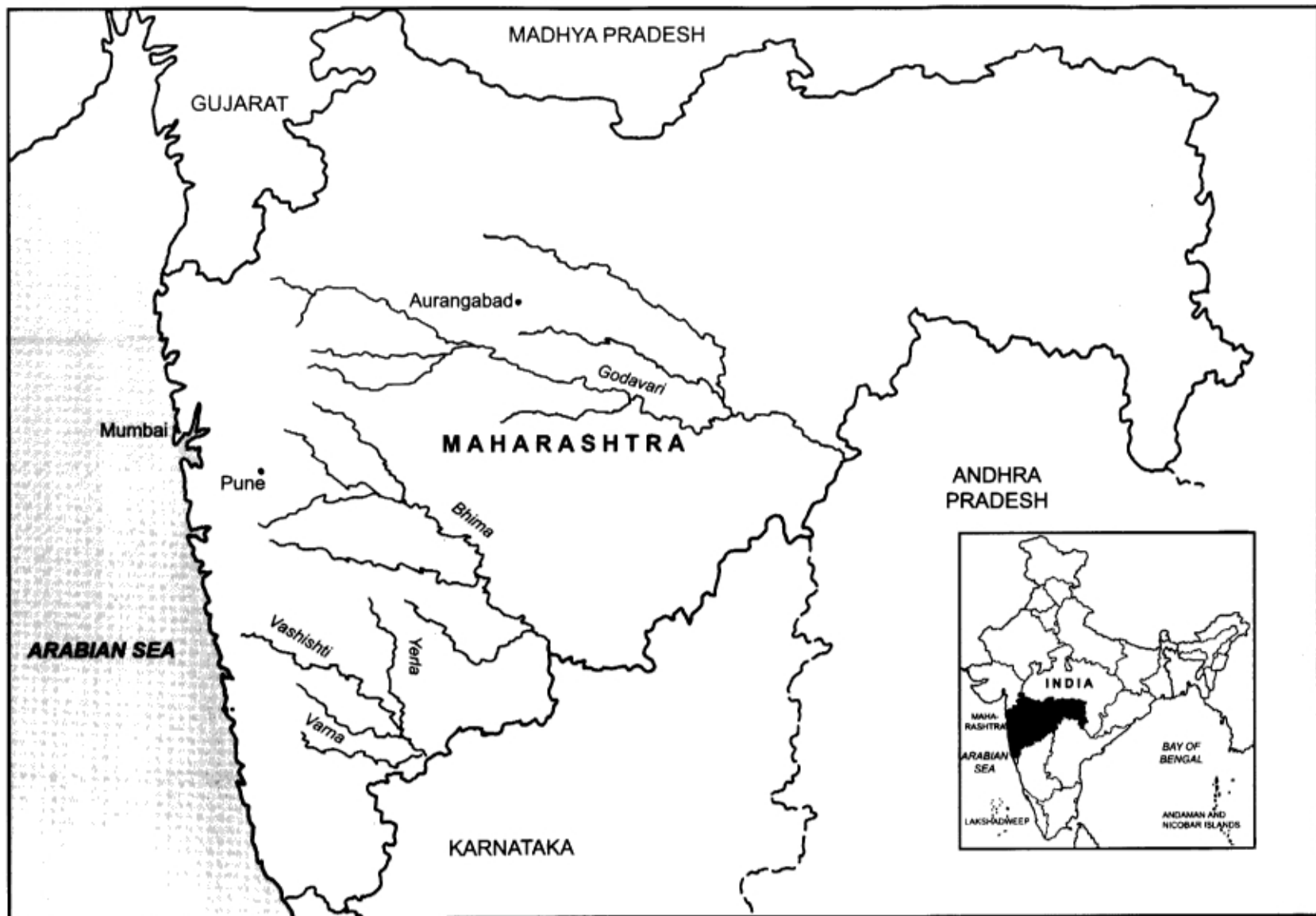
Assistance for Electronic Fishing Equipment

The operational cost on fishing trips has been increasing due to a hike in cost of ice and diesel. The State has already introduced the programme of dissemination of information of PFZ in the sea, received through satellite. In addition to this it is proposed to install electronic fishing equipments such as echo sounder, GPS, walkie-talkie on fishing boats to locate fishing shoals. These equipments not only help in saving diesel, but also facilitate shore-to-ship contact in view of safety of crew as well as fishing boats.

Improvement of Fishing Harbor and Facilities at Fish Landing Centers

Due to the rapid pace of mechanisation programme, there is considerable increase in marine fish production. It is imperative to provide landing and harbor facilities along the coast for quick unloading of fish, which is a highly perishable commodity.

At present there are 184 landing centers including 42 trawling jetties belonging to Port Department. The fishing jetties are provided with limited facilities for fish landing. Hence the State has already taken up crash programme for improvement of these landing centers. Under this programme construction of six fishing jetties is in progress.



Moreover, the State has three fishing harbours viz. Sassoon Dock (Mumbai), New Ferry Wharf (Mumbai) and Mirkarwada (Ratnagiri). The constructions of five fishing harbors is in progress.

Establishment of Indian Sea Food Infrastructure Center

The Sassoon Dock is an important landing center where many fish processing plants are located. The center has poor hygienic and sanitary conditions in the premises over which the exporters have no control. Recently it was proposed to form a holding company with equity participation by the MPEDA and the Government of Maharashtra on the lines of Kerala Industrial Infrastructure Development Corporation. The State Government has formulated a project called the Indian Sea Food Infrastructure Center (ISIC). The Center will be equipped with effluent treatment plant, ice plant, water treatment plant, quality control laboratory power supply, etc, as per the norms prescribed by the EU. The financial structure of the proposed ISIC is envisaged based on equity of 25% and debt of 75%. The equity share capital comprises 26% by holding company and 74% by the exporter.

Record Maintenance & Data Processing

The success of the implementation of the policy depends upon the formulation and implementation of schemes commensurate with the policy for which authentic up-to-date data is necessary. The State Fisheries Department had established Statistical wing in the year 1960. The Statistical wing is implementing the scheme of marine fisheries statistics that envisages compilation of information on fish catch survey, economics of fishing operations, quinquennial census of fishermen, boats and nets, capital investment in fishing industry, prices, etc. The wing is also maintaining data on inland fisheries. The Statistical wing is now computerising related fisheries data for assessing the performance of the various schemes being implemented.

The State Government is taking the following measures to increase fish production and export of commercial varieties of fishes.

- Diversification of existing trawlers to long liners, purse seiners, etc.
- Introduction of intermediate crafts for offshore fishing.
- Continuation of enforcement of MMFRA with the assistance of four patrolling boats and patrolling staff.
- Dissemination of information of potential fishing zone in the sea, received through satellite.
- Cold chain facilities (ice factories, cold storages refrigerated vans, etc).
- Improvement of landing facilities at existing jetties and establishment of new marine fishing harbors.
- Introduction of sea farming practices.
- Introduction of ship to shore communication facilities by installing two stations at Mumbai and Ratnagiri.

STATE - KARNATAKA

General information

Karnataka, formerly known as Mysore, is the eighth largest State in India in terms of area and population. It is spread over an area of 191 791 sq. km and has a population of 449 lakhs, according to the 1991 Census. The population density of the State is 234 persons per sq. km. The State has a literacy of 55.98% with a male literacy rate of 67.25% and female literacy rate of 44.34%. A predominantly rural and agrarian society, 71% of the population depends on agriculture that generates 49% of State's income.

Physical features

The State is located on the western edge of the Deccan plateau and is surrounded by Maharashtra and Goa on the north, Andhra Pradesh on the east, Tamil Nadu and Kerala on the south. On the western side of the State is Arabian Sea.

Fisheries Resources

Karnataka has a coastline of 300 Km with a rich continental shelf of 27 000 sq. km and an EEZ of 87000 sq.km with a resource potential of 4.25 lakh tonnes of fish production per annum. The State is endowed with 5.03 lakh hectares of freshwater resources with a good potential for fish production. Besides this, the State has 8 000 ha of brackishwater area. The present fish production of the State is around 2.90 lakh tonnes.

Karnataka has the highest number of mechanised boats with 6,318 crafts operating in inshore waters. The marine fish production in the inshore waters has almost reached saturation point and further attention is required to exploit the offshore and deep-sea resources.

There are 29 fish landing centers including five minor fishing harbors in the State. To overcome crowding of fishing vessels in these harbors and to assist smaller mechanised boat operators and traditional fishermen, constructions of fish landing jetties have been taken up at intermediate centers.

Though the State has vast inland water resources, most of them are rainfed and thereby the water holding capacity depends on good monsoon. Besides there is heavy siltation of these water bodies reducing the overall effective waterspread area. However, attempt has been made to develop all suitable resources resulting in increased inland fish production in recent years. The State has a leasing policy for inland water bodies categorising them based on waterspread areas and fixing priorities while leasing. The fishery rights of water bodies not leased out are disposed of by tender-cum-auction.

Supply of quality fish seed as a stocking material being a pre-requisite for intensive development, greater attention is given for fish seed production including assistance to private entrepreneurs to establish fish seed production and rearing farms. The fish seed production is around 200 million in terms of fry.



As per the ad hoc survey conducted by the State Agriculture Department, about 9.91 lakh hectares of land has become either saline, alkaline or water-logged, especially in the command areas of the major irrigation projects, due to continuous irrigation and has become unfit for cultivation. These lands have facility to draw copious water from the adjacent canals and can be utilised for aquaculture by correcting the soil and water quality. The State Government is implementing a scheme to encourage farmers to take up fish culture in these waterlogged areas.

The State Government is implementing several of the centrally sponsored schemes and State plan schemes with the main object of augmenting fish production. The emphasis is on the improvement of socio-economic condition of the fisherfolk. Attention is also given towards providing infrastructural facilities and marketing of fish.

Need for Code of Conduct

The State Government's administrative jurisdiction on management of fisheries is restricted to the limits of territorial waters. The marine living resources are widespread and migratory in nature. Important stocks of prawns, mackerels, sardines, tunas, shark, pomfrets, seers, which are available in the State's coasts, are also caught by the neighbouring States and by fishing boats operating beyond territorial waters. Multi-day off-shore/deep sea fishing vessels, chartered and licensed deep-sea fishing vessels operate throughout the year. They catch large quantities of trash fish and discard them into the sea. Continuous fishing in time and space largely affect the stock of marine living resources which calls for the code of conduct to be applied for conservation management and development of all types of fishing including integration of fisheries in the coastal area management.

Therefore the need of the hour is to conserve and manage the resources for sustainable development of fisheries that requires proper education of the fisherfolk. The marine fish landings from inshore waters is showing declining trend calling for suitable conservation measures by adapting the code.

Fish being a highly perishable food item, proper attention is required towards handling, transportation and preservation, processing and marketing. Further there should be proper management for the disposal of wastes in the fish landing centers.

In the inland fisheries sector, management of the natural resources especially rivers and reservoirs needs attention calling for adaptation of the code.

Status of Implementation of the Code in the State

The State Government is implementing the Kamataka Marine Fishing Regulation Act 1986, even before the formulation of Code of Conduct for Responsible Fisheries. Under the Act, fishing by mechanised boats with any kind of gear is banned during monsoon, that is, from 10th June to 15th August every year. The registration and licensing of fishing vessels is taken up by authorized officers. The fishing areas are demarcated for the traditional boats, purse-seiners and trawlers.

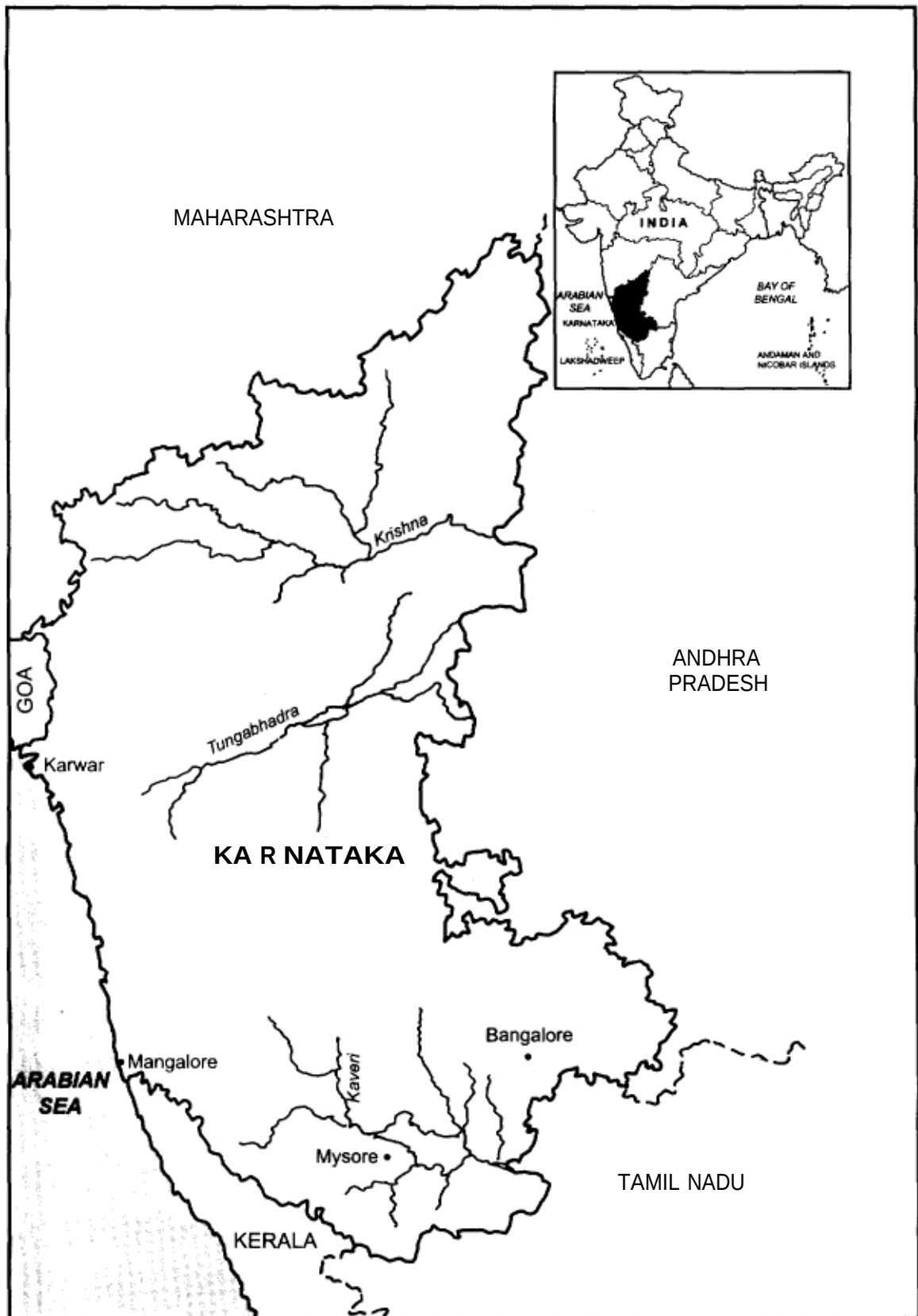
Enactment of Inland Fisheries Act for the conservation of inland fisheries resources is under consideration of the State Government.

Government of India has setup Aquaculture Authority to oversee the development of coastal aquaculture, as per the guidelines issued by the Supreme Court. Under the Aquaculture Authority, State level and District level aquaculture committees have been set up. These aquaculture committees have recommended the applications of the shrimp farmers to the Aquaculture Authority for issue of licenses to take up improved traditional system of aquaculture.

issues involved in Implementation of the Code

The fisherfolk have to be educated about the code, which has direct bearing on future development of fisheries including socio-economic impact. Although there may be initial resistance to accept the code, this could be overcome by creating social awareness through training and extension.

KARNATAKA



In the inland fisheries, suitable management practices including optimum stocking, mesh size regulation, ban on fishing by destructive gears and dynamiting are required to be enforced to achieve optimum production.

Assistance Required by the State Government for implementation of the Code

The code recognises various aspects of fisheries including capture, processing and trade of fish and fishery products, fishing operations, aquaculture, research and integration of fisheries into coastal area management. The code also identifies the need to prevent over fishing and take up conservation and management measures for sustained fisheries. Since the code is voluntary, those who are involved in fisheries are to be educated to adapt the code to have proper resources management and their environment. For this extension and education programmes have to be taken up which requires budgetary support from Government of India or from external agencies.

Thrust areas have to be identified where the code has to be adapted. For identification of thrust areas a technical committee need to be constituted. The committee can also take up constant monitoring of the implementation of the code.

The State has to create public awareness regarding the need for protection and management of resources and their participation in the management process. This requires a cadre of technical personnel. Training of personnel requires attention for which Government of India may provide financial assistance. Voluntary organisations and NGOs can be involved in the implementation of the Code,

STATE - GOA

General Information

Goa, which was under Portuguese occupation, attained independence along with Daman and Diu, on December 19, 1961. It attained full statehood on May 30, 1987. Situated between Karnataka and Maharashtra, the Terekhol river forms Goa's northern border while it is surrounded in the south and east by Karnataka and in the west by the Arabian sea. With a population of 1169793, the State has a population density of 316. The State has a literacy rate of 76.96% with a male literacy of 85.48% and female literacy of 68.20%.



Export of iron and manganese sustain the State's economy. Paddy is the main agricultural crop followed by ragi, cashew and coconut. A fleet of 1 551 trawlers and 2 450 country crafts are engaged in fishing and sustains a population of 40 000 people. Tourism is a major revenue earner for the State.

Present Status of Fisheries

Fish assumes special significance for Goa as it forms one of the chief components in the diet of about 95% of Goans. With a coastline of 104 kms and around 250 kms of inland waterways and 4 000 hectares of marshy land along the estuaries, Goa holds a vast potential for development of fisheries. With the commissioning of the Salau and Anja irrigation projects and around 100 hectares of freshwater tanks, the total freshwater resources of Goa will be 3 800 hectares.

Marine Fisheries

Among the marine catches, there are around 41 varieties of fish species, the prominent among these being mackerel and sardines which form almost 46% of the total catch. The other popular varieties are catfish, kingfish and pomirets. The commercial varieties also include prawns, squids, cuttlefish, breams and ribbon fish.

Over the last 20 years, the State has witnessed rapid mechanisation of fishing crafts initially with the loans advanced by the Government and financial assistance provided in the form of subsidies to the tune of 20% on the cost of the hull and engines. The rapid mechanisation has resulted in over 1 050 fishing vessels with around 500 of these engaged in purse seining and rest in trawling operations. Around 2 000 country crafts and canoes are engaged in gill net fishing, exploiting the rich demersal and pelagic resources of inshore and offshore waters.

Fishing vessels/crafts (in numbers)	1990	2000
Mechanised		
Trawlers	764	1092
Gill Neters	425	1100
Line	-	-
Non-Mechanised	2000	2194
Total	3189	4386

The infrastructure support plays a great role in development of fisheries. With the increase in the fishing fleet, new avenues for export of certain fishes and seafood and encouragement by the Government of India to exploit deeper waters, it has become imperative to provide necessary infrastructure and integrated shore facilities like jetties, ice factories, cold storages and other shore amenities. The Fisheries Department has already provided jetties at Malim, Chapora, Cutbona, Cortalim and Talpona. There is also a proposal under consideration for the development of Cutbona as a Mini Fishing Harbor.

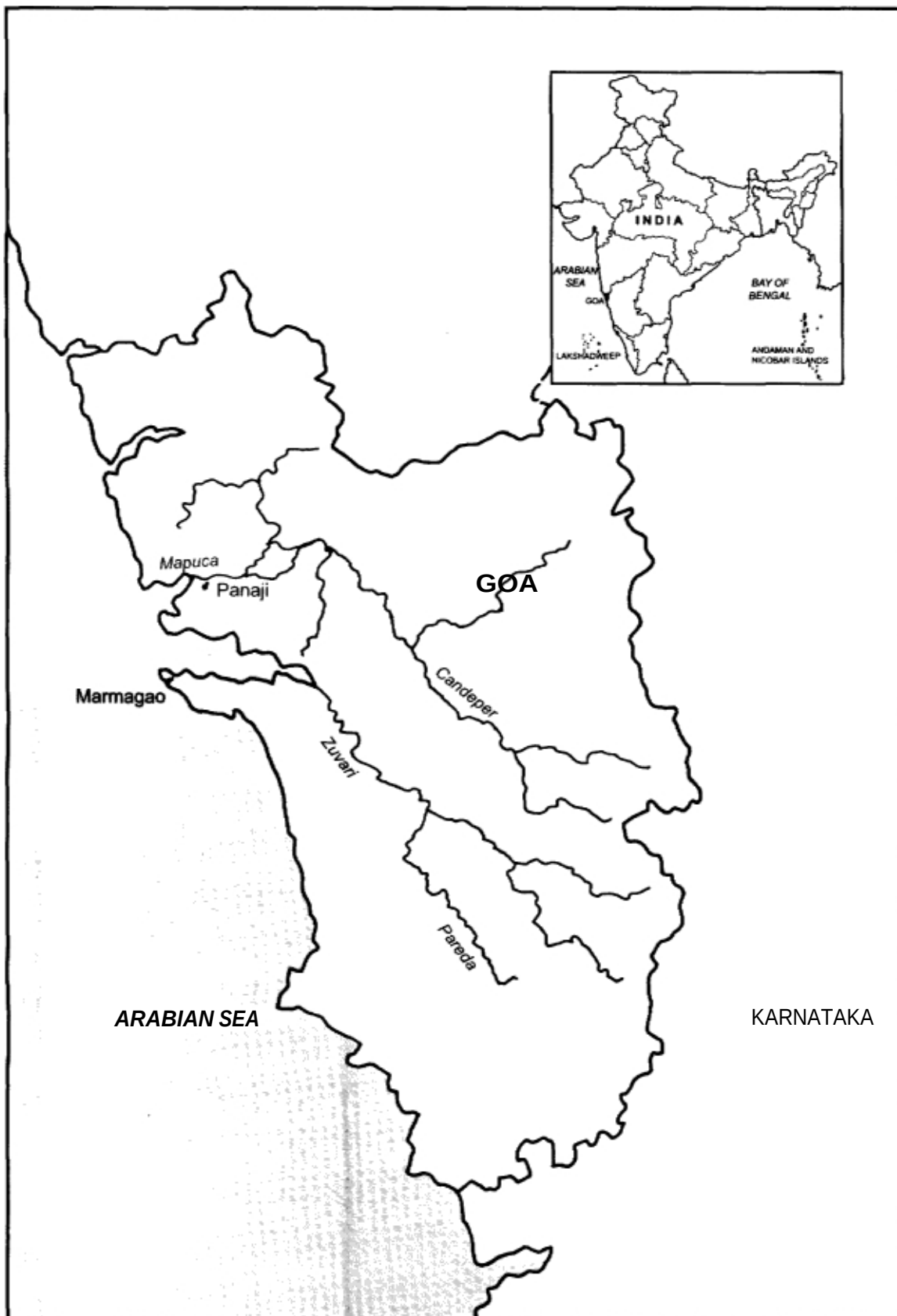
Amenities like auction shed, net mending sheds, administrative building, workshops facilities, concrete pavement, parking area, overhead tank, H.S.D outlets, approach roads, ice factories and cold storages are provided/being provided at each landing center. The Government has cold storage and ice plants installed at Patio and Chapora catering to the retail requirement of the ice by the fisherman.

Marine Fisheries (traditional)

An estimated 20 000 fishermen of Goa have settlements in coastal fishing villages and those bordering the seven estuaries, creeks and other tributaries numbering around 61 covering eight taluks of the State, Despite mechanisation since 1964, 25% of the fish and seafood products is contributed by traditional fishermen.

The traditional sector has also taken up mechanisation of their traditional crafts, which helps them in the netting operations. The Government has encouraged mechanisation of the country crafts by outboard/inboard motors with financial assistance, in the form of subsidy, to the tune of Rs. 10 000/- under Centrally Sponsored Schemes on 50:50 basis. The Department has provided subsidies to 572 people. Providing financial assistance to the tune of Rs.30 000 as subsidy for the construction of wooden/F.R.P canoes is also under the active consideration of the Government.

GOA



Goa - Fisheries at a Glance

1.	(a) Coastal length	-	104 km	
	(b) Continental shelf (up to 100 fathoms depth)	-	10 000	
2.	Number of fishing villages (marine)	-	42	
3.	Fisheries population	-	30225	
4.	Active fishermen population	-	11 944	
5.	Number of mechanised Boats registered with the Directorate of Fisheries until 1999	-	1128	
6.	(i) No of motorised crafts registered with Directorate of Fisheries		735	
	(ii) No. of non-motorised country crafts	-	1 963	
7.	No. of registered nets			
8.	(i) Fish landing centers (jetties)			
	(ii) Fish landing ramps	-	14	
9.	H.S. Diesel Outlets operated through Fisheries Coop Societies			
10.	Fisheries Cooperative Societies	-	4	
11.	No. of members in Coop. society		5	
12.	Annual fish landing (in tonnes) in Goa.		889	
		1997	1998	1999
	Marine	91 277	67 236	60 075
	Enland	3 270	3 474	3 365
	Total	94 547	70 710	63 440
13.	Export of Marine Products (in tonnes)	14 284	6 175	9 054
	Quantity (in tonnes)	—	2 910	3 491

UNION TERRITORY - LAKSHADWEEP

General Information

Lakshadweep is the tiniest Union Territory of India and lies about 220 to 440 kms from Kochi in Kerala. It is an archipelago comprising 12 atolls, three reefs and five submerged banks, with an area of 32 sq km. The Union Territory (UT) was formed in 1956 and it was named Lakshadweep in 1973 (earlier name was Laccadives) with Kavaratti as the capital. The population of Lakshadweep is about 52 000 with a density of 1 615 persons per sq km. There are ten inhabited islands, namely Andrott, Amini, Agatti, Bitra, Chetlat, Kadmat, Kalpeni, Kavaratti, Kiltan and Minicoy. Bitra is the smallest of all having a population of 225 persons (1991). The literacy is about 79% and the main language is Malayalam in addition to some local dialects. Agriculture is the mainstay of Lakshadweep's economy with coconut as the only crop of economic importance. Average coconut production in the island is 27.7 million nuts a year.



Present Status of Fisheries

Lakshadweep has immense potential for development of marine fisheries. The islands have a lagoon area of about 4000 sq kms, territorial waters covering an area of 20000 sq kms, continental shelf of 4 000 sq km, an Exclusive Economic Zone (EEZ) of seven lakh sq km and a coastline of 132 km. Which is approximately 1.6 % of the country's total coastline.

Fish Production

The estimated marine fishery potential in the EEZ of Lakshadweep is about 63000 tonnes consisting mainly of tuna and tuna like fishes, elasmobranchs, perches, etc. Presently about 19 species/groups comprise the commercially important fishes caught from the seas around the Islands. The coral reefs surrounding the islands have an unrivalled wealth of ornamental fish species.

Fish production in Lakshadweep Islands has steadily increased from 6333 tonnes in 1991 to 9 845 tonnes in 1994. During 1996-97 the production was estimated to be 11 750 tonnes. In 1998-99, the total fish production in the Islands touched 13 540 tonnes. Skipjack tuna accounts for about 75% of the annual production which is about 68% of the country's total production of this species. Nearly 50% of the total catch comes from Agatti Island. The fish landings during the period 1991-1999 and their contribution in the total catch of the country are given below.

Fish Production in Lakshadweep During the Period 1992-93 to 1998-99

Period	Fish Production (000 tonnes)	
1992-93	9.73	(0.38%)
1993-94	9.41	(0.355)
1994-95	9.75	(0.36%)
1995-96	9.82	(0.36%)
1996-97	11.75	(0.43%)
1997-98	10.55	(0.36%)
1998-99	13.54	(0.50%)

The figures in parentheses denote the percentage in total fish production in the country.

Institutional Framework

The Department of Fisheries of the Lakshadweep Administration and the Lakshadweep Development Corporation Ltd. are the two institutions responsible for the development of fisheries in the Islands. Salient features of these two institutions are as follows.

- The Department of Fisheries is the nodal Department responsible for the development of fisheries in the islands. The Department is headed by a Director and has 131 supporting staff, including five Assistant Directors and one Assistant Engineer for implementation of various schemes of the Union Territory and Centrally Sponsored Schemes of the Government of India..
- The Lakshadweep Development Corporation Ltd. (IDCL) was incorporated under the Companies Act, 1956 on 22.12.1987. It is a fully owned Government company under the Lakshadweep Administration. The present paid up capital of the Corporation is Rs.4 crores. The funds for this purpose were provided by the Fisheries Department of the Union Territory through equity contribution from their budget.
- The basic objectives of the Corporation are to utilise the resources of fish and coconut in the Lakshadweep group of Islands and to undertake trading and manufacturing activities. The Corporation has a staff strength of 53 at present including one Managing Director, one Company Secretary and three Managers, one each for the Dried Coconut Plant (DCP) Unit, Fish Meal Unit and the Canning Factory.
- The institutional framework for research comprises a Survey Centre at Minicoy of the Central Marine Fisheries Research Institute, Cochin. The centre is involved in the survey and biological investigations of fish fauna in the Islands.

Infrastructure

During 1994 the islands had a total fishermen population of 6 000 of which 3 700 were engaged in full time fishing and the others part time and occasional. A total of 1 378 fishing crafts (traditional- 594, motorized- 306, mechanized 478) comprised the fleet during the period 1999 which constituted 0.49% of the total fishing fleet in the country. The fleet in the islands mainly consists of mechanised pole and tuna long lining fishing boats. For the landing and berthing of the fishing fleet, three fish landing centres have been constructed at Kavaratti, Minicoy and Agatti islands. There are 10 fishing villages in the islands and 11 established fish landing centres. A tuna canning factory is located at Minicoy island for processing of tuna and the same has now been expanded by the Lakshadweep Development Corporation Ltd., for the production of tuna cans. The Corporation has also set up a fishmeal unit at Agatti island.

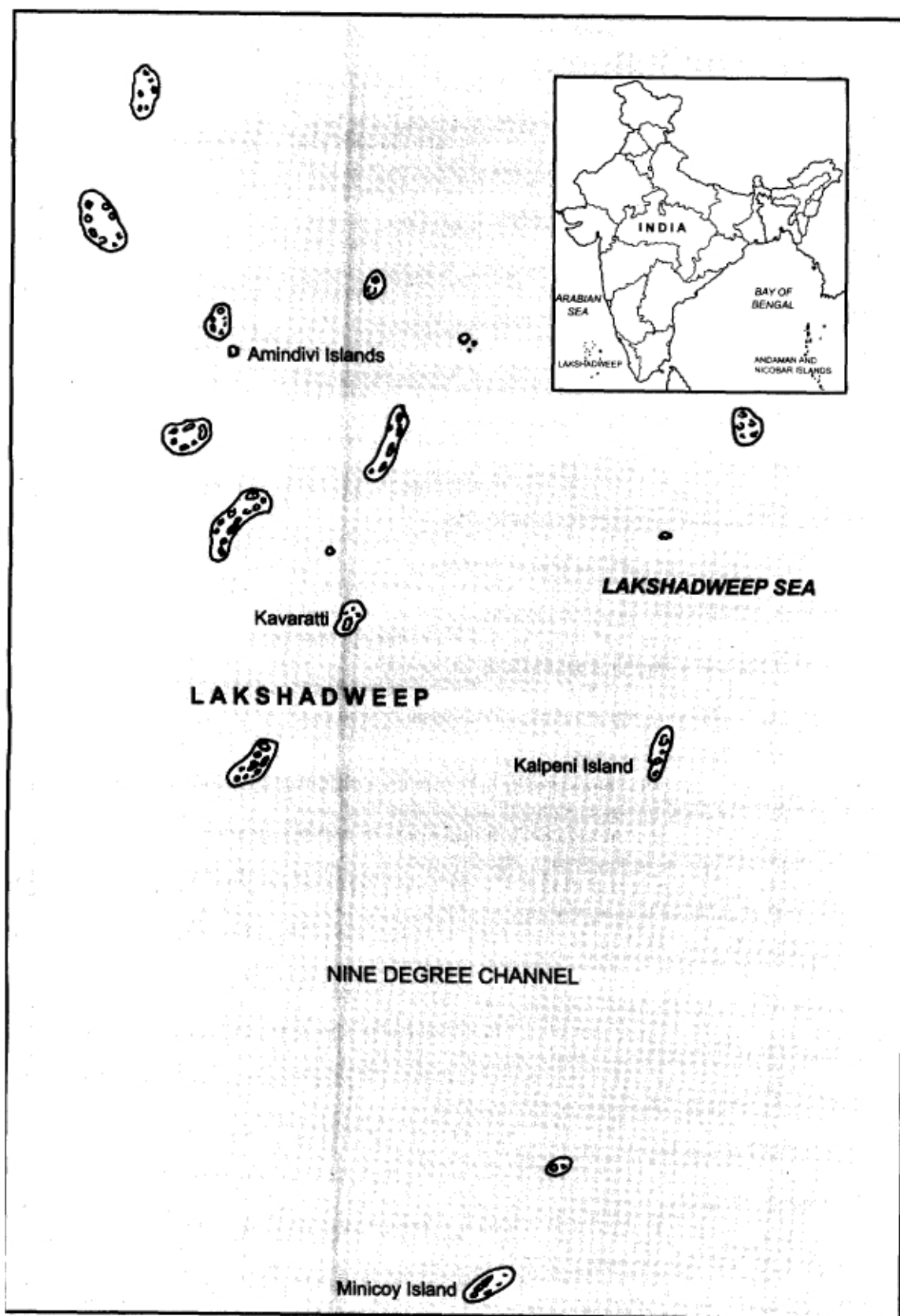
The major fisheries activities undertaken and other facilities established by the Corporation for achieving the objectives are:

- Tuna canning factory of the Department of Fisheries at Minicoy;
- Marketing of canned tuna;
- Fish meat-cum-masmin unit at Agatti island; and
- Implementation of the credit guarantee scheme under which guarantee is provided for the credit availed by the entrepreneurs in the island with a view to enhance entrepreneurship.

There is no ice plant or cold storage facility in any of the islands in Lakshadweep. The main reason for this is non-availability of sufficient power and freshwater. Infrastructure for boat building includes two boat-building yards, which are engaged in the construction of fishing boats. For education and tourism purpose, an aquarium-cum-museum has also been set up at Kavaratti during 1989.

Constraints

- The Lakshadweep islands have immense potential for development of fisheries, which can not only boost the local economy, but also generate considerable surplus for exports. However, the development



of fisheries has not been commensurate with the potential that exists. Remoteness of the islands is one of the major reasons for this. There is no suitable fishing harbour in the Islands in order to operate fishing boats during the southwest monsoons. There are only three fish landing centres at Kavaratti, Minicoy and Agatti islands. The post-harvest infrastructure is inadequate and fish being a highly perishable commodity, this area needs considerable strengthening.

- The extension programmes in the field of fisheries are also found to be very weak. This needs to be strengthened to motivate the fishermen to take up innovative fishing methods.

Prospects for Development of Fisheries

Taking into account the area of the lagoon (4000 sq km) territorial waters (20 000 sq km) and the EEZ (7.0 lakh km), Lakshadweep could be considered as one of the most endowed territory of the Indian Union from the fisheries point of view. Presently the fish production from Lakshadweep is hardly 20% of the potential, which shows that a vast potential remains unexplored. Therefore, schemes and plans need to be put in place for harnessing of the resources in the most sustainable and responsible manner.

There is vast scope for increasing marine fish production from Lakshadweep, especially of tunas by introducing new generation of boats and diversified fishing techniques. Based on the recommendations of a study team that evaluated the requirements of the fishing sector in the Islands, boats for shark fishing are being introduced. Five 38-footer wooden shark-fishing boats are under construction for issue to the fishermen on subsidy. The construction of one 55-footer wooden fishing boat by the Department of Fisheries for demonstration fishing for shark and tuna to fishermen has also been approved. These initiatives will help in developing tuna and shark fishing in Lakshadweep during the coming years.

A central team deputed to the Islands in 1995 in their report *inter alia* suggested that tuna being the mainstay of the island, exploitation of this species should attract greater attention. Trade in fresh frozen tuna is possible either with the main land or for export. Tuna production may be augmented by tuna purse-seining or mothership type of operation. For attaining such objectives, it is felt that the trade for fresh and frozen tuna will be possible for entrepreneurs who have the facilities for the collection, preservation and transportation from Lakshadweep to the destination. For this purpose suitable vessels with freezing facilities must be introduced. Further, tuna purse-seining to augment production is again a commercial venture employing sophisticated vessels,

The existing pole-and-line fishing boats used by fishermen in Lakshadweep are mostly 25' boats. Keeping in view the needs of the local fishing community, the existing boats need to be modified. Accordingly, the Department of Agriculture and Cooperation had appointed a Committee to develop a suitable design of small, mechanized boats in Lakshadweep. The Committee, in their report submitted in January 1996, recommended two types of improved designs of boats, namely 30 feet wooden boats for Minicoy and other areas. The administration has been requested to develop these designs for implementation. It is expected that these designs will be kept in view while constructing vessels for supplying to the fishermen during the Ninth Five year Plan.

Several species of colourful fishes inhabiting the coral reefs of Lakshadweep islands are considered as ornamental fishes suitable for maintenance in seawater aquarium. Live ornamental fishes have a ready export market and the possibilities of collection and export of these species have drawn the attention of the Government. The Central Marine Fisheries Research Institute at Cochin has been entrusted with a programme for survey and assessment of ornamental fish resources in the Islands.

The existing landing and berthing facilities for the fishing fleet are highly inadequate. This needs to be strengthened so that the fishing vessels (existing and those to be introduced) can safely and quickly land their catch without deterioration in the quality. Setting up of small fish landing centres at all strategic locations with the back up post-harvest facilities would be necessary for modernising the fishing sector.

The Lakshadweep Development Corporation Ltd is still in a growing stage and it needs more funds to become fully viable to consolidate its activities so as to carve a niche in the market and generate profits.

Being the first Public Sector Undertaking (PSU) in the Union Territory, it had to face several constraints limiting factors like remoteness of the islands from the mainland, inadequate transportation and communication facilities and non-availability of some of the raw materials, except coconut and fish etc. To overcome the constraints, the Corporation has been able to arrange funds to the extent of Rs.4 crore by equity contribution from the Fisheries Department. It has also improved the transportation facilities in collaboration with the Port Department of Lakshadweep Administration. These measures have yielded results and the Corporation has been able to make profits during the years 1995-96 and 1996-97.

Proposals for Ninth Five Year Plan

Major schemes such as the construction and supply of mechanised boats on subsidy to fishermen, supply of in-board engines to fishermen at full cost on hire purchase system, development of off-shore fishing with diversified methods, development of shore-based infrastructural facilities, mariculture, equity contribution to LDCL, human resource development, etc, which are implemented in the Eight Five Year Plan are proposed to be continued during Ninth Five Year Plan at a proposed outlay of Rs. 1674 lakhs.

An average growth rate of 3% per annum in marine fish production is expected to be achieved during the Ninth Five-Year Plan. Besides, future emphasis for fisheries development in Lakshadweep would be on exploitation of under-exploited tuna resources, creation of more infrastructure facilities for fish processing and marketing network from island to island and from island to main land. Joint venture programmes, especially in marketing of tuna and other varieties are also planned during the Ninth Five Year Plan.

STATE - KERALA

General Information

Kerala, situated on the southwestern part of India, is one of the smallest States of India with 1.18% of the total area of the country. The density of population is 747 persons per sq km with urban population forming about 26.31% of the total population. The percentage of literacy is highest in Kerala at 93%; with a male literacy rate of 94.45% and female literacy rate of 86.93%.



The State is divided into three geographical regions comprising: i) High lands, ii) Midlands, iii) Low Lands. The coastal region comes under the lowlands and fisheries and coir industry form a major part of the industry in this area. One third of the nations marine exports are from Kerala.

Kerala is divided into 14 revenue districts. Among them, Thiruvananthapuram, Kollam, Alappuzha, Ernakulam, Thrissur, Kozhikode, Kannur and Kasargode come under coastal area. Cochin, the major port in Kerala is well known as the Queen of Arabian Sea. A main part of fisheries export business is concentrated in Cochin.

Present Status of Fisheries

The State has a coastline of 590 km. and a continental shelf area of 40 000 sq km. within 200 m. depth. It has been estimated that the fisheries potential in this zone is about 8 lakh tonnes per annum.

Kerala is also endowed with a vast area of inland water spread, with rich potential for fish culture, extending to over 3.61 lakh ha including backwaters (2.43 lakh ha) three reservoirs (0.30 lakh ha) tanks and ponds (0.03 lakh ha) and rivers (0.85 lakh ha). The total fish production of Kerala in 1998-1999 was 649 220 tonnes of which marine fish production accounted for 583 340 tonnes.

In the paper presented here, the Government lists its views and suggestions which are to be implemented at the national level, and the projects it is doing or propose to do at the State level.

National level

- Currently the administrative ministry in charge of fisheries at the national level is the Ministry of Agriculture. Under this Ministry, the Department of Animal Husbandry and Diaring is looking after the affairs of the fishery economy of the nation. There is not even a separate Department for Fisheries, but only a Division under the above mentioned Department. The State Government strongly feels that for the effective implementation of the Code of Conduct for Responsible Fisheries a separate fisheries department and fisheries ministry is absolutely essential.
- A "National Fisheries Commission" may be constituted on a permanent basis to advice the Government of India on matters pertaining to national fisheries policies; issuing guidelines to State Governments; ways and means to implement the FAO Code of Conduct for Responsible Fisheries; streamlining and homogenising the Marine Fisheries Regulation Acts of different maritime States; setting up of a machinery to police and monitor the operations by deep sea vessels; settling inter-State issues on marine fisheries; formulating national and State-level fisheries resource management practices, etc.

Fisheries Resource Management Organisations may be set up in all States as autonomous bodies along the lines of the Fisheries Resource Management Society of Kerala, with central assistance. Assistance may be given both for establishment as well as for the various projects taken up by these Fisheries Resource Management Organisations.

State Level

Kerala has taken up many pioneering fisheries resource management measures very much in tune with the present Code of Conduct during the past two decades. The fisheries development and management Policy (July 1994) of the Government of Kerala states:

“The thrust of this new policy is to chart a course of action, which will restore the vitality, and dynamism of Kerala’s fisheries. This calls for a multi-pronged approach which will focus on the sustainability of the resource base, the economic viability of the industry, the provision of a decent level of living to the persons who labor in the sector and ensure a good supply of fish for local consumption and export. While continuing essential, supportive welfare measures, the core of the policy focus will be developmental and management oriented,

Para 71.2 of the Code of Conduct reads:

“Within areas under national jurisdiction, States should seek to identify relevant domestic parties having a legitimate interest in the use and management of fishery’s resources and establish arrangements for consulting them to gain their collaboration in achieving responsible fisheries.

The Government of Kerala has devolved its powers to the local self-governments (panchayats) that is the village panchayats, municipalities and corporations for the implementation of development and conservation projects at the local level. The Ninth Five Year Plan was implemented in a completely decentralised manner by the widely acclaimed “People’s campaign for decentralised planning”. Various fisheries projects at the village level were conceived, planned and implemented at the neighborhood and village level. This shows the potential of the State in achieving local level people’s participation in development as well as in conservation and management programmes. Many village panchayats have already taken up mangrove afforestation programmes, social fisheries (fish and shell fish ranching in open waters), construction of artificial reefs, control on sand mining from river beds, conservation awareness campaigns, mariculture of shell fish, etc.

The State government proposes to involve all local self-governments in the State in the resource conservation management and responsible fishing as applicable at the local level.

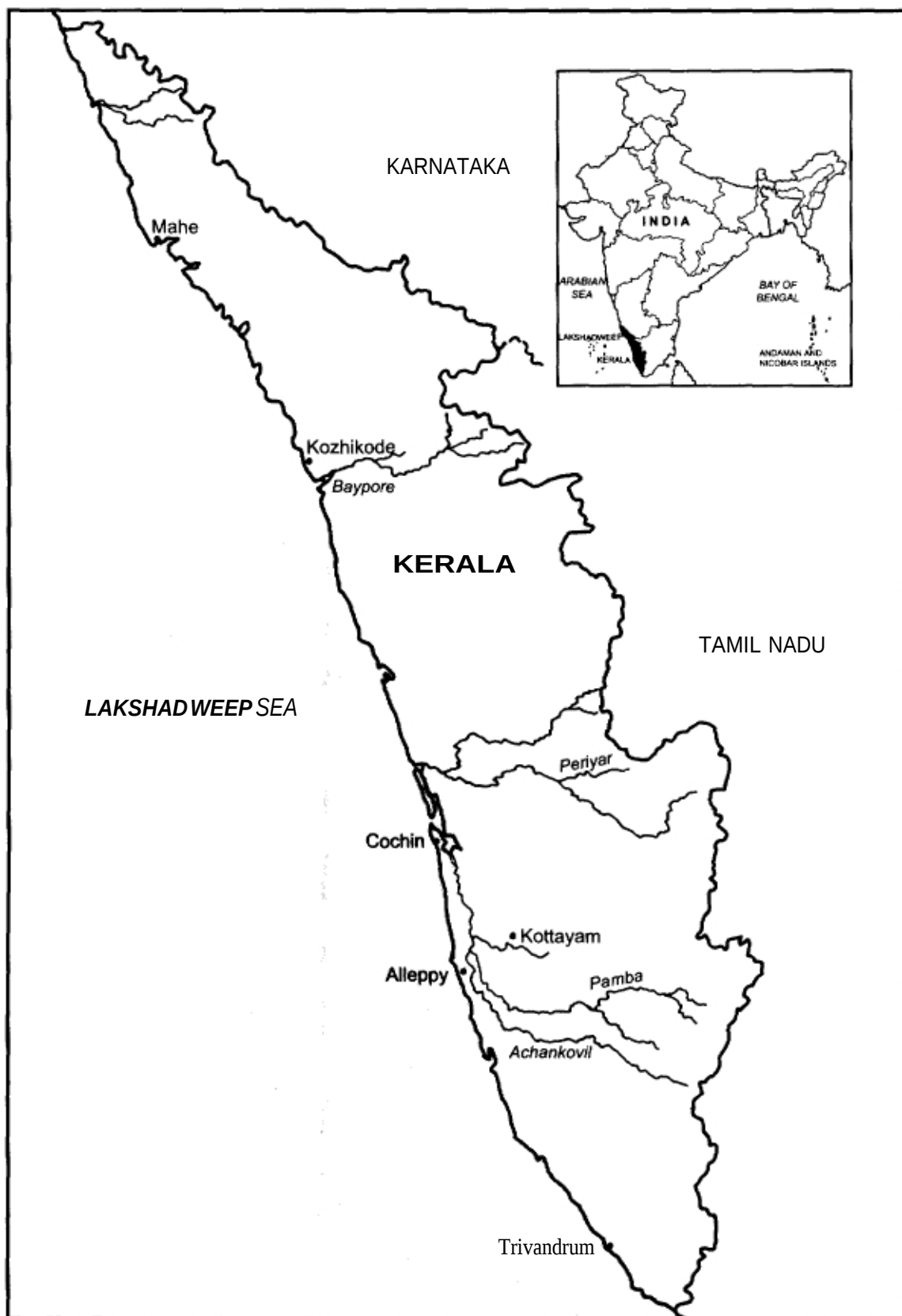
Article 8 of the Code of Conduct enlists the various requirements regarding fishing operations to be implemented by the member nations. The Kerala Marine Fishing Regulation Act, 1980 empowers the Government of Kerala with wide-ranging powers to/for:

- a) regulate, restrict or prohibit certain matters within specified areas;
- b) prohibition of use of fishing vessel in contravention of any order made under the act;
- c) licensing of fishing vessels;
- d) prohibition of fishing using fishing vessels which are not licensed;
- e) cancellation, suspension and amendment of licenses;
- f) registration of vessels;
- g) make rules regarding the operations of fishing vessels, gear, areas, seasons; and
- h) adjudication of offences under the act and to impose penalty for violations.

Under this Act, the Government of Kerala has already implemented the following:

1. Registration of all types of crafts;
2. Licensing of all types of crafts and gear;
3. Restriction of certain types of fishing gear;
4. Zoning of fishing grounds according to socio-economic and technical considerations;
5. Closed seasons and closed areas;

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6. Ban on various highly destructive types of fishing operations;
7. Marine patrolling;
8. Adjudication of violations and imposing of penalties;
9. Ban on certain mesh sizes;
10. Ban on night trawling;
11. Studies on the impact on various types of fishing operations; and
12. Moratorium on new licenses for mechanised fishing vessels in the coastal waters.

In the Inland Sector, the State has taken the following steps:

Backwater patrolling;

2. Moratorium on new licenses for stake nets and china nets in the backwaters;
3. Protection of endangered species such as Mahseer (*Tor* species);
4. Compliance with coastal zone management regulations in brackishwater aquaculture;
5. Ban on destructive fishing gears such as dynamiting, poisoning and stupefaction;
6. Control of sewage pollution in the brackishwater systems of the State;
7. Ban on operation of stake nets against high tide to protect migratory fish and shell fish and their larvae;
8. Ranching in riverine, lacustrine and estuarine waters;
9. Providing sanctuaries for highly exploited species in lakes and rivers;
10. Development and conservation of reservoir fisheries;
11. Popularisation of inland aquaculture incorporating sustainable and environment-friendly culture practices; and
12. Removal of illicit fishing gears from backwater systems.

Organisational set up of Fisheries Resource Management Society (FRMS)

The Society was registered on 1.6.1997 under the Travancore-Cochin Literary Scientific and Charitable Act, 1955. The Society reviews and evaluates all fishery development, management and conservation programmes in Kerala, undertakes comprehensive inter-disciplinary research studies and builds up appropriate contacts with other research and development agencies such as the CMFRI, CIFT, MPEDA and universities. The Society is managed by a governing body that consists of Minister for Fisheries, Kerala (Chairman); Secretaries for Fisheries and Finance, Kerala; Chairman, MPEDA; Directors of CMFRI, CIFT; School of Environmental Studies (Cochin University of Science and Technology); Dean, College of Fisheries; and Chief Executives of ADAK. Matsyafed and two representatives of fishermen nominated by the government.

Reforms

The State government has appointed a committee of scientists, legislators and technocrats to suggest comprehensive reforms and legislations for the sustainable development of our fishery economy and to ensure equity and welfare for fishermen. The terms of reference of the committee are as follows:

1. Suggest approaches for conserving, managing, allocating and regulating the water bodies and its resources of the State;
2. Suggest measures to ensure the right of ownership of fishing;
3. Suggest measures to ensure the rights of access of the aquatic resources to those who fish;
4. Suggest measures to ensure the rights of first sales of catch vest with those who fish;
5. Suggest measures for comprehensive fish marketing regulation system to protect the interests of fish producers and consumers;
6. To suggest measures for protection, development and management of land and water ward zone to protect the interest of fisher folk;

The committee is expected to submit its report and draft legislations to the government soon.

Article 9: Aquaculture Development

9.1 Responsible development of aquaculture, including culture-based fisheries in areas under national jurisdiction.

The brackishwater and coastal aquaculture of the State are fully controlled by the Aquaculture Authority set up by the Government of India wherein appropriate measures were incorporated for the promotion of aquaculture. Furthermore, the government also sponsors time-bound research projects to monitor, evaluate and recommend necessary action in undertaking aquaculture in a responsible manner.

9.2 Responsible development of aquaculture including culture-based fisheries within trans-boundary aquatic ecosystems

The candidate shellfish species used for aquaculture in the State consist of two species of shrimps, one species of prawn, one species of crab, one species of edible oyster and two species of mussels which are indigenous to the State.

However, the freshwater fish farming consists of six species of which three are exotic while three are alien in origin. The exotic species contribute to a substantial share of the freshwater fish production of the State. As none of the exotic and alien species are reported to attain full maturity in the open waters and therefore, there is no-serious concern on the threat of exotic and alien species on the biodiversity of the freshwater bodies of Kerala. However, in compliance with the notification issued by the Ministry of Agriculture, the Government is taking all efforts to stop the clandestine introduction of aquatic organisms in the State and to destroy the stock of similar species such as the African cat fish, Pirannah, etc in the ponds and hatcheries of the State.

9.3 Use of aquatic genetic resources for the purpose of aquaculture including culture-based fisheries.

At present the Government is implementing an innovative fish farming technique in which the fish productivity from the derelict water bodies are significantly improving with the least damage to the biodiversity. The total area covered under this scheme (Janakeeya Matsya Krishi) is around 10 000 ha and the average production achieved is around 2 tonnes per ha.

With a view to incorporate indigenous species in the culture basket of Kerala, an indigenous fish breeding center has been established at Pallam, Kottayam. The purpose of establishing this center is to develop appropriate technologies for the breeding and propagation of cultivable and endangered fish species of Kerala, This will cater to the requirements of fish farmers and also to utilise them for the stock rehabilitation programmes in the selected rivers and lakes of the State.

9.4 Responsible aquaculture of the production level

Agencies such as ADAK (Agency for the Development of Aquaculture, Kerala), which are instrumental in promoting brackishwater shrimp farming of the State, regularly organise awareness campaigns for prawn farmers to educate them on the negative effects of overstocking, excess feeding, poor water management, adverse effects of antibiotics, etc in the shrimp farms. They also teach them the principles of management of fish health and pond hygiene. These programmes are helpful in the promotion of responsible aquaculture in the State.

Article 10. Post Harvest Practices and Trade

The Government is giving top most priority for the responsible fish utilisation by the implementation of the following:

- Construction of modern fishing harbors having facilities for maintaining hygiene and sanitation and with all modern amenities for the storage and transportation, fish landing centers with potable water supply and accommodation, road access, electricity, etc.
- Regular awareness campaigns among coastal fisherfolk are conducted on hygienic post harvest handling of fish, Cold storage facilities have been provided in almost all coastal districts for the proper preservation of the catch. The Government has also developed well-designed and well-equipped inland fish market across the State.
- The Government is contemplating formulation of a legislation to confer the right-of-first-sale to those who fish (Aquarian Reforms Committee).

Article 12. Fisheries Research

The Government has recently appointed a Fisheries Masterplan Committee comprising scientists and administrators to prepare long-term and short-term projects in various fields of fisheries sector. These developmental projects are envisaged to bring about sustainable utilisation of fish resources, equity and social justice to the fishermen and the supply of high quality fish and fish products to consumers.

Kerala has the rare distinction of having many fisheries research and educational institutions of national and international repute. Concerted research and development activities are being carried out in different disciplines of fisheries such as stock assessment and fisheries biology, fisheries environment and ecology, development of hatchery and grow-out technology, aquaculture nutrition, disease of cultured stock, post harvest handling, quality assurance, fisheries economics, etc in the above institutions. Besides, the Govt. also sponsor issue-based research projects through the Universities, etc. in the following areas:

- Impact assessment of monsoon trawl ban imposed along Kerala coast on the exploited stock and its socio-economic implication;
- Impact of trawling on the seabottom and its living communities;
- Shrimp disease in the grow outs of Kerala;
- Survey, sampling and development of hatchery technology of Mahseer;
- Mangrove afforestation programme;
- Breeding and propagation of indigenous fish such as *Etrolus suratensis*;
- Bibliography of endangered and threatened freshwater fishes of Kerala;
- Health studies of fishermen;
- Empowerment of coastal fisher womenfolk; and
- Impact assessment study on the ranching *Macrobrachium rosenbergii* in Kuttanad.

From the plans and actions listed above, it can be concluded that the Government of Kerala has been following a sound fisheries development and management policy that is very much in line with the Code of Conduct for Responsible Fisheries. Needless to say, revalidation and updating might be necessary on various points for which the State is only too willing to associate and work together with the central and sister governments.

STATE - TAMIL NADU

General Information

With 29 districts and an area of 130 058 sq km, Tamil Nadu is situated on the southeastern side of the Indian peninsula. Bounded on the east by the Bay of Bengal, in the south by the Indian Ocean, in the west by the States of Kerala and Karnataka and the north by Karnataka and Andhra Pradesh, the State has a population of 55 858 946. The geographical features can broadly be divided into two distinct areas: the eastern coastal plain and the hilly region along the north and the west. The State has a literacy rate of 63.72% with 74.88% among males and 52.29% among females.



Agriculture forms the mainstay of the economy. The principal plantation crops are tea and coffee and the State accounts for 77% of leather produced in the country. According to CMIE figures of industrial investment in 1999, the rate of growth of industrial investment in the State was 24.94%.

Present Status of Fisheries

Tamil Nadu is one of the eight maritime States of India endowed with the second longest coastline of 1 076 km. There are 556 marine fishing villages along the coast with a total fishermen population of 8.53 lakhs of which 2.62 lakhs are actively engaged in fishing. Although the basic objectives of fisheries development viz. augmentation of fish production and export earnings from marine products remained the same throughout the Five-Year Plans, welfare of fishermen was included as an important objective during the Seventh and Eighth plans. The development strategy was accordingly oriented towards modernisation of the traditional and meachmsed sector and the introduction of a judicious mix of resource specific deep-sea fishing vessels through charter, joint venture, 100% EOU, etc. This helped in the optimum exploitation of fisheries resources in the EEZ and increasing exports besides improving standards of traditional fishermen. The total marine fish production of the State during 1997-1999 was 3.59 lakh tonnes. Tamil Nadu has exported 41 000 tonnes of marine products worth Rs. 1 220.00 crores during 1997-98.

Resources

The 1 000 km coastline of Tamil Nadu can be broadly classified as:

- | | | | |
|------|-----------------------------|--------|--------------------------------|
| i. | Coramandel coast | 350 km | from Chennai to Point Calimere |
| ii. | Palk Bay | 275 km | from Point Calimere to Pamban |
| iii. | Gulf of Mannar | 315 km | from Pamban to Kanniyakumari |
| iv. | West Coast
(Arabian Sea) | 60 km | Westwards from Kanniyakumari |

The continental shelf of Tamil Nadu (upto 100 fathom/200 mts depth) is narrow in most places varying from 4.0 to 6.0 km in width from the coast and covers an area of 41 412 km. The continental shelf of Tamil Nadu is divided into three zones namely:

- i) the inshore belt, upto 10 fathom depth;
- ii) the offshore grounds, 10 to 25 fathoms depth;
- iii) the 'Deep Sea' area, 25 to 100 fathoms.

A rough calculation of the above said areas is:

i) Inshore belt	=	16058 km
ii) Offshore ground	=	7 197 km
iii) Deep sea area	=	18 157 km
Total		41 412km

The EEZ of Tamil Nadu is about 0.19 million sq km. The stock assessment of marine fisheries potential was first carried out (luring 1927-1928 with the vessel "LADY GOSHAN" followed by periodic studies by the Fisheries Department, Central Marine Fisheries Research Institute (CMFRI), Fishery Survey of India (FSI), etc. The resource potential is estimated as follows:

Gulf of Mannar:

a. Pelagic Resource Potential	-	5.0 lakh tonnes
b. Demersal fisheries including Wedge Bank	-	2.85 lakh tonnes

Palk bay

a. Pelagic fishery potential	-	0.56 lakh tonnes
b. Demersal fishery potential	-	1.13 lakh tonnes

Coromandal coast

Combined both pelagic and demersal Potential	-	1.50 lakh tonnes
Total		<u>11.04 lakh tonnes</u>

Infrastructure

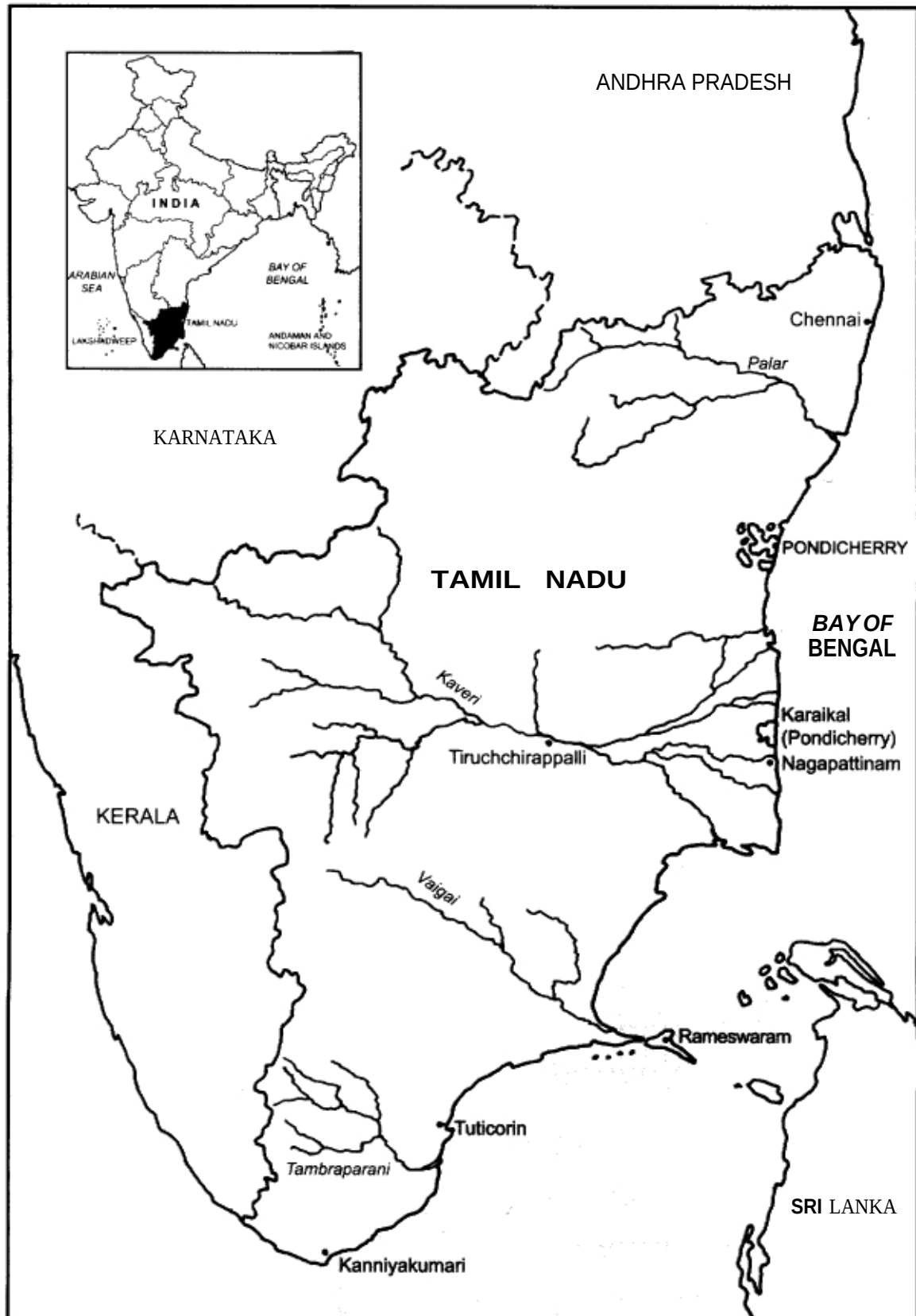
The fishing fleets of Tamil Nadu consist of 33 945 traditional crafts, 9 896 mechanised- and 8 592 motorised-crafts. Construction of fishing harbors and landing centers was an important developmental activity under plan schemes. Presently there are three major fishing harbors, two medium fishing harbors, 362 fish landing centers and five fish landings jetties in the entire coast of Tamil Nadu.

Marine fish production

The marine fishing policy of Tamil Nadu has focussed on the exploitation of resources in inshore waters by introduction of mechanisation over the last four decades. As a result, the marine fish production in Tamil Nadu has gone up from 93 280 tonnes in 1961-62 to 3.59 lakh tonnes in 1998-1999. The marine fish production in Tamil Nadu is almost stagnant over the past decade. Out of the total marine fish production in Tamil Nadu, 95% comes from the inshore waters. The technological advancement coupled with growing dependence on the resources exerts pressure in the inshore areas resulting in declining catch per unit effort (CPUE). This has created frequent group clashes between traditional fishermen and mechanised boat operators causing tension and harming the social atmosphere.

Though the inshore fishery resources are exploited at near optimum level, the fishery resources of offshore and deep-sea areas are either unexploited or underexploited. The main reason for this are (i) non-induction of adequate deep-sea vessels (ii) lack of technology, expertise and infrastructural facilities for exploiting the deep-sea fishery resources.

TAMIL NADU



Management and conservation plan

As discussed earlier, the inshore fishery resources are exploited at near optimum level and there is a vast scope for the exploitation of fishery resources in the offshore and deep-sea areas. There are two sets of challenges in marine fishing sector in the new millennium. These pertain, firstly to maintain the sustainability of the fisheries practice developed so far and secondly in utilising the potential fisheries resources hitherto unexploited. Management measures in marine fisheries include both promotion and conservation. Until recently, the government has been taking mostly promotional measures. Now there are indications of over fishing of stocks. Hence the marine fisheries have to be developed and maintained at sustainable levels with due regard to conservation.

Degradation of marine environment

The impact on fisheries due to the effluent discharge from coastal industries and discharge of sewage into the sea is debated in various forms from time to time. In the Indian context, the environmental parameters due to pollution need to be continuously monitored so as to assess the extent of impact on the health of the ecosystem and fish stocks. The other natural cause for degradation on the marine environment is siltation in the river mouths and sea erosion. Man made structures like harbours also have an impact on the adjacent ecosystem.

Marine National Park

The Government has initiated resource management efforts to enhance and regenerate the resources that are under threat of degradation in the coastal ecosystem. For example, there is a threat to the coral reef of Gulf of Mannar, an important ecosystem indiscriminately exploited for liming purposes. Similarly, the mangrove ecosystem in the east coast is under the threat of degradation due to illegal cutting for fuel purposes. Now, the Government, with a view to conserve these critical habitats has declared a part of Gulf of Mannar as Marine National Park.

Sea ranching

For sustainable marine fisheries, stock enhancement of marine living organisms is an important factor. Some of the South East Asian Countries succeeded in their marine stock enhancement by declaring closed seasons, fish sanctuaries and mesh regulation in specific areas, especially at breeding and nursery grounds of marine living organisms. "Sea ranching" is another way of stock enhancement by stocking with captive bred juveniles. The Government, on an experimental basis, carried out ranching of tiger shrimps seeds in Pulicat lake during the year 1997/1998 which was well received by the local fisherfolk.

It is estimated that the loss due to ineffective post-harvest technology of marine catches is 30%. This can be avoided by improving the transport system. The 'by-catch' discard by fishing fleets has threatened the populations of many of the commercially unimportant aquatic organisms. Hence strategies must be evolved for reduction of 'by-catch', either legally or by educating the fisherfolk about the technology of value addition.

Coastal aquaculture

The natural resources are not infinite. In order to encourage the fisherfolk to diversify from capture fisheries to culture, the Government promoted aquaculture activities through Brackishwater Fish Farmers Development Agency (BFDA) and Marine Products Export Development Authority (MPEDA). During the last decade, the shrimp aquaculturists lured by the high returns, adopted semi intensive shrimp culture systems that have led to disease outbreak. The conflicting interest for development of coastal land areas has also led to many social problems. Hence it is our responsibility to promote eco-friendly sustainable aquaculture systems. The Government scrupulously follows the guidelines issued by the Aquaculture Authority of India (AAI) constituted as per the directions of the Supreme Court of India to regulate fishing activities. In Tamil Nadu, apart from shrimp aquaculture, the other mariculture activities like marine fin fish culture, cage culture, pen culture, molluscan culture are yet to be developed. The assured supply of quality seeds, lack of technology, lack of consumer preferences are some of the hurdles in the development of mariculture activities. Strategies must be evolved to develop these mariculture activities.

Issues involved in the implementation of the Code of conduct for Responsible Fisheries and assistance that the State would like for its time bound implementation

The Code of Conduct mainly deals with the conservation and regulation. The increase in population warrants employment opportunities and increase in production. Increases in the population of fisherfolk have caused increase in the fishing efforts that ultimately result in reduction in per capita income and depletion of the fishery, Therefore regulation and conservation alone are not sufficient to meet the contingencies. Increase in production has to be aimed systematically by all the maritime States.

The Code of Conduct for Responsible Fisheries has been pursued in the State and its principles are not new to Tamil Nadu. In 1983, the Marine Fishing Regulation Act and Rules were passed in Tamil Nadu, to regulate the marine fishing and to protect the interests of the traditional fisherman. The Act provides..., mesh regulation, imposing of ban on certain fishing and on certain gears to conserve the fishery for longer duration so as to conserve the fish wealth for the future generation. It also stipulates the area/zone of fishing for traditional fishing and mechanised fishing.

Even with all the above precautionary measures, the increase in population is a major constraint. The increase in production will provide adequate supply. where as inadequate production will definitely resort for rationing. Increase in population in the fishing community has caused constant increase of fishing efforts.. Rate of production by nature remains more or less the same on the resource side, whereas the increase of fishing efforts. naturally decrease the landing/per capita income/return, The increase in population, number of mechanised fishing boats, number of country crafts and fish food requirements are all causing over fishing and in certain cases exceed the sustainable limit.

The State government would have to look into the above mentioned issues to bring in sustainable and responsible fisheries in its marine and inland sectors.

UNION TERRITORY - PONDICHERRY

General information

The Union Territory of Pondicherry covers an area of 492 sq km and consists of four regions — Pondicherry, Karaikal, Mahe and Yanam. The territory has a population of 80 000 according to the 1991 Census. The population density is 1 605 persons per sq km. The literacy rate is 74.91% with a male literacy of 83.91% and female literacy at 65.79%. About 45% of the population is engaged in agriculture and allied areas. This territory was under French administration until November 1954.



Pondicherry has a coastline of 45 kms rich with marine fisheries resources. The total fish production of Pondicherry for 1998-1999 was 42 700 tonnes. Of this 38 600 tonnes was from marine sector alone. While Pondicherry, Karaikal and Yanam are situated on the Coromandal coast, Mahe is situated on the Malabar coast.

Present Status of Fisheries

The Fisheries Department was set up in the Union Territory only after the *defacto* merger of the former French Territories with Indian Union. The major objectives vested with this Department are to augment marine and inland fish production and to improve the socio-economic conditions of the fishing community thereby generating employment opportunity. To achieve the above objectives, various production/welfare oriented developmental schemes are implemented in an effective manner.

There is a potential area of 1434.80 hectares of inland water resources of all descriptions viz., major lakes, minor lakes, panachayat/municipality tanks, ponds and aquaculture farms are developed under Fish Farmers Development Agency programme amenable to capture fishery and aquaculture. About 800 ha of brackishwater resources are available at Pondicherry, Karaikal and Yanam regions.

With the twin objective of increasing fish production from both marine and inland water resources and to improve the socio-economic status of fisherfolk of the Union Territory, various development/welfare-oriented schemes are formulated and are being implemented placing greater emphasis on production-cum-employment oriented activities.

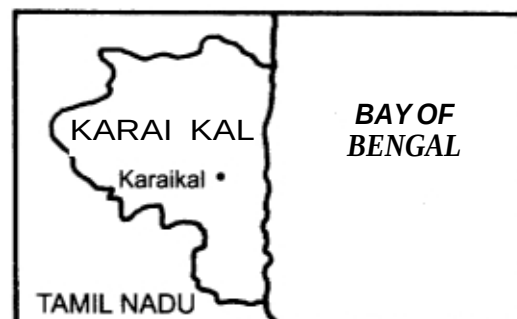
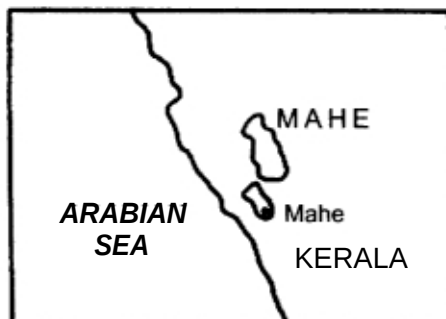
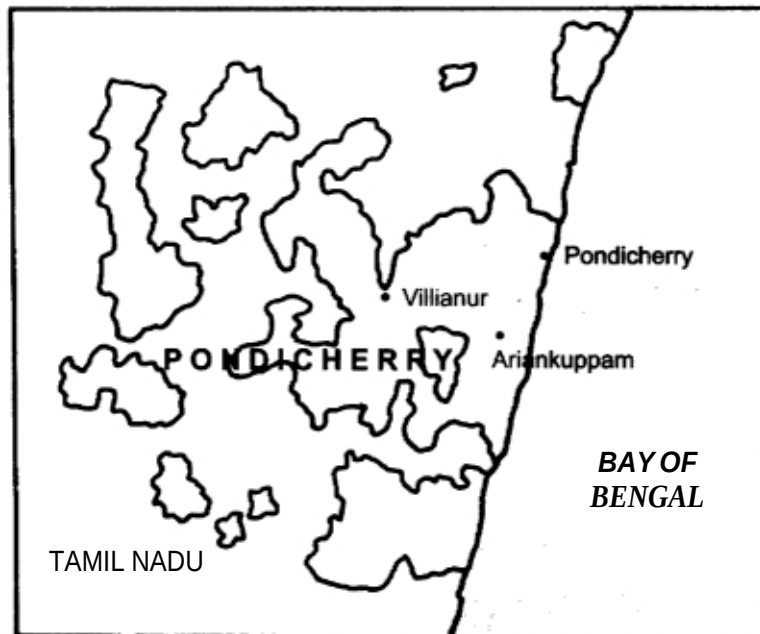
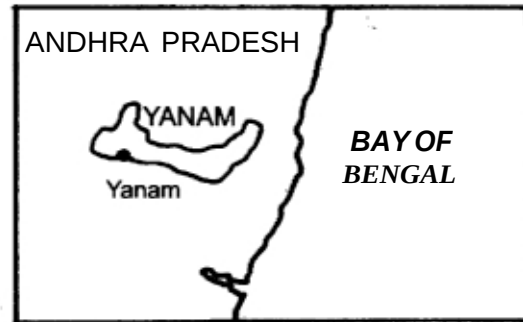
Fisheries have been recognised as a thrust area in the Union Territory of Pondicherry during successive Plan periods and especially during the Ninth Plan Period.

Marine fisheries

There are 45 marine fishing villages with a population of about 43495 out of which 10000 marine fishermen are actively engaged in fishing. At present about 560 mechanised boats and about 7300 traditional crafts are engaged in marine fishing. The Union Territory is promoting development of sustainable and responsible fisheries and the following important programmes *inter alia* are being implemented.

- Financial assistance to fishermen as 45% loan, 45% subsidy and 10% beneficiary contribution is granted for the procurement of indigenous crafts and tackles to improve their socio-economic status and to increase fish production. Further it is also proposed to grant 50% subsidy for the procurement of FRP cattamaran for availing loan from financial institutions.
- It is also proposed to implement the scheme through fishermen cooperatives wherein the fishermen beneficiary will deposit 50% of the cost of FRP cattamaran with societies and the balance 50% subsidy to a maximum of Rs.25,000/- will be released to society and the society in turn will deliver the FRP cattamaran to the beneficiaries.
- Essential engine spares are provided at reasonable rates besides undertaking services, repairing of engines of mechanised boats/OBM owned by mechanised boat operators. Periodical inspection of boat are also carried out. The second component is to provide quick transport facilities to fishermen by hiring out fish vans through fishermen cooperative societies to transport fish catches from the landing centers to marketing places before spoilage and to fetch better returns.
- The government proposes to provide shore-based facilities, infrastructural facilities to set up ice plant-cum-cold storage unit in the coastal fishing villages. It is proposed to constitute the Fishing Harbour Development and Management Authority to look after maintenance and management of the Fishing Harbour Project after its completion at Pondicherry and Karaikal. Fish landing jetty at Yanam is under construction.
- To disseminate technical know-how in fisheries technology, fishermen youth are being deputed to various Central/State Training Institute for undergoing training. Further a short-term training programme will be conducted for fishermen on post harvest technology. Fisheries personnel will be deputed for fisheries short-term training programme on modern fisheries techniques. It is also proposed to grant cash awards to meritorious students belonging to fishermen community who have secured the first two highest marks in SSLC/Matric and Higher Secondary classes.
- At present there are 38 Fishermen Cooperative Societies in the Union Territory of Pondicherry with membership of 28 754. To strengthen and for better functioning of the primary cooperative societies, financial assistance are extended in the form of share capital contribution and loan for various purposes such as for the purchase of site, construction of building and purchase of vehicle, medium term loan/working capital and furniture subsidy.
- For effective and proper exploitation of vast and rich fishery resources from marine and inland waters and to minimise the burden of the fishermen on the procurement of fishery requisites like nets, ropes, floats, sinkers, nylon twine, fish containers, ice boxes and other requisites, 33% subsidy is granted by the Department and subsidy is to be distributed through fishermen cooperative societies.
- Interest subsidy not exceeding 8% on loan amount obtained from nationalised banks for the activities relating to aqua culture, fish vending, purchase of cattamaran, mechanised boats, OBM and construction of houses by fishermen is granted by the fisheries department.
- To extend financial assistance to fishermen during the lean months and also to cultivate saving habit, a sum of Rs.45 a month per person is collected from active inland fishermen who are members of fishermen cooperative societies for a period of 8 months in a year. A total amount of Rs.360 thus collected is matched by double the amount granted by Government. The total sum of Rs.1 080 is disbursed during the four lean months to each fisherman equally at Rs.270 each. Nearly 600 inland fishermen will be benefited.
- During natural calamities like cyclone, flood, fire, drought, etc. assistance in the form of food, cloth, rice and other essential commodities is provided to fishermen community. Financial assistance is also granted for loss of crafts/tackles/loss of life during natural calamities/fire accident.

PONDICHERRY



The cooperative societies can play an important role in the development of fisherfolk. At present, 38 fishermen cooperative societies with 28 754 members are functioning in this Union Territory of Pondicherry which includes one apex society, namely Pondicherry State Fishermen Cooperative Federation, Karaikal Fishermen Cooperative Marketing Union and 36 Primary fishermen cooperative societies. In order to create awareness among fisherwomen, one Fisherwomen Cooperative Society was established at Mahe viz., “Priyadarshini Fisherwomen Cooperative Society”. All the Fisherwomen members are actively engaged in fishing activities and other self-employment project.

Mechanised boats require safe anchorage during adverse weather conditions to land their catches, loading of fuel etc. In the absence of above facilities the mechanised boats faced hardship during rainy seasons, Therefore, it is proposed to construct fishing harbors at Pondicherry and Karaikal.

STATE - ANDHRA PRADESH

General Information

Andhra Pradesh occupies an area of 275 068 sq. km and has a population of 66 508 008. The population density is 242 persons every sq km. The State has a literacy of 45.1% with a male literacy of 56.24% and a female literacy of 33.71%. Bounded by Madhya Pradesh and Orissa in the north, the Bay of Bengal in the east, Tamil Nadu and Karnataka in the south and Maharashtra in the west, Andhra Pradesh has 23 districts. These districts fall under three distinct regions which are the coastal region made up of nine districts called Andhra, the interior region consisting of four districts known as Rayalaseema and the Telengana region which include the capital Hyderabad and nine adjoining districts.



The Economy

With a widely diversified farming base that is rich in a variety of cash crops, the State is surplus in foodgrains and is aptly known as the granary of southern India. Agriculture accounts for about 50% of the State's income and provides livelihood for 70% of the population. Paddy, jawar, bazra, ragi, maize, groundnuts, chillies, cotton, castor, sugarcane and tobacco are the crops extensively cultivated in the State. With a 974 km long coastline, Andhra Pradesh is the largest maritime State of India. Andhra Pradesh contributed 410 820 tonnes of fish for the year 1998-99 of which marine fish production was estimated at 150 000 tonnes.

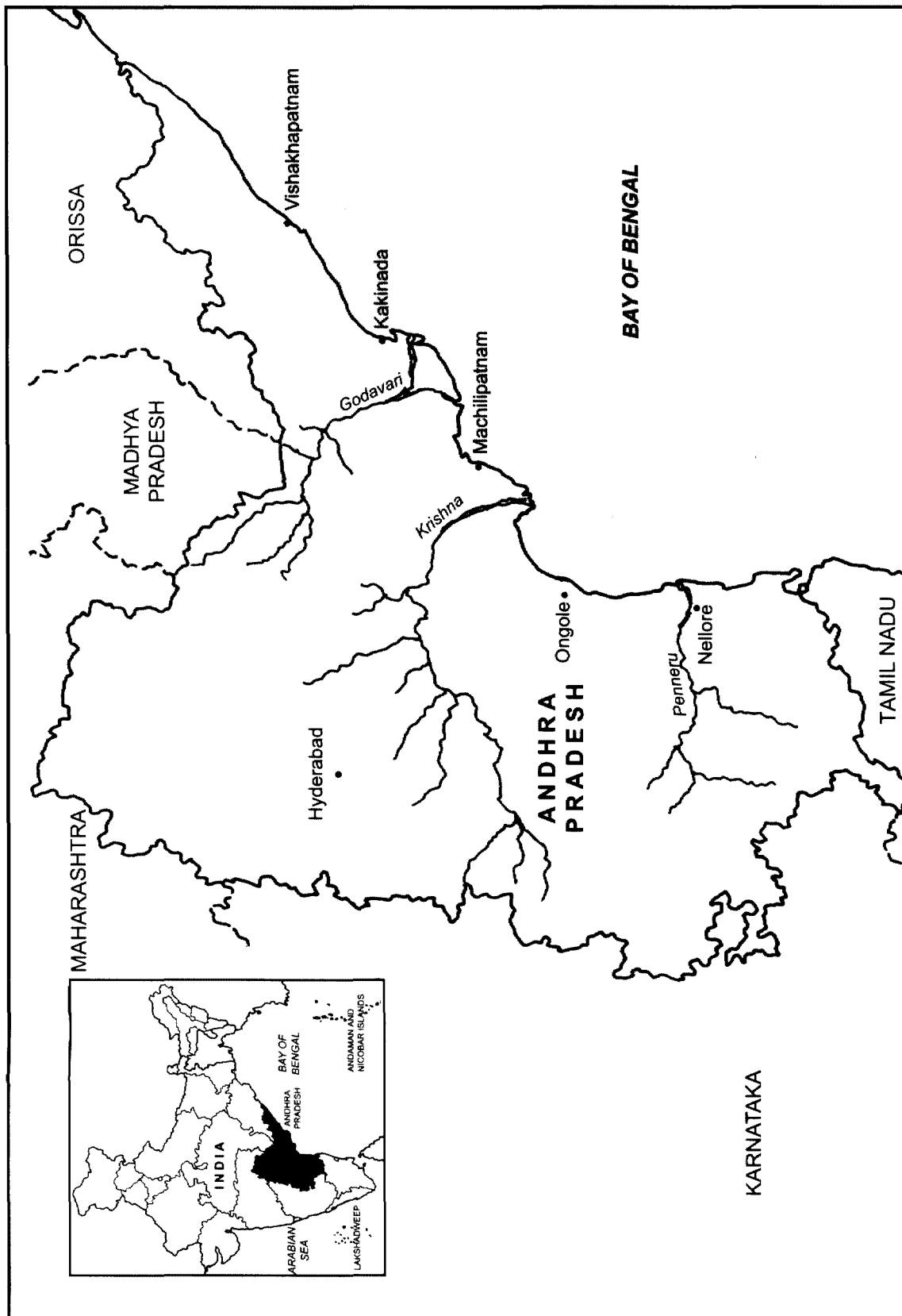
Implementation of the Code

The marine resources, which have hitherto been considered inexhaustible, are showing the signs of decline. There have been reports of over-exploitation of important fish stocks, damage to eco-systems, economic losses and issues affecting the fish trade. All these point towards a threat for the sustainability of fisheries, which will have adverse effect on the nutritive food supply. Therefore, the FAO initiative in the drafting of the Code of Conduct is very timely. Some of the important activities undertaken by the Government of Andhra Pradesh towards sustainable and responsible fisheries are as follows:

One of the most important fishery management practice is the observance of ban on fishing by all the coastal States in India. It is laudable that based on the Government of India's initiative a uniform ban of 45 days is being considered for observation by all the maritime States. A fishing ban of 45 days from April 15 to May 30 has been observed during the last two years on the east coast, which has resulted in enhancement of fish landings substantially, particularly in Andhra Pradesh as per the statistics. More scientific evaluation of the outcome of ban, both in terms of the observance of spawning period, as different species have different breeding seasons, and also the net addition of landings in the entire coast, need to be conducted.

- Similarly, establishment of artificial reefs will go a long way towards enhancing fishery wealth of the ocean. Andhra Pradesh with the assistance of Government of India have established five artificial reefs on the east coast and one by an NGO at Nellore District. This scheme is based on community-based development and the fishermen in the neighborhood have been trained and made aware of the advantages.

ANDHRA PRADESH



- Another important measure for sustained fishery including aquaculture is to regulate the quality of seed and feed, which have direct bearing on the ecological balance. The State Government has initiated a Seed Act for controlling the quality of seed, which is pending the approval of the State Legislature. Similarly, enactment on the quality of feed, which is being produced in huge quantities, should also be regulated by standardisation like ISI marking.
- The Marine Fishing Regulation Act which has been enacted by all the maritime States, based on the guidelines given by the Government of India, is yet another important tool for regulating fisheries and also for preventing excess exploitation, and for preventing disputes among fishery rights of traditional fishermen and mechanised fishermen. These Acts shall be implemented in the right spirit uniformly by all the maritime States to have a better impact on the fishery activity.
- The Code also envisages the right of consumers to safe, wholesome and unadulterated fishery products. While it shall be the duty of each State to ensure hygienically processed fishery products to be made available to the consumers, it may perhaps be necessary to have a central legislation stipulating standards in processing, packing and so on.
- Establishment of marine parks and sanctuaries will go a long way in understanding the animal life and their habitats by the common people, besides providing amusement and tourist attraction. The Government of India should encourage the State Governments in this regard for the establishment of marine parks and sanctuaries. So is the case with the protection of mangroves along the coast, which is the natural habitat for several shrimp and fish species.
- Presently there is no system of proper exchange of data among the maritime States. Perhaps, there is a need for the establishment of a Central Maritime Secretariat duly drafting an Officer from each of the Member States to be located at a convenient place, one on the east coast and the other on the west coast.
- Regarding the safety and welfare of the fishermen as envisaged in Article 8 of the Code, Andhra Pradesh has established shore to vessel communication stations all along its coastline connecting them with the VHF sets supplied to the mechanised boats on 50% subsidy basis. Similarly an important life saving device like life floats as designed in consultation with the FAO is also being supplied to all the fishermen on 50% subsidy basis.
- It is also necessary that transfer of technology should be made more relevant by establishing more research institutions at field level and better extension work organised perhaps with the intervention of BOBP, GOI and State governments.
- One of the important steps to be taken for sustainable fishery activity is to lend financial assistance through financial institutions on liberalised and user-friendly terms.

UNION TERRITORY - ANDAMAN & NICOBAR ISLANDS

General Information

Andaman and Nicobar group of islands are a group of more than 3 000 islands of which a majority are uninhabited being too small or with no water. The important islands in the Andaman group are Land Fall Island, North Andaman, Middle Andaman and South Andaman. There is also Little Andaman further south, about 100 km from the capital Port Blair. The important islands in Nicobargroup are Great Nicobar, Car Nicobar, Chowra, Teresa, Nancowrie, Katchal and Little Nicobar. The total area of the two groups of islands is 8 249 sq km of which Andamans with 6 340 sq km accounts for more than 76 percent of the land area. It has a coastline of 1 912 km, about 35 000 sq km of Continental Shelf and an Exclusive Economic Zone (EEZ) covering an area of 0.6 million sq km. The total population of the islands is slightly above 4 lakhs (Table 1). The terrain of the island is generally mountainous enclosing narrow valleys and thick evergreen tropical forest, which covers about 86% of the total land area.



As large-scale agricultural and industrial development is impossible in this island group, it is largely dependent on wood-based industries. The forest products consist of sawn timber, commercial plywood, match splints and veneers. The principal crops cultivated are rice, coconut and arecanut. Other crops are sugar cane, pulses, fruits and vegetables.

The islands have a fragile ecosystem consisting of landmasses followed by mangrove vegetation, swamps, protected bays and creeks. These areas can suitably be utilised for developing eco-friendly aquacultural practices, *i.e.* brackishwater and marine culture practices. Since these islands are covered under CRZ-4 category, any developmental activity has to be taken up by following the CRZ-4 norms.

Present Status of Fisheries

These islands are blessed with enormous fishery potential, both in terms of resources and quantity. The estimated marine fish potential of the island is 2435 lakh tonnes and the present catch is only 28 000 tonnes annually which is about 10% of the potential.

The reason for the present under-utilisation may be that the island is completely isolated from the main land of India and indigenous fishermen are not available here. The fishermen are brought from the mainland of India mainly from Andhra Pradesh, Kerala and Tamil Nadu under the settlement scheme of Government of India by the Administration. They were settled in different islands. Their economic condition is not sound. As a result they are unable to invest a few lakhs of rupees for acquisition of mechanised fishing vessels. At present there are nearly 2 500 active marine fishermen possessing fishing license.

Brackishwater aquaculture is totally non-existent in the islands. The swamps, mudflats, low lying areas near to the coastline, which have less utility, could be used effectively for brackishwater aquaculture. This will

not only produce export-oriented seafoods but also generate employment. A macro level survey to identify suitable sites for brackishwater aquaculture was conducted during 1998 by the administration with the joint team of CICEF, Bangalore, MPEDA, Department of Forests and Environment and the Department of Fisheries. The survey reported that a total of 61.8 hectares of land is suitable for brackishwater aquaculture.

For coastal aquaculture (mariculture) varieties of marine fin fishes and shellfishes are available in the Andaman and Nicobar seas but this could not be taken up till recently because it is a new venture and has to be first tested. It is proposed to start a pilot project in the near future.

Fishing crafts and gears

Presently fishing is done with traditional fishing crafts. Fishermen operate plank built boats, fitted with inboard/outboard engines and indigenous crafts. The size of plank built boat is 25 ft to 35 ft and that the dug-out canoes are 10 ft to 22 ft. At present about 1200 country crafts, 247 motorised boats and 17 mechanised fishing vessels are in operation in Andaman waters.

The fishing gear employed are gill nets, hooks and lines, cast nets, shore seines and anchor nets. Besides these, long lines and trammel nets are also used in North and Middle Andamans. There are 13 fish landing centers in the Islands (Tables 2 & 3).

The aboriginal tribes use bows and arrows along the shore during low tide. The Nicobaries' traditional fishing include hand picking, skin diving, spearing and narcotising fish in rock pool during low tide. Nowadays they also fish using out-riggered canoes, cast nets, gill nets and hook and line for their food requirements. The fishing season is spread over nine months excluding the monsoon months i.e. June to August. The boats fitted with inboard engines (iBMs) land about 150-200 kg/trip while the catch per day of dugout canoes ranges between 20 to 30 kg fish.

Fish Production

The Islands' fish production is very low as compared to its resources potential. Sardines, mackerel and anchovies constitute the major catch among the pelagic group (Tables 4 & 5). Demersal fishery potential is under exploited which can sustainably be increased. Fish production from freshwater aquaculture is very little.

Berthing Facilities

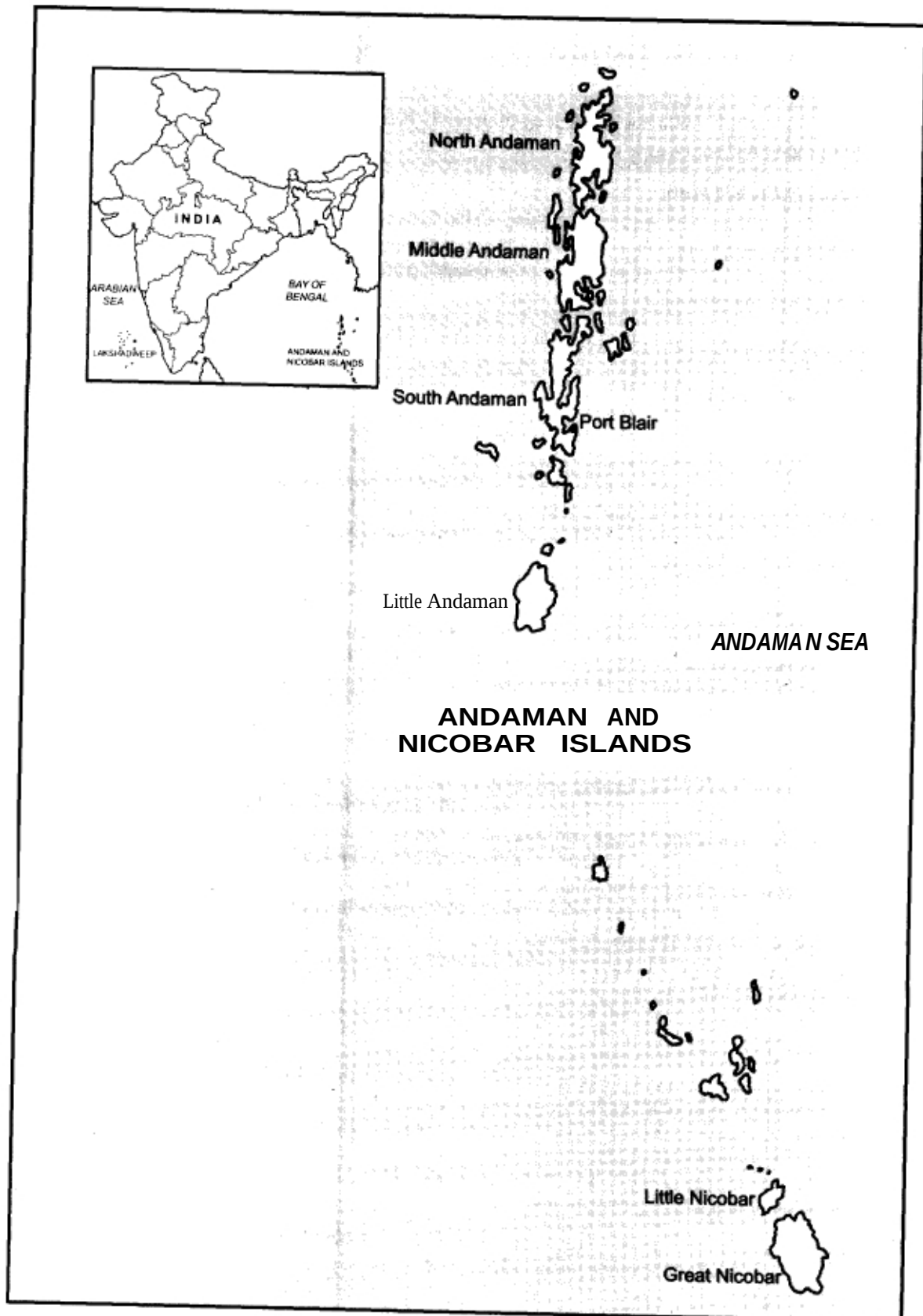
In order to provide proper fish landing and berthing facility for fishing boats, the Department is taking immediate steps to construct a fish landing jetty with modern facilities. For the creation of required infrastructure for processing, storage and disposal of fish catch in the Islands, the Department is in the process of creating cold storage facilities at different places. At present a 25 tonnes cold storage and 15 tonnes ice plant is operational at Port Blair to meet the demand of ice storage facilities. Another ice plant of 15 tonnes capacity and cold storage with a capacity of 10 tonnes has also been commissioned at Hut Bay. More ice plants and cold storages at Rangat, Mayahunder and Campbell Bay are in various stages of construction. The Department has also provided financial support to Andaman & Nicobar Islands Integrated Development Corporation for the construction of ice plants and cold storages at Wandoor, Havelock and Diglipur. The export of fish and fish products from A & N Islands during the last 5 years is given in Tables 6 & 7.

Fish markets have also been constructed at various places to facilitate marketing of fish/other marine products by the fish vendors. These markets have also been provided with deep freezers for storage of excess catch. More markets are proposed at various places during the remaining period of the Ninth Five Year Plan.

Status of Implementation of Code of Conduct for Responsible Fisheries in Andaman and Nicobar Islands

In Andaman and Nicobar Islands, a regulation namely A & N Islands Fisheries Regulation, 1938, was promulgated with the objective of regulating marine fishing. Based upon this Regulation, the A & N Islands Marine Fishing Rules were framed in 1939, which were amended from time to time to meet the developmental

ANDAMAN AND NICOBAR ISLANDS



requirements in the sector. At present fishing in the waters surrounding the islands is governed by the following rules:

- A & N Islands Fishing Rules, 1939.
- The A & N Islands Shell Fishing Rules, 1938

As per these rules, fishing can be done based only on a valid fishing license and dinghy (boat) license issued by the Director of Fisheries. For the purpose of fishing for marine shells, the entire coastal area is divided into 11 zones and involves issue of zonal shell fishing license. This is given only to those in possession of a valid shell dealers' license and who are registered with the Directorate of Industries as Small Scale Industrial Units.

For the purpose of implementation of the rules, there are fishery Officers whose duties and responsibilities have been laid down under the rules. Thus, there is a legal and institutional framework for the control of fishing in the Islands.

Originally, the jurisdiction of the Chief Commissioner, A & N Islands (now the Lt. Governor), extended upto 12 nautical miles, which was extended up to 24 nautical miles in 1995 for the purpose of fishing only. So far fishing activities in the islands have been governed only by these rules. No separate code of conduct for responsible fishing has been framed.

The existing Regulation and Rules were framed to meet the immediate felt requirements; there was no specific perspective on sustainable management of fishery resources at the time. Based on the guidelines of the Government of India, the Andaman and Nicobar Administration has framed an updated draft as Andaman & Nicobar Island Marine Fisheries Regulation, 1998. This has been submitted to the Government of India for obtaining the assent of the President of India.

implementation of the Code of Conduct for Responsible Fisheries in A & N Islands

The ultimate objective of the Code of Conduct for Responsible Fisheries is the sustainable development of fishery resources to meet the requirements of the present generation without impairing its capacity to meet the requirements of the coming generations. In order to meet the requirements, there are various issues involved, which are to be addressed on priority. The main issues involved are:

- Formulation of a Fisheries Development Policy suitable for the island conditions.
- Working out a new strategy for the development of fisheries with short-term and long-term objectives.
- Formulation of a new Regulation/Act and of different rules covering all aspects of marine capture fisheries, mariculture fish processing and trade.
- Providing a proper institutional framework including re-structuring and re-organisation of the Fisheries Department.
- Integration of Marine Capture Fisheries, Coastal Aquaculture, Tourism and other developmental requirements in the Coastal Zone in a mutually inclusive way, taking also into consideration the Coastal Regulation Zone Act.

The Assistance Required for Time Bound implementation of the Code of Conduct

The Department is implementing a scheme namely: "Resource Survey and Sea Ranching" with a Ninth Plan outlay of Rs.24.50 lakhs. Out of this, during the last two years Rs.2.21 lakhs have been spent. The objective of the scheme is to take care of depleting/depleted fishery resources by sea ranching/sea farming. The scope of the scheme has to be enlarged to meet the various requirements laid down under the Code. An outlay of Rs. 300 lakhs will be required for this in the remaining part of the Ninth Five Year Plan.

Fisheries Management

For the management of fisheries, the Department is the nodal agency with a limited strength of technical manpower spread over various islands. The structure and manpower of the Department is not sufficient to meet the present and future requirements. A policy is also to be finalised in this region. Lastly Marine Fisheries Regulation Act is awaiting the approval of the Government of India.

Fishing Operation

The present fishing practice is artisanal and traditional. The fishing rights of traditional fishermen are to be protected while permitting the operation of motorised and mechanised fishing boats.. They should not fish in the same fishing zone. For this purpose, the enactment of marine fisheries regulation act is essential. There is a need for parallel development of existing traditional fishing with motorised fishing and mechanised fishing.

Aquaculture Development

So far no mariculture worth mentioning has taken place in the islands even though a cage culture project was started some time back. The project had to be wound up in the absence of a clear policy on mariculture and rules governing the subject. Our interest in this area is development of aquaculture in an environment friendly manner without causing damage to the coral reef area. A policy in this regard is under consideration of the Administration.

Integration of Fisheries with Coastal Area Management

The coastal area in the islands is under great pressure for the development of various sectors like fisheries, tourism and other development needs. It has been found that many activities are interrelated. It is essential to formulate an Integrated Coastal Zone Management Plan for various inter-related sectors.

Fisheries Research

As far as research and development and technology inputs are concerned, the Islands are lagging behind. No technical input worth mentioning has trickled down to the stakeholders, namely fishermen. Any research project should have a direct bearing on the immediate felt needs of the fishermen and such areas have to be identified by the Administration in conjunction with the fishermen. Research institutions should work out solutions to the problems so identified,

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Table 1. General Information

1	Location of A&N Islands	6°14°N Latitude 92°94°E Longitude
2	Geographical area (sq.km)	8293 sq.km
3	Total Exclusive Economic Zone (EEZ)	0.6 Million sq.km
4	Coastline (in km)	1 912
5	Continental shelf area	<35 000 sq.km
6	Mangrove Area (marshy and swamp) (in hectare)	38 000
7	Brackish water area (in hectare)	618
8	Fresh water area (in hectare)	279
9	Fishery potential (lakh tonnes)	2.435
10	Population (in lakhs)	> 4.0

Table 2. Important Fish Landing Centres in A&N Islands

Diglipur	:	Neil Island
Maybunder	:	South Andaman
Rangat	:	Little Andaman
Billiground	:	Car Nicobar
Kadamtal	:	Katchal
Uavelock	:	Nancowri
Campbell bay	:	

Table 3. Fishing Gear Used for Pelagic Fishery in Andaman Waters

S. No	Name of Gears	1995-96	1996-97	1998-99	1999-2000
1	Gill Net	1,038	1,044	1,047	3095
2	Shore Seine Net	45	49	6	13
3	Anchor Net	35	38	2	1
4	Castnet	612	615	615	1164
5	Hook and Line	900	913	801	2724
6	Trammel Net	-	-	-	02

Table 4. Variety-wise Marine Fish Landings

No	Name of the Species	1995 Qty (in tonnies)	1996 Qty (in tonnes)	1997 Qty (in tonnes)	1998 Qty (in tonnes)	1999 Qty (in tonnes)
1	Elasmobranches	885	985	886	1157	941
2	Sardines	3192	3214	3194	3926	5237
3	Thissoctes	1191	1201	1118	2581	312
4	Anchovies	1382	1408	1395	1073	1361
5	Silverbellies	1410	1420	1405	1090	1098
6	Mackeral	1559	1589	1430	1087	1213
7	Carangids	1455	1456	1350	1139	2249
8	Seer Fish	700	799	729	882	1172
9	Tuna	972	781	970	3823	1362
10	Sail & Sword Fish	345	348	328	342	241
11	Baracuda	914	942	842	022	1021
12	Pomfrets	342	393	345	472	499
13	Mullets	896	904	805	1262	1153
14	Hilsa	1630	1680	1580	729	478
15	Perches	1946	1951	1926	1482	3356
16	Belonidae	353	358	390	113	133
17	Chirocentridae	358	359	340	331	83
18	Cat Fish	590	560	540	431	388
19	Polynmids	209	218	209	201	480
20	Scienids	253	253	249	276	82
21	Prawns	369	250	405	601	785
22	Crabs	141	140	145	578	556
23	Ribbon Fish	473	48	395	597	527
24	Miscellaneous	4655	4661	3998	3788	1996
	Total	26120	26551	24974	28983	26673

Table 5. Center-wise Marine Fish Landings (in kgs)

Name of Region	from Port Blai	1991	1992	1993	1994	1995	1996	1997	1998	1999
Digilpur	18kms	842	1251	1241	1662	1306	1478	1954	1100	788
Mayanhunder	157 kms	624	953	982	1166	784	797	898	876	612
Rangat	93 kms	2650	2715	1,985	2360	1090	2128	3558	2727	3043
South Andanian		16396	17993	16931	18874	19560	19744	16872	22755	20595
Little Andaman	122kms	585	895	760	1045	1045	1013	800	836	887
Car Nicobar	278 kms	177	224	210	277	261	222	121	93	27
Nancowry	435 kms	515	620	582	62	552	650	319	135	199
Campbell bay	482 kms	550	753	643	762	522	519	452	461	522
Total		22338	25404	23334	26696	26120	26651	24974	28983	26573

Table 6. Export of Fish and Fish Products (in kgs)

items	1996	1997	1998	1999	2000
Live Fish (grouper)	-	-	5800	2000	7955
Chilled fish	-	-	—	-	
Frozen fish	9061	25400	26446	14351	11144
Dried Fish	64631.71	52500	20117	33395	16416
Shark fins	1443	539	1431.9	4530.8	2049
Shell or chanks			-	-	-
Lobster (live)	231.5	860	2626	2145	10235
Crab (Live)	11807.5	19423.5	11881.5	10499	18227
Prawn	20874.75	4522.5	1524	3441	11942

Table 7. Number of Exporters of Different Kind of Fish Products

Description	Number
Live crabs	9
Live fish (groupers)	1
Live Lobsters	7
Prawns/Shrimp (frozen)	6
Dried fish	4
Shark fins	12
Deep sea fish	2
Fish	7

STATE - ORISSA

General Information

Orissa lies in the east coast of India, surrounded by West Bengal on the north east, Bihar on the north, Andhra Pradesh on the south east, Madhya Pradesh on the west and Bay of Bengal on the east. The State has 480 km of coastline and 24 000 sq.km of continental shelf that spreads over six coastal districts, which are Balasore, Bhadrak, Kendrapara, Jagatsinghpur, Puri and Ganjam. The density of population is 202. The literacy is 48.65% of which male literacy forms 62.37% and female is 34.40%. There are 329 fishing villages with a population of 1 73 197. There are four fishing harbors, 23 jetties and 67 fish landing centers in the State.



Physical Features

The entire coast of the State is broadly divided into two regions viz, North Orissa coast comprising Balasore, Bhadrak and Kendrapara districts, and South Orissa coast constituting Jagatsinghpur, Puri and Ganjam districts. The North Orissa coast is shallow, muddy and calm with extensive river deltas compared to South Orissa coast, which has the surfbeaten sandy beaches. The Chilika lagoon, situated in Khurda district, is the largest of its own kind, having minimum waterspread area of 790 sq. km. with its opening to Bay of Bengal. A population of 1 04 040 from 128 fishing community villages solely depends on Chilika fisheries. Fishing activity, which is closely related to the socio-economic conditions of the local inhabitants of the coastal area, needs to be regulated by certain principles for sustainable benefit.

Present Status of Marine Fisheries

The continuous and intensive exploitation of marine fisheries resources has resulted in increase in fish production during the last five years *i.e.* 1995-1996-1.23 lakh tonnes., 1996-1997-1.33 lakh tonnes, 1997-1998-1.56 lakh tonnes 1998-1999-1.24 lakh tonnes and 1999-2000-1.25 lakh tonnes as against the maximum sustainable yield (MSY) of 1.256 lakh tonnes. However, there are indications that the inshore fishery has already reached the maximum production level in Orissa coast. It is therefore imperative that appropriate management measures are taken up in order to maintain the fishery activity at the maximum sustainable yield levels.

Poor replenishment of the natural fisheries is considered an important cause for depletion of catch because the fishing nets catch breeders and young fish/prawns during the breeding season. Estuaries and backwaters are excellent nursery grounds for many species of marine prawns, which constitute an important source of recruitment for the inshore stock, and they should not be exploited. Sea turtles face mortality along the coast and are considered endangered. Considering all the above factors the State Government has already implemented the Orissa Marine Fishing Regulation Act/Rules with the objective to regulate fishing activity and for scientific management of fisheries in the territorial water of the State.

Some of the important features of OMFRA/Rules are:

- Strict enforcement of Orissa Marine Fishing Regulation Act/Rules to restrict the numbers of fishing boats to be operated in the harbors and jetties;

- Prohibiting fishing of prawn larvae around river mouths and in adjacent coastal waters:
 - i) Prohibit fishing within a seaward radius of 20 km from Gahirmatha area of Bhitarkanika Wild Life Sanctuary.
 - ii) Prohibit fishing up to a seaward distance of 20 km from the high tide line (Shore) of Orissa from Jatadhar River Mouth to Devi River mouth and from Chilika mouth (Magarmukha) to Rushikulya River mouth for a period of 5(five) months from January to May of each calendar year.
The above-restricted area is meant for safe migration of sea turtles to their respective breeding grounds.

Use of Turtle Excluder Device (TED) in the trawl nets. Its actual use is limited because of the unavailability of the appropriate design.

The proposals for declaring ban on marine fishing during the breeding season and increasing mesh size of the cod end of the trawl net up to 30 mm. are under active consideration of the State Government for inclusion in the OMFRA/Rules.

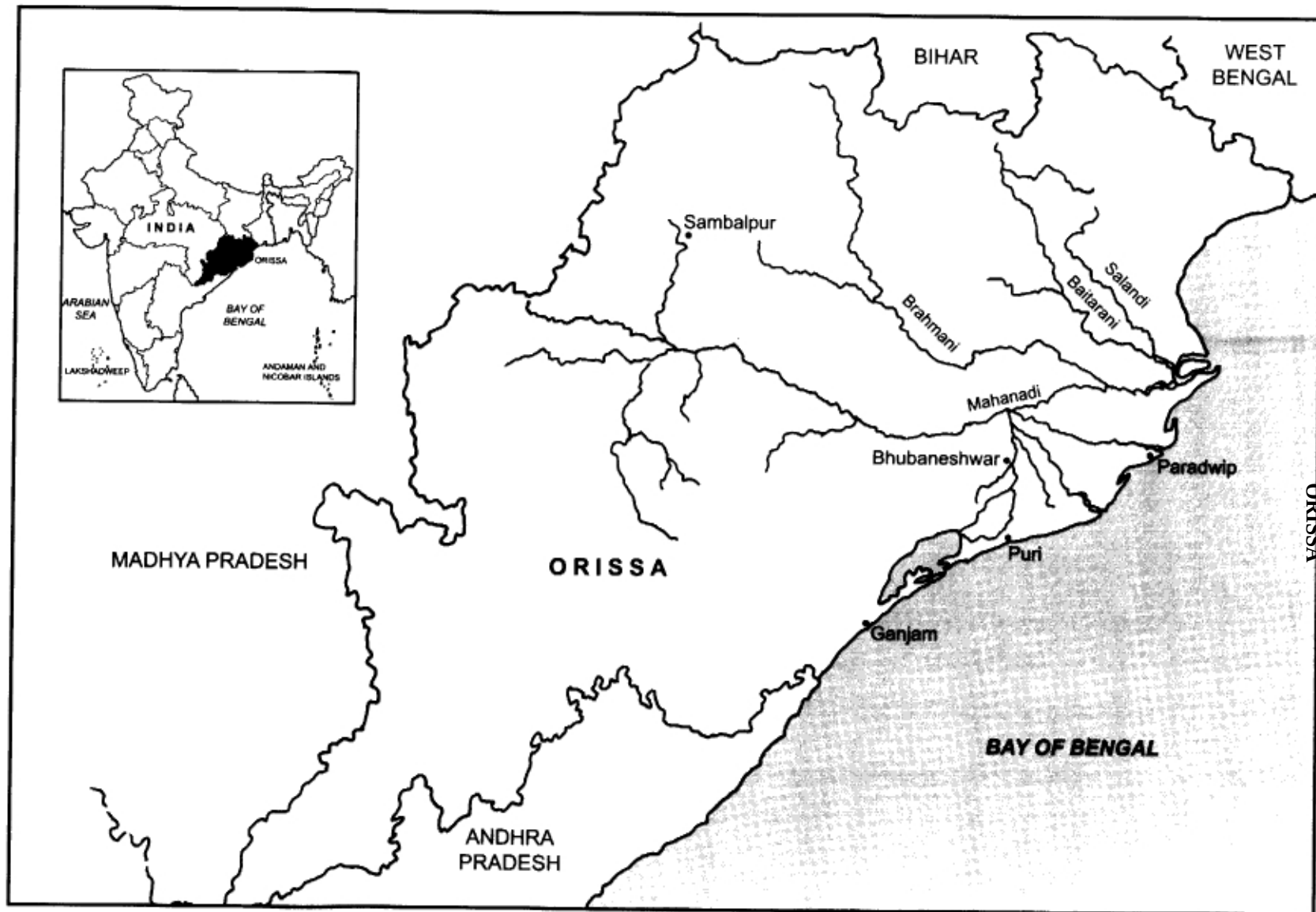
Further, the State Government has notified Gahiramatha “(Marine) Wild Life Sanctuary” with total area of 1 435.00 sq. km including 1 408.00 sq. km of water body and 27 sq. km of landmass including reserve forests (mangrove), mud flats and accreted sand bars. It restricts the fishing activities in the area. The State Government has also constituted State level monitoring body to review proper enforcement of the legal provisions against illegal fishing in sea turtle congregation areas and four monitoring teams for patrolling of the coastal sea, seizure of offending fishing trawlers and boats and their detention in custody and prosecution.

In the case of brackishwater aquaculture, the State Government is restricting the proliferation of aquaculture (shrimp) ponds in the coastal area. Shrimp farmers practising traditional and improved traditional systems of shrimp farming are encouraged to adopt improved technology for increasing production as per the guidelines of the Aquaculture Authority of India. In this regard the local inhabitants are advised to follow the Coastal Regulation Zone norms.

While considerable stress has been given in recent years for the protection of forest and land resources, the marine fishery development schemes aim at only increasing fish production without paying adequate attention to conservation of resources. The educational and socio-economic backwardness prevailing among the coastal fishermen renders proper implementation of conservation policies difficult. It is therefore imperative that an effective educational process is put into operation to enlighten the fishing community about the benefit of the conservation programmes and about the appropriate know-how for their successful implementation. So, appropriate extension programmes in an organised manner should be initiated for creating public awareness on conservation of marine resources.

Above all, considerable data on the MSY of Orissa coast is a primary requirement for perspective coastal resource harvesting plan. Hence Fishery Survey of India, Mumbai and CMFRI, Cochin may conduct exploratory survey and inform the administration of the harvestable potential. They should also estimate additional harvestable yield that could be obtained on a sustainable basis from different depth zones as the Islands have a peculiar continental shelf,

. * *



State Marine Profile - Orissa

Typeoffishingboats	Nos.
Mechanised	1495
Motonsed	5053
Traditional	11933
Total	18481

Infrastructure	
Fishing Harbors	4
Fishery Jetties	23
Fish landing Centers	67
Ice Plants	7 (Deptl.)
Processing plants, Cold	
Storage, Ice Plant &	21 (Pvt.)
Peeling Shed	

Primary Fishermen Cooperative Societies

Marine	73
Chilika Lagoon	84

Marine Catch Statistics (figures in tonnes)

SLNo.	Items	1995-96	1996-97	1997-98	1998-99	1999-00
1	Prawns	6211	6858	12684	7892	9909
2	Pomfret	7527	8676	8247	6976	7891
3	Hilsa	5596	8285	15058	9547	6686
4	Polynemids	2290	2975	1555	2017	2167
5	Clupeids	3912	5050	5456	4378	2737
6	Sciaenids	16133	16150	11048	10691	7346
7	Catfish	7058	7346	9848	9234	7468
8	Elasinobranches	8354	8496	14730	10029	12259
9	Other Varieties	66118	69626	77455	63565	69472
	Total	123199	133462	156018	124329	125435

Sustainable and Exploitable Marine Potential of Orissa (in tonnes)

Demarsal Fishes	77,400
Crustaceans:	
a) Penaeid Prawns	4,700
b) Non-penaeid prawns	2,400
Other Crustaceans	300
Cephalopods	500
Pelagic resources	40,000
Total	1,25,600

Source: FSI, Bulletin 19th Nov.1990

STATE - WEST BENGAL

General information

West Bengal stretches from the Himalayas in the north to the Bay of Bengal in the south. It has boundaries with Sikkim and Bhutan on the north, Assam and Bangladesh in the east, the Bay of Bengal in the south and Orissa, Bihar and Nepal on the west. Covering an area of 88 752 sq km, the State has 19 districts. It has a population of 68 077 965 with a density of 766. The literacy rate is 57.72% with males at 67.24% and females at 47.15%. Agriculture forms the backbone of the State with 70 percent of the population engaged in agriculture and allied activities. While the State accounted for 15.3 percent



of the country's total output of rice, it produced 66.5 percent of the country's jute and 22.2 percent of tea. Other major crops include potatoes, oilseeds, betelvine, tobacco, wheat, barley and maize. It is also one of the major industrial centers of the country with 10 236 registered and functioning factories. Major industries include engineering, automobiles, chemicals, pharmaceuticals, aluminium and timber processing. It is also the base of a large number of public sector enterprises in the country.

Present Status of Fisheries

The Fisheries Department is well aware of the dangers of rapid and uncontrolled exploitation and development in the fisheries sector. The Government is also equally aware about the new approaches to fisheries management embracing conservation and environmental consideration. The articles of The Code of Conduct for Responsible Fisheries are very important to this State. In order to give effect to the articles of the Code, multi-pronged steps have been taken. So far as obligations of legal instrument with binding effect are concerned, the Fisheries Department has enacted and enforced two main acts.

- West Bengal Inland Fisheries Act, 1984.
- West Bengal Marine Fishing Regulation Act, 1993.

Planning for Development of Inland Fisheries in the State

The principles contained in the Code have prompted the lawmakers to enact the West Bengal Inland Fisheries Act, 1984. This Act was made with the clear objective of conservation, development, propagation, protection, exploitation and disposal of inland fish and fisheries in West Bengal. Some of the important provisions made under this Act may be stated here by way of illustration. The State Government may for the purpose of conservation and propagation of fish, by notification restrict, for any specified area and for specified period, fishing of special size, group of species of fish, and may by rules regulate the conservation of propagation of fish including the following:

- the erection or use of fixed engine;
- the construction, temporary or permanent of nay wire, dam or bund;
- the dimension and king of any net or size of any mesh or nay or other fishing contrivance, and the mode of using them - Section 300 of the aforesaid Act.

It has further been stated in Section 3(2) that 'No person shall construct any dam, barrage, bund or barrier of any kind whatsoever on a flowing river without making provision for fish-pass or fish-ladder of such

description and in such manner as may be directed by the competent authority'. It is also important to note that Section 5 of the Act prohibits any persons from using dynamite or other explosive substance or putting any poison, lime or noxious material in any fishery or other water area with the intent to catch or destroy any fish therein. If he commits this he has to be punished with imprisonment for a term, which may extend to six months or with fine which may extend to Rs. 2 000 or with both.

It is also very important to mention that this law forbids any person to discharge into any flowing water or any confined water area any industrial waste, sewage or other polluting substance that may affect the health of life of fish or cause destruction of fish, or act in contravention of any rules regulating the protection of fish.

Any person causing pollution of any flowing water or any confined water area may also be prosecuted and shall, on conviction be punished with imprisonment for a term which may extend to six months or with fine which may extend to Rs. 10 000 or with both vide Section 6 (3) of the Act.

In our training courses and awareness camps meant for fish farmers and fishermen, all these provisions of laws and rules are stressed and propagated.

Restrictions Observed for Coastal Aquaculture

The provision of the Coastal Regulation Zone rules is being strictly observed in the State. Shrimp farming in the coastal area is being done only in accordance with the recommendation of Aquaculture Committee of the Districts- and State-level Aquaculture Committee and finally with the sanction of the Aquaculture Authority of India. So all environmental hazards likely to result from irresponsible culture in the Coastal Regulation Zone are being minimised or eliminated.

Enactment and enforcement of the West Bengal Marine Regulation Act and West Bengal Marine Fishing Rules

The Act came into force from 5 March 1998. The Act and Rules framed thereunder were made for proper management, conservation and rational exploitation of marine resources within the area of fishing jurisdiction of the State.

The State government has powers to regulate, restrict and prohibit the following matters:

- the fishing in any specific area by such class or classes of fishing vessels as may be prescribed;
- the number, size and class of fishing vessels which may be used for fishing in any specified area;
- the catching in any specified area of such species of fish and for such period as may be specified in the notification;
- the use of such fishing gear indicating mesh, size or type of construction or any other general description of any specified area as may be prescribed;

‘the State (Government will make an order for achieving the aforesaid purposes keeping in mind, *infer alia*, the need to conserve fish and to regulate fishing on scientific basis (Section 492) (b) of the West Bengal Marine Fishing Regulation Act, 1993).

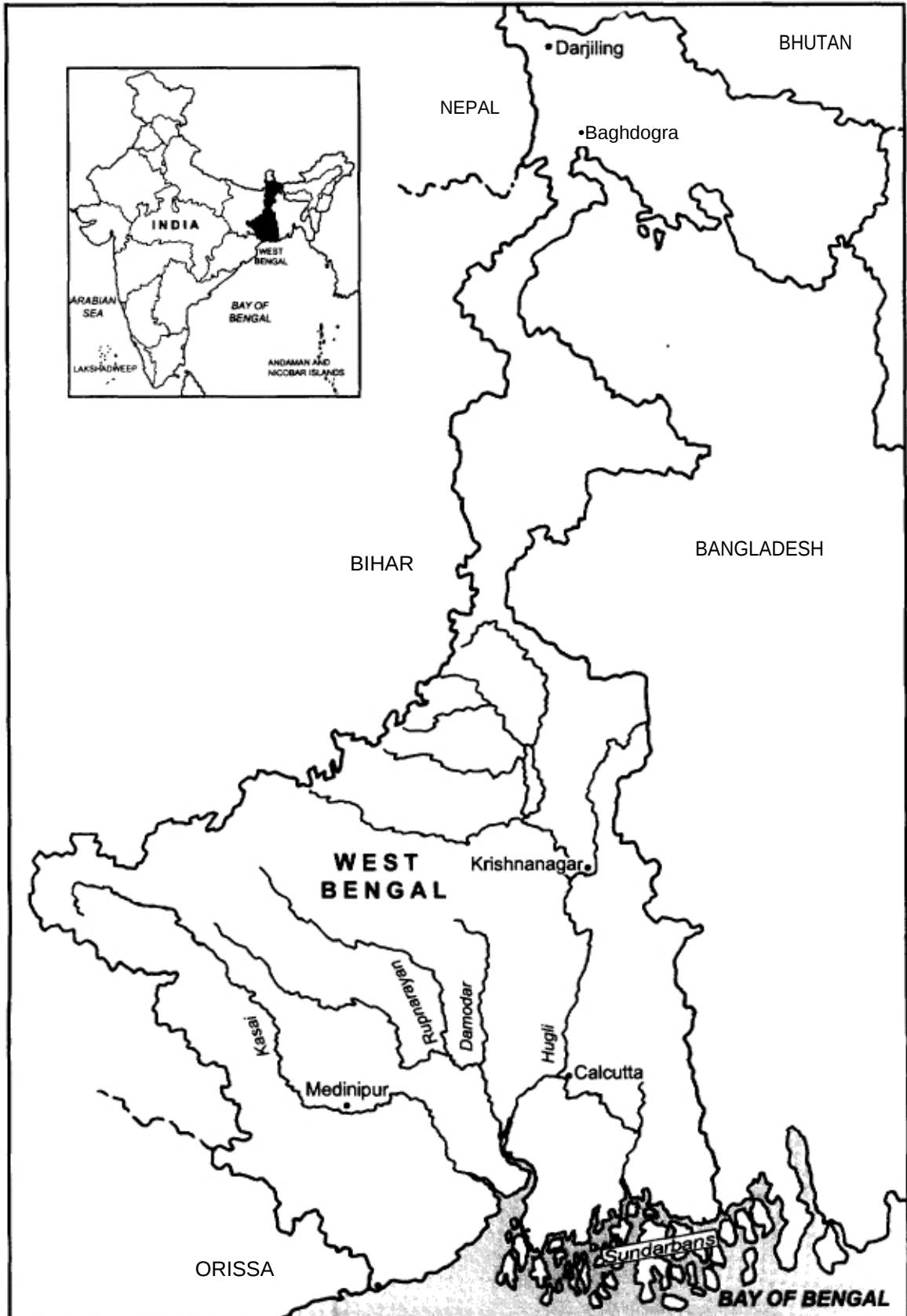
Section 9 of this Act also enjoins that the owner of every vessel, used or intended to use for the purpose of fishing, and kept in the State shall get the vessel registered under this Act. It is also important to note that if any fishing vessel is found to be used or has been used in contravention of any of the provision of this Act or the rules or the orders made thereunder or any of the conditions of the license, the authorised officer may enter and search vessel and impound such vessel with all the fittings and accessories on board and seize any fish found in it vide Section 15 of this Act,

Management of Fishing Harbour

Presently, the State has the following three fishing harbours:

- Fraserganje
- Shankarpur State - I
- Shankarpur Stage - II

WEST BENGAL



There are many as 12 Fish Landings Centers in the State – five in Midnapore district and seven in South 24 Parganas district. The checklist for better management and maintenance of hygienic condition in the fishing harbors and fish landing centers; as received from the Government of India, has already been circulated to the appropriate authority for compliance as far as practicable. Some of the conditions mentioned in the checklist require investment of funds for minor structural changes and modifications. The shortage of funds have up till now stood in the way of giving full effect to the checklist and making harbors better from the hygienic point of view.

In this connection it is worthwhile to mention that Government of India has provided four petrol Boats to the State Government for facilitating implementation of the provisions of Marine Fishing Regulation Acts and Rules in the territorial waters of the State. Construction of the boats has been completed, but for want of fund the Government is unable to bear the operation cost. Government of India may kindly consider to provide financial support for running and operation of these boats.

Introduction of combination vessels in exploitation of marine resources

It has been experienced during fishing in marine fisheries that considerable quantities of commercially cheaper variety of fish captured by the trawlers is thrown into sea for want of suitable facilities on boarding. It is true that introduction of combination vessel in such area is a capital intensive endeavour. Nevertheless, it is suggested that such facilities may be introduced on pilot basis with help from Government of India/FAO.

Awareness Camp in Fisheries Sector

Awareness camps are being periodically organised at different places along with coastal belts of the state. Seminars, workshops, group discussions, etc, on marine fishing activities are being organised where not only the Departmental officers but also the Naval and Coast Guard officers participate.

Role of NGO

Only two non-governmental organisations, Ramakrishna Mission NSLP and Ramakrishna Mission, Nimpith, are actually engaged in fisheries activities in the State. They are confined within inland fisheries.. Their role is praise worthy. It is important to add that no NGO is doing any work in the marine fisheries sector.

Simplification of the Code

This requires in-depth study. However, this is to note that some of the essence of the Code has been translated into Bengali and distributed among the local fishermen.

The Code of Conduct for Responsible Fisheries should be more actively pursued and implemented through enforceable measures. Holding seminars and workshops and training camps at the field level will help the State in this matter.

FISHERIES STATISTICS

*Source- Department of Animal Husbandry & Dairying,
Ministry of Agriculture, Government of India*

FIGURES AT A GLANCE

Area of the country	3.29 million sq. km.		
2. Length of Coastline	8118 kms		
3. Exclusive Economic Zone	2.02 million sq. km.		
4. Continental shelf area (approx.)	0.5 million sq. km.		
5. Fish Production and potential (million tonnes)			
	<u>Marine</u>	<u>Inland</u>	<u>Total</u>
Fish Production 1998-99	2.70	2.56	5.26
Production potential (Est.)	3.9	4.5	8.4
6. Export of fisheries products, 1998-99			
Quantity (Tonnes)	302.93		
Value (Rs crores)	4 626.87		
(US\$ crores)	110.69		
7. Contribution of fisheries to Gross Domestic Product (GDP), 1998-99 at current prices			
a) GDP from fisheries	Rs. 19 555 crores		
b) Contribution of fisheries sector to			
i. Total GDP	1.3 per cent		
ii. GDP from Agriculture sector	4.6 per cent		
8. Population			
a) On March 1, 1991	846.30 million		
b) On March 1, 1999 (Projected)	980.36 million		
c) Annual Growth Rate 1996-2001	1.60% (Projected)		
9. Fishermen population (as per Livestock Census, 1992)			
No. of family members			
i. Total	6 730 300		
ii. Males	2 386 100		
iii. Females	1 980 000		
iv. Children	2 364 200		
Engaged in fishing operations			
i. Fulltime	738400		
ii. Parttime	713700		
Engaged in fishing related activities other than actual fishing			
i. Marketing of fish	464 700		
ii. Repair of fishing nets	225 700		
iii. Processing of fish	87 500		
Other activities	256 200		

TABLE 1: MARINE FISHERY RESOURCES - COASTAL STATES AND UNION TERRITORIES

State/ Union Territory	Approximate length of coast line (Kms.)	Continental shelf (*000 sq. km.)	No. of landing centres	No. of fishing villages
1. Andhra Pradesh	974	33	508	508
2. Goa	104	10	88	72
3. Gujarat	1,600	184	286	851
4. Karnataka	300	27	29	221
5. Kerala (P)	590	40	226	222
6. Maharashtra	720	112	184	395
7. Orissa	480	26	63	329
8. Tamil Nadu	1,076	41	362	556
9. West Bengal	158	17	47	652
10. Andaman & Nicobar Islands (P)	1,912	35	57	45
11. Daman and Diu (P)	27	-	7	31
12. Lakshadweep(P)	132	4	11	10
13. Pondicherry	45	1	28	45
Total	8,118	530	1,896	3,937

P - Provisional

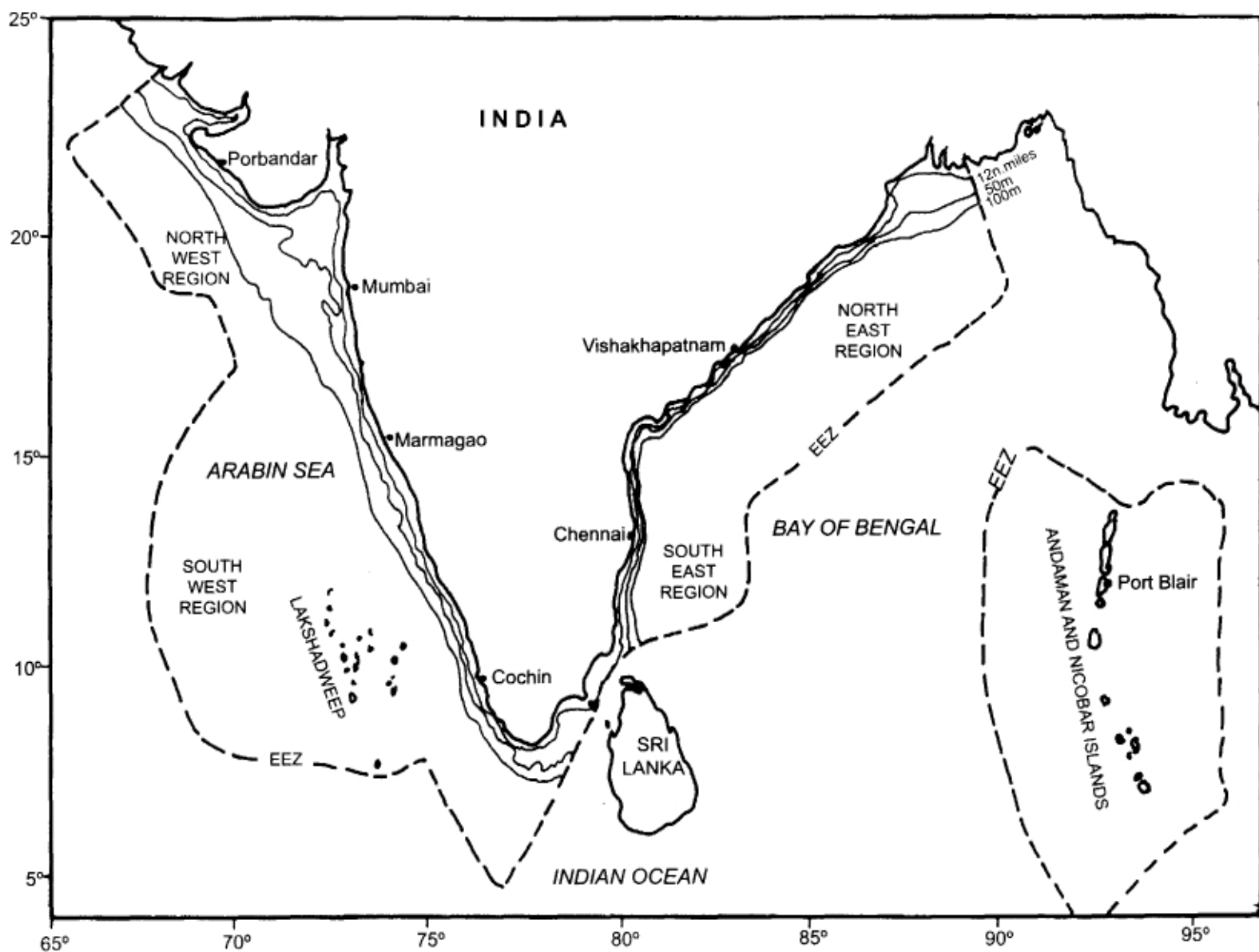
Source: State Governments! Union Territory Administrations

TABLE 2: INLAND FISHERY RESOURCES BY STATES AND UNION TERRITORIES

state/Union Territory		Length of Rivers and Canals (Kms)	Reservoirs (iakh ha)	Ponds and Tanks (iakh ha)	Beels, Oxbow lakes & Derelict water bodies (lakh ha)	Brackish water (lakh ha)
1.	Andhra Pradesh	11,514	2.24	5.17	--	0.79
2.	Arunachal Pradesh	2,000	--	2.76	0.42	--
3.	Assam	4,820	0.02	0.23	1,10	--
4.	Bihar	3,200	0.60	0.95	0.05	--
5.	Goa	250	0.03	0.03	--	--
6.	Gujarat	3,865	2.43	0.71	0.12	3.76
7.	Haryana	5,0..	Neg.	0.10	0.10	--
8.	Himachal Pradesh	3,000	0.42	0.01	--	--
9.	Jammu & Kashmir	27,781	0.07	0.17	0.06	—
10.	Karnataka	9,000	2.11	2.90	--	0.08
11.	Kerala	3,092	0.30	0.30	2.43	2.43
12.	MadhyaPradesh	20,661	2.94	1.19	--	--
13.	Maharashtra	16,000	2.79	0..59	--	0.10
14.	Manipur	3,360	0.01	0.05	0.04	--
15.	Meghalaya	5,600	0.08	0.02	Neg.	--
16.	Mizoram	1,395	--	0.02	--	--
17.	Nagaland	1600	0.17	0.50	Neg.	--
18.	Orissa	4,500	2.56	1.14	1.80	4.17
19.	Punjab	15,270	Neg.	0.07	--	--
20.	Rajasthan	5,290*	--	1.80	--	--
21.	Sik.kim	900	1.20	--	0.03	--
22.	Tamil Natlu	7,420	0.52	0.56	0.07	0.56
23.	Tripura	1,200	0.05	0.13	--	--
24.	Uttar Pradesh	31,200	1.50	1.62	1.33	--
25.	West Bengal	2,526	0.17	2.76	0.42	2.10
26.	Andaman & Nicobar Islands	115	0.01	0.03	--	0.37
27.	Chandigarh	2	--	Meg.	Neg.	--
28.	l)adra & Nagar Haveli	54	0.05	--	--	--
29.	i)aman & Diu	12	--	Neg.	--	Neg.
30.	Delhi	150	0.04	--	--	--
31.	Lakshadweep	--	--	--	--	--
32.	Pondicherry	247	--	Neg.	0.01	0.01
INDIA		191,024	20.31	23.81	7.98	14.37

Provisional

FIGURE 1. EXCLUSIVE ECONOMIC ZONE, TERRITORIAL WATERS, ETC. OF INDIA



**TABLE 3: SUMMARY OF MARINE FISHERIES RESOURCES POTENTIAL
IN THE INDIAN EEZ**

('000 tonnes)

Regions	Demersal		Pelagic		Oceanic	Total
	0-30 m beyond 50m		0.50 m beyond 50m			
North west coast	377	379	273	188		1217
South west coast	361	112	589	245		1307
North east coast	103	40	117	61		321
South east coast	195	118	195	46		554
Andaman & Nicobar		...	139	139		
Lakshadweep		...	...	63		63
Oceanic 295 295						
Total	1036	649*	1174	742	295	3896
300-500 m depth		4**				4
Grand Total	1036	653	1174	742	295	3900

* Includes resources upto in depth in lat. 8)-JO) N

** Except lat. 8)- 10) along the west coast

Source: Working Group Report

**TABLE 4: POTENTIAL OF FISHERY RESOURCES IN THE INDIAN
EXCLUSIVE ECONOMIC ZONE**

(Million tonnes)

Depth range (m)	0-50	50-200	200-500	Oceanic	Total
1	2	3	4	5	6
Demersal	1.28	0.625	0.028	--	1.933
Neretic Pelagic	1.00	0.742	--	--	1.742
Oceanic Pelagic	--	--	--	0.246	0.246
Total	2.28	1.367	0.028	0.246	3.921
Per cent to total	58.1	34.9	0.7	6.3	100.0

**FIGURE 2: POTENTIAL MARINE FISHERY
RESOURCES BY DEPTH**



TABLE 5: FISH PRODUCTION AND AVERAGE ANNUAL GROWTH RATE, INDIA - 1950-1998

Year	Fish Production ('000 tonnes)			Average Annual Growth Rate (Per cent)		
	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	1,160	9.53	3.05	7.65
1965-66	824	507	1,331	-1.27	16.21	2.95
1970-71	1,086	670	1,756	6.36	6.43	6.39
1973-74	1,210	748	1,958	3.81	3.88	3.83
1978-79	1,490	816	2,306	4.25	1.76	3.33
1979-80	1,492	848	2,340	0.13	3.92	1.47
1980-81	1,555	887	2,442	4.32	3.24	3.91
1981-82	1,445	999	2,444	-7.07	12.63	0.08
1982-83	1,427	940	2,367	-1.25	-5.91	-3.15
1983-84	1,519	987	2,506	6.45	5.00	5.87
1984-85	1,698	1,103	2,801	11.78	11.75	11.77
1985-86	1,716	1,160	2,876	1.06	5.17	2.68
1986-87	1,713	1,229	2,942	-0.17	5.95	2.29
1987-88	1,658	1,301	2,959	-3.21	5.86	0.58
1988-89	1,817	1,335	3,152	9.59	2.61	6.52
1989-90	2,275	1,402	3,677	25.21	5.02	16.66
1990-91	2,300	1,536	3,836	1.10	9.56	4.32
1991-92	2,447	1,710	4,157	6.39	11.33	8.37
1992-93	2,576	1,789	4,365	5.27	4.62	5.00
1993-94	2,649	1,995	4,644	2.83	11.51	6.39
1994-95	2,692	2,097	4,789	1.62	5.11	3.12
1995-96	2,707	2,242	4,949	0.56	6.91	3.34
1996-97	2,967	2,381	5,348	9.60	6.20	8.06
1997-98	2,950	2,438	5,388	-0.57	2.39	0.75
1998-99	2,696	2,566	5,262	-9.40	5.25	-2.34
1999-2000*	2,834	2,823	5,657	5.12	10.01	7.48

* Provisional

Note: The growth rates presented for the periods prior to 1979 are the average annual compound growth rates

Source:

- i. **Central** Marine Fisheries Research Institute, Kochi for the period up to 1970-71.
- ii. State Governments / Union Territory Administrations since 1970-71.

TABLE 6: FISH PRODUCTION OVER THE PLAN PERIODS - INDIA

Plan Period	Fish Production at end of the period (000_tonnes)			Growth (Per cent) during the plan period			Average Annual Growth rate
	Marine	inland	Total	Marine	Inland	Total	
Pre-PlanPeriod (1950-51)	534	218	752	-	-	-	-
1st Plan (1951-56)	596	243	839	11.61	11.47	11.57	2.31
2nd Plan (1956-61)	880	280	1,160	47.65	15.23	38.26	7.65
3rd Plan (1961-66)	824	507	1,331	- 6.36	81(1)7	1474	2.95
Annual Plans (1966—69)	904	622	1,526	9.71	22.68	14.65	4.88
4th Plan (1969—74)	1,210	748	1,958	33.85	20.26	28.31	5.66
5th Plan (1974-79)	1,490	816	2,306	23.14	9.09	17.77	3.55
Annual Plan (1979—80)	1,492	848	2,340	0.13	3.92	1.47	1.47
6th Plan (1980—85)	1,698	1,103	2,801	13.81	30.07	19.70	3.94
7th Plan (1985-90)	2,275	1,402	3,677	33.98	27.11	31.27	6.25
Annual Plan (1990—91)	2,300	1,536	3,836	1.10	9.56	4.32	4.32
Annual Plan (1991-92)	2,447	1,711	4,157	6.39	11.33	8.37	8.37
8th Plan (1992-97)	2,967	2,381	5,348	16.76	33.51	23.65	5.17

- i. Central Marine Fisheries Research Institute, Kochi for the period up to 1970-71.
State(Governments/UnionTerritory/Administrations since)1970-71

FIGURE 3: FISH PRODUCTION BY SOURCE - SELECTED YEARS

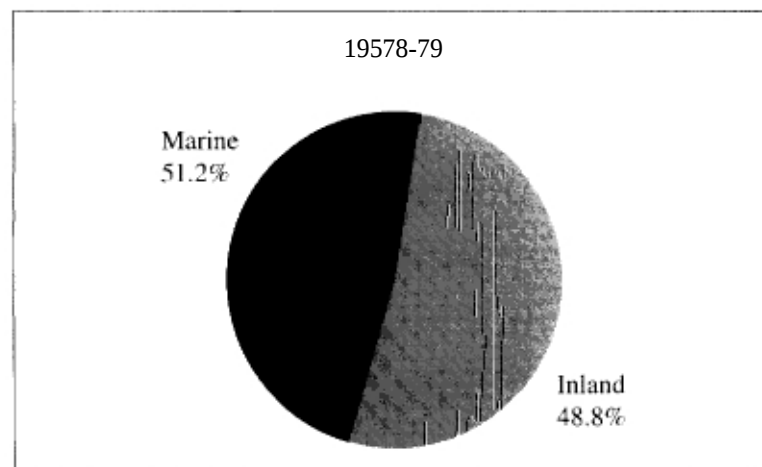
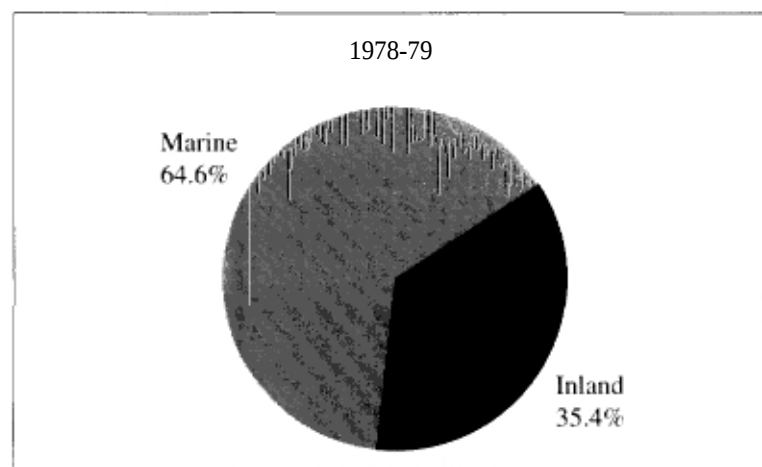
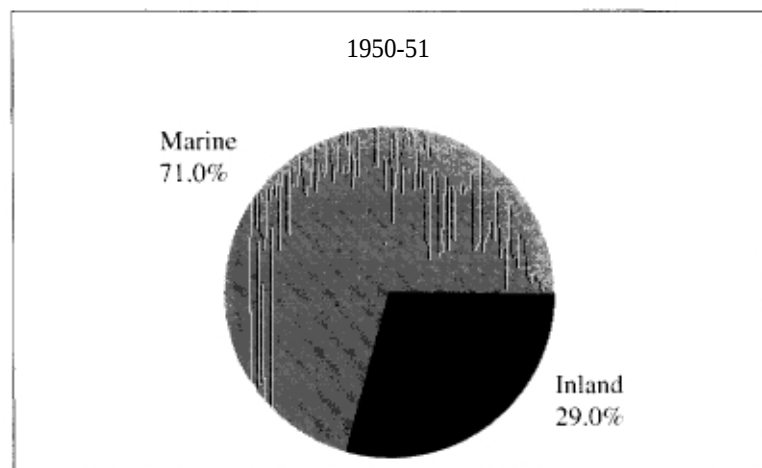


TABLE 7: FISH PRODUCTION BY STATES/UNION TERRITORIES. 1989-1999

(In '000 tonnes)

State/Union Territory	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	State/ Union Territory
1. Andhra Pradesh	245.78	256.60	264.67	263.55	321.37	345.39	355.96	359.36	372.86	410.82	1. Andhra Pradesh
2. Arunachal Pradesh	1.00	1.25	1.49	1.60	1.70	1.80	1.85	1.85	2.13	2.30	2. Arunachal Pradesh
3. Assam	58.43	76.00	130.00	140.00	151.65	153.00	155.06	154.61	155.13	155.71	3. Assam
4. Bihar	156.55	159.93	184.97	164.07	200.1	195.1	239.8	240.8	208.54	202.29	4. Bihar
5. Goa	54.65	56.22	49.55	104.26	105.44	101.90	87.82	97.06	92.05	69.02	5. Goa
6. Gujarat	459.51	545.00	556.95	638.00	684.86	715.36	660.00	725.35	816.50	630.00	6. Gujarat
7. Harvna	20.02	23.20	24.30	20.15	22.58	24.13	28.01	30.00	32.05	32.52	7. Harvna
8. Himachal Pradesh	4.62	5.20	6.02	6.39	6.63	5.29	5.94	6.27	6.69	6.79	8. Himachal Pradesh
9. Jammu & Kashmir	1.00	13.00	13.05	13.30	14.50	16.10	16.52	17.80	18.53	18.85	9. Jammu & Kashmir
10. Karnataka	241.97	236.83	245.75	239.89	249.15	244.04	304.87	324.43	285.13	255.61	10. Karnataka
11. Kerala	569.02	550.58	565.13	534.40	604.69	596.56	582.14	631.03	583.86	649.22	11. Kerala
12. Madhya Pradesh	37.96	36.95	40.68	55.71	53.53	80.18	91.28	110.53	115.16	119.59	12. Madhya Pradesh
13. Maharashtra	443.00	385.00	455.39	464.74	433.62	446.88	464.00	590.00	580.00	520.38	13. Maharashtra
14. Manipur	7.50	8.50	9.95	11.20	11.51	12.01	12.50	12.70	13.70	15.31	14. Manipur
15. Meghalaya	0.97	1.52	3.31	3.56	3.98	1.24	3.58	3.58	3.09	4.53	15. Meghalaya
16. Mizoram	2.81	2.95	3.14	3.38	2.50	2.00	2.50	2.55	2.70	2.78	16. Mizoram
17. Nagaland	0.83	0.83	1.50	1.50	1.82	2.50	3.00	4.00	3.70	4.50	17. Nagaland
18. Orissa	153.76	161.29	182.91	213.14	232.28	257.66	258.04	276.96	309.51	284.23	18. Orissa
19. Punjab	8.50	11.20	17.00	16.00	19.00	24.00	26.00	32.00	36.00	44.50	19. Punjab
20. Rajasthan	6.63	6.02	8.36	10.92	12.22	13.97	12.40	14.30	15.10	12.00	20. Rajasthan
21. Sikkim	neg.	0.10	0.09	0.09	0.10	0.10	0.15	0.15	0.14	0.14	21. Sikkim
22. Tamil Nadu	363(X)	370.95	385.00	406.00	423.92	438.50	448.00	459.79	464.60	469.75	22. Tamil Nadu
23. Tripura	18.18	21.20	23.24	23.37	24.50	25.10	25.71	27.47	27.91	28.41	23. Tripura
24. Uttarpradesh	93.47	104.26	113.31	121.43	132.17	139.90	145.70	149.43	160.02	183.03	24. Uttarpradesh
25. West Bengal	601.00	680.00	734.00	757.00	806.00	820.42	893.00	937.00	950.02	995.00	25. West Bengal
26. Andaman and Nicobar islands	13.60	15.15	25.28	24.27	25.13	26.17	25.73	26.44	27.27	27.44	26. Andaman & Nicobar Islands
27. Chandigarh	0.04	0.05	(1.19)	0.05	0.16	0.08	0.009	0.08	0.00	0.00	27. Chandigarh
28. Dadra and Nagar Haveli	-	neg.	-	0.02	0.09	0.08	0.04	0.04	0.02	(1.02)	28. Dadra & Nagar Haveli
29. Daman and Diu	7.73	7.73	15.94	13.43	11.53	(1.54)	15.28	15.28	18.81	26.85	29. Daman & Diu
30. Delhi	0.00	3.00	4.00	3.60	3.80	3.00	4.00	4.00	4.20	4.42	30. Delhi
31. Lakshadweep	6.97	7.60	5.81	9.73	9.41	9.75	9.82	11.75	10.55	13.54	31. Lakshadweep
32. Pondicherry	32.30	33.78	35.33	38.55	41.61	40.93	40.82	32.65	42.52	32.70	32. Pondicherry
Deep Sea Fishing Sector	50.00	50.00	50.00	60.00	0.00	0.00	30.00	0.00	30.00	30.00	Deep Sea Fishing Sector
	3,676.90	3,835.89	4,151.61	4,365.30	4,644.36	4,785.85	4,949.39	5,348.24	5,388.49	5,262.25	INDIA

TABLE 8: MARINE FISH PRODUCTION BY STATES! UNION TERRITORIES, 1989-1999**(In 000 tonnes**

State/Union Territory	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	State/ Union Territory
Andhra Pradesh	111.35	120.35	125.79	113.07	154.32	150.26	151.99	152.05	146.55	150.00	1. Andhra Pradesh
2. Goa	52.65	53.18	47.11	101.49	102.11	98.46	84.21	93.76	88.81	65.84	2. Goa
3. Gujarat	432.36	500.00	516.85	589.00	619.84	645.26	600.00	660.07	745.71	550.00	3. Gujarat
4. Kamataka	186.13	183.83	181.41	174.19	174.52	173.75	217.51	222.78	189.86	160.61	4. Karnataka
5. Kerala	535.71	514.24	524.76	496.24	559.20	548.37	532.55	578.92	526.34	583.34	5. Kerata
6. Maharashtra	393.00	325.00	390.86	387.55	350.40	357.00	387.00	481.00	453.00	394.88	6. Maharashtra
7. Orissa	77.89	78.00	87.88	119.38	103.93	122.89	123.20	133.46	156.08	124.33	7. Orissa
8. Tamil Nadu	289.00	288.95	301.00	308.00	317.72	330.50	330.00	350.79	355.10	359.55	8. Tamil Nadu
9. West Bengal	89.00	125.00	142.00	145.00	153.00	151.20	153.00	172.00	164.00	171.50	9. West Bengal
10. Andaman and Nicobar Islands	13.60	15.15	25.19	24.17	25.08	26.12	25.68	26.40	27.23	27.40	10. Andaman and Nicobar Islands
11. Daman & Diu	7.73	7.73	15.94	13.43	11.53	11.50	15.28	15.28	18.81	26.85	11. Daman and Diu
12. Lakshadweep	6.97	7.60	5.81	9.73	9.41	9.75	9.82	11.75	10.55	13.54	12. Lakshadweep
13. Pondicherry	29.51	30.62	32.68	35.00	37.78	36.75	36.82	38.55	38.42	38.60	13. Pondicherry
Deep Sea Fishing Sector	50 00	50 00	50 00	60 00	3000	30 00	1000	30. 00	30 00	30.00	Deep Sea Fishing Sector
INDIA	2,274.90	2,299.65	2,447.28	2,576.25	2,648.84	2,691.81	2,707.06	2,966.81	2,950.46	2,696.46	INDIA

Source: State Governments/Union Territory Administrations

TABLE 9: INLAND FISH PRODUCTION BY STATES/ UNION TERRITORIES, 1989-1999

(In '000 tonnes)

	90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	State/Union Territory
1.Andhra Pradesh	134.43	136.25	138.88	151.48	167.05	195.13	203.97	207.31	226.31	260.83	1.Andhra Pradesh
2.Arunachal Pradesh	1.00	1.25	1.49	1.60	1.70	1.80	1.85	1.85	2.13	2.30	2.Arunachal Pradesh
3. Assam	58.43	76.00	130.00	140.00	151.65	153.00	155.06	154.61	155.13	155.71	3. Assam
4. Bihar	156.55	159.93	184.97	164.07	200.71	195.37	239.58	249.78	208.54	202.29	4. Bihar
5. Goa	2.00	3.05	2.44	2.77	3.32	3.44	3.61	3.30	3.24	3.18	5. Goa
6. Gujarat	27.15	45.00	40.10	49.00	65.02	70.10	60.00	65.28	70.80	80.00	6. Gujarat
7. Haryana	20.02	23.20	24.30	20.15	22.58	24.13	28.01	30.00	32.05	32.52	7. Haryana
8. Himachal Pradesh	4.62	5.20	6.02	6.39	6.63	5.29	5.94	6.27	6.69	6.79	8. Himachal Pradesh
9. Jammu & Kashmir	13.00	13.00	14.05	14.30	14.50	16.10	16.52	17.80	18.53	18.85	9. Jammu & Kashmir
10. Karnataka	55.84	53.00	64.34	65.70	74.63	70.29	87.35	101.65	95.28	95.00	10. Karnataka
11. Kerala	33.31	36.34	40.37	38.16	45.48	48.19	49.59	52.10	57.51	65.86	11. Kerala
12. Madhya Pradesh	37.96	36.95	40.68	55.71	54.53	80.18	91.28	110.53	115.16	119.59	12. Madhya Pradesh
13. Maharashtra	50.00	64.00	64.53	77.19	83.22	89.88	77.00	109.00	127.00	125.50	13. Maharashtra
14. Manipur	7.50	8.50	9.95	11.20	11.51	12.01	12.50	12.71	13.70	15.31	14. Manipur
15. Meghalaya	0.97	1.52	3.31	3.56	3.98	3.95	3.58	3.58	3.09	4.53	15. Meghalaya
16. Mizoram	2.81	2.95	3.14	3.38	2.50	2.00	2.50	2.55	2.70	2.78	16. Mizoram
17. Nagaland	0.83	0.83	1.50	1.50	1.82	2.50	3.00	4.00	3.70	4.50	17. Nagaland
18. Orissa	75.87	83.29	95.03	93.76	128.36	134.77	134.85	143.50	153.43	159.90	18. Orissa
19. Punjab	8.50	11.20	17.00	16.00	19.00	24.00	26.00	32.00	36.00	44.50	19. Punjab
20. Rajasthan	6.63	6.02	8.36	10.92	12.22	13.97	12.40	14.30	15.10	12.00	20. Rajasthan
21. Sikkim	neg.	0.10	0.09	0.09	0.10	0.10	0.15	0.15	0.14	0.14	21. Sikkim
22. Tamil Nadu	75.00	82.00	84.00	98.00	107.20	108.00	108.00	109.00	109.50	110.20	22. Tamil Nadu
23. Tripura	18.18	21.20	23.24	23.37	24.50	25.10	25.71	27.47	27.91	28.41	23. Tripura
24. Uttar Pradesh	93.47	104.26	113.31	121.43	132.37	139.90	145.70	149.43	160.02	183.03	24. Uttar Pradesh
25. West Bengal	512.00	555.00	592.00	612.00	653.00	669.22	740.00	765.00	786.02	823.50	25. West Bengal
26. Andaman and Nicobar Islands	--	--	0.09	0.10	0.03	0.05	0.05	0.04	0.04	0.04	26. Andaman and Nicobar Islands
27. Chandigarh	0.04	0.05	0.09	0.05	0.16	0.08	0.08	0.08	0.00	0.00	27. Chandigarh
28. Dadra & Nagar Haveli	Neg.	Neg.	Neg.	0.02	0.10	0.08	0.04	4.00	0.02	0.02	28. Dadra & Nagar Haveli
29. Daman & Diu	--	--	--	--	--	0.04	--	--	--	0.00	29. Daman & Diu
30. Delhi	3.00	3.00	3.40	3.60	3.80	3.90	4.00	4.10	4.20	4.42	30. Delhi
31. Lakshadweep	--	--	--	--	--	--	--	--	--	--	31. Lakshadweep
32. Pondicherry	2.89	3.16	2.65	3.55	3.83	4.19	4.00	0.04	4.10	4.11	32. Pondicherry
INDIA	1,402.00	1,536.25	1,709.33	1,789.05	1,995.50	2,096.76	2,242.32	2,381.43	2,438.04	2,565.81	INDIA

Source: State Governments/Union Territory Administrations

TABLE 10: CONTRIBUTION OF INDIA TO WORLD FISH PRODUCTION, SELECTED YEARS

('000 tonnes)

	World Production			Contribution of India		
	Total	Marine	Inland	Total	Marine	Inland
	19,755	17,521	2,234	730	520	210
	28,642	24,968	3,673	839	596	243
	36,691	32,665	4,026	1,161	880	282
	51,229	46,141	5,088	1,331	824	507
	67,279	61,277	6,003	1,759	1,086	673
	68,341	61,481	6,860	2,267	1,482	785
	75,585	67,953	7,633	2,445	1,555	891
	91,553	80,888	10,665	2,839	1,747	1,092
	103,590	88,997	14,593	3,875	2,300	1,575
	124,152	102,801	21,351	4,998	2,786	2,212
	128,648	105,252	23,396	5,353	3,016	2,337
	130,882	105,770	25,112	5,477	3,024	2,453

Totals may not tally due to rounding off.

Source: FAO

TABLE 11: PERCENTAGE CONTRIBUTION OF INDIA TO WORLD FISH PRODUCTION, SELECTED YEARS

	Contribution of India to World Fish Production (Per Cent)		
Year	Total	Marine	Inland
1950	3.70	2.97	9.40
1955	2.93	2.39	6.62
1960	3.17	2.69	7.00
1965	2.60	1.79	9.97
1970	2.61	1.77	11.21
1975	3.32	2.41	11.44
1980	3.24	2.29	11.67
1985	3.10	2.16	10.24
1990	3.74	2.58	10.79
1995	4.03	2.71	10.36
1996	4.16	2.87	9.99
1997	4.18	2.86	9.77

Source: FAO

TABLE 12: AVERAGE ANNUAL GROWTH RATE IN FISH PRODUCTION - INDIA AND REST OF THE WORLD, SELECTED YEARS

Period	India			Rest of the World		
	Total	Marine	inland	Total	Marine	Inland
1950-55	2.82	2.76	2.99	7.71	7.34	10.46
1955-60	6.72	8.11	2.97	5.08	5.52	1.85
1960-65	2.77	-1.29	12.48	6.90	7.15	4.80
1965-70	5.72	5.66	5.82	5.60	5.84	3.36
1970-75	5.21	6.42	3.13	0.31	0.07	2.70
1975-80	1.52	0.96	2.56	2.04	2.02	2.16
1980-85	3.03	2.36	4.16	3.91	3.55	6.92
1985-90	6.42	5.65	7.59	2.50	1.93	6.47
1990-95	6.54	6.53	6.55	1.09	0.60	4.42
1995-96	5.33	4.06	7.12	4.37	3.35	4.07
1996-97	4.87	3.10	7.33	3.98	2.79	5.02

Source : FAO

TABLE 13: FISH PRODUCTION - MAJOR FISH PRODUCING COUNTRIES, 1992-1997

(000 tonnes)

Country	1992	1993	1994	1995	1996	1997
1. China	19,738	23,638	28,116	32,731	36,542	39,937
2. Peru	7,508	9,010	12,005	8,944	9,522	7,878
3. Japan	9,298	8,782	8,182	7,509	7,441	7,408
4. Chile	6,627	6,192	8,021	7,890	7,231	6,366
5. USA	5,688	6,026	6,043	5,712	5,454	5,493
6. India	4,318	4,633	4,828	4,998	5,353	5,477
7. Russian Fed.	5,644	4,470	3,791	4,391	4,749	4,749
8. Indonesia	3,543	3,806	4,025	4,252	4,454	4,581
9. Thailand	3,246	3,385	3,522	3,573	3,562	3,430
10. Norway	2,758	2,758	2,770	2,987	3,133	3,415
11. Rep. of Korea	3,304	3,336	3,478	3,360	3,334	3,268
12. Philippines	2,626	2,633	2,722	2,786	2,770	2,767
13. Iceland	1,586	1,730	1,574	1,628	2,078	2,229
14. Denmark	1,997	1,658	1,916	2,044	1,723	1,866
15. Vietnam	960	1,067	1,184	1,460	1,470	1,588
16. Mexico	1,246	1,192	1,260	1,405	1,531	1,572
17. Spain	1,246	1,204	1,270	1,373	1,361	1,384
18. Argentina	706	934	953	1,151	1,252	1,355
19. Bangladesh	967	1,047	1,091	1,173	1,264	1,342
20. Taiwan	1,327	1,419	1,255	1,297	1,240	1,308
Total for above countries	84,333	88,920	98,006	100,664	105,464	107,413
WORLD TOTAL	107,656	112,094	120,307	124,152	128,648	130,882

Source: FAO

TABLE 14: PER CENT SHARE OF MAJOR FISH PRODUCING COUNTRIES IN WORLD FISH PRODUCTION, 1992-1997

Country	1992	1993	1994	1995	1996	1997
1. China	18.3	21.1	23.4	26.4	28.4	30.5
2. Peru	7.0	8.0	10.0	7.2	7.4	6.0
3. Japan	8.6	7.8	6.8	6.0	5.8	5.7
4. Chile	6.2	5.5	6.7	6.4	5.6	4.9
5. USA	5.3	5.4	5.0	4.6	4.2	4.2
6. India	4.0	4.1	4.0	4.0	4.2	4.2
7. Russian Fed.	5.2	4.0	3.2	3.5	3.7	3.6
8. Indonesia	3.3	3.4	3.3	3.4	3.5	3.5
9. Thailand	3.0	3.0	2.9	2.9	2.8	2.6
10. Norway	2.6	2.5	2.3	2.4	2.4	2.6
11. Rep. of Korea	3.1	3.0	2.9	2.7	2.6	2.5
12. Philippines	2.4	2.3	2.3	2.2	2.2	2.1
13. Iceland	1.5	1.5	1.3	1.3	1.6	1.7
14. Denmark	1.9	1.5	1.6	1.6	1.3	1.4
15. Vietnam	0.9	1.0	1.0	1.2	1.1	1.2
16. Mexico	1.2	1.1	1.0	1.1	1.2	1.2
17. Spain	1.2	1.1	1.1	1.1	1.1	1.1
18. Argentina	0.7	0.8	0.8	0.9	1.0	1.0
19. Bangladesh	0.9	0.9	0.9	0.9	1.0	1.0
20. Taiwan	1.2	1.3	1.0	1.0	1.0	1.0
Contribution of above countries	78.5	79.3	81.5	80.8	82.1	82.0
WORLD TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 15: INLAND FISH PRODUCTION. MAJOR FISH PRODUCING COUNTRIES, 1992-1997
(‘000 tonnes)

Country	1992	1993	1994	1995	1996	1997
1. China	6,336	7,655	9,224	11,015	12,752	14,254
2. India	1,722	1,931	2,005	2,212	2,337	2,453
3. Bangladesh	666	706	809	874	936	991
4. Indonesia	710	770	799	818	917	799
5. Thailand	277	337	372	388	445	436
6. Vietnam	213	213	233	458	428	434
7. Philippines	503	463	476	430	416	422
8. USA	325	331	307	311	313	347
9. Egypt	242	238	252	285	299	311
10. Tanzania	276	295	248	317	309	307
11. Russian Fed.	378	307	291	273	285	278
12. Brazil	210	215	220	234	263	256
13. Myanmar	182	212	224	226	237	245
14. Uganda	265	220	213	209	195	218
15. Pakistan	122	123	133	136	160	190
16. Congo	185	193	153	156	160	159
17. Taiwan	170	192	190	176	160	155
18. Kenya	157	177	200	189	175	155
19. Japan	188	177	169	167	167	153
20. Iran	82	96	115	117	139	141
Total for above countries	13,209	14,851	16,633	18,991	21,093	22,704
World Total	15,491	17,085	18,840	21,351	23,396	25,112

Source: FAO

TABLE 16: MARINE FISH PRODUCTION - MAJOR FISH PRODUCING COUNTRIES, 1992-1997

('000 tonnes)

Country	1992	1993	1994	1995	1996	1997
1. China	13,402	15,983	18,891	21,716	23,790	25,683
2. Peru	7,474	8,970	11,955	8,892	9,492	7,844
3. Japan	9,110	8,606	8,013	7,342	7,275	7,255
4. Chile	6,626	6,190	8,019	7,888	7,229	6,358
5. USA	5,363	5,695	5,736	5,401	5,141	5,146
6. Russian Fed.	5,266	4,163	3,499	4,118	4,464	4,470
7. Indonesia	2,833	3,036	3,227	3,434	3,537	3,782
8. Norway	2,757	2,758	2,769	2,986	3,133	3,415
9. Rep. of Korea	3,259	3,305	3,446	3,330	3,303	3,236
10. India	2,596	2,703	2,823	2,786	3,016	3,024
11. Thailand	2,969	3,048	3,150	3,185	3,117	2,994
12. Philippines	2,124	2,169	2,246	2,355	2,354	2,345
13. Iceland	1,584	1,728	1,573	1,626	2,077	2,228
14. Denmark	1,960	1,622	1,880	2,006	1,689	1,832
15. Mexico	1,117	1,061	1,132	1,276	1,393	1,439
16. Spain	1,219	1,174	1,243	1,342	1,327	1,346
17. Argentina	694	922	940	1,138	1,239	1,341
18. Malaysia	1,088	1,137	1,162	1,227	1,218	1,249
19. Vietnam	747	854	951	1,002	1,042	1,153
20. Taiwan	1,157	1,227	1,065	1,121	1,080	1,153
Total for above countries	73,345	76,351	83,720	84,171	86,916	87,293
World Total	92,165	95,009	101,467	102,801	105,252	105,770

Source: FAO

TABLE 17: FISH PRODUCTION FROM INDIAN OCEAN, 1992-1997

('000 tonnes)

Country	1992	1993	1994	1995	1996	1997
Indian Ocean Countries						
1. India	2,596	2,703	2,823	2,786	3,016	3,024
2. Thailand	683	862	814	867	928	906
3. Indonesia	558	617	634	679	716	744
4. Myanmar	618	625	600	606	636	673
5. Malaysia	536	532	528	611	574	567
6. Pakistan	432	499	419	405	395	422
7. Bangladesh	301	341	282	299	328	352
8. Iran Islamic Rep.	252	221	217	251	243	239
9. Sri Lanka	187	205	215	221	214	220
10. Australia	145	150	128	138	132	133
11. Oman	112	116	119	140	120	117
12. United Arab Emi.	95	100	109	106	107	114
13. Yemen	80	86	83	103	101	113
14. Maldives	82	90	104	105	106	108
15. Madagascar	78	86	88	88	88	90
16. Tanzania	61	43	47	50	55	57
17. Egypt	39	46	43	43	44	52
18. Saudi Arabia	46	48	55	46	48	50
19. Mozambique	28	26	23	22	27	31
20. Somalia	21	19	17	16	16	15
21. Mauritius	19	21	19	17	12	14
22. Comoros	12	12	13	13	13	13
23. Iraq	1	2	4	5	12	11
24. Bahrain	8	9	8	9	13	10
25. Kuwait	8	8	8	9	8	8
Other Countries						
1. Spain	86	98	105	141	133	135
2. Taiwan	69	140	80	115	110	116
3. France	98	95	105	101	89	78
4. Japan	59	66	45	56	48	50
5. Korea, Rep. of	31	30	25	23	32	38
Total*	7,463	8,006	7,875	8,173	8,524	8,679

* Including countries not mentioned above

Source: FAO

TABLE 18: FISHERMEN POPULATION BY STATES! UNION TERRITORIES, 1992

(Numbers in hundreds)

State/Union Territory	Total No. of members				Number of family members engaged in fishing operations		Family members engaged fishing related activities other than actual fishing				State/Union Temtory
	Males	Females	Children	Total	Full time	Part time	Marketing of fish	Repair of fishing nets	Processing of fish	Other activities	
1.AndhraPradesh	2,768	2,602	3,348	8,718	1,428	1,321	1,121	504	219	260	1.AndhraPradesh
2. Arunachal Pradesh	4	1	--	5	--	--	420	--	--	--	2. Arunachal Pradesh
3.Assam	1,538	807	795	3,140	254	201	132	113	26	--	3.Assam
4. Bihar	1,800	1,322	1,589	4,711	255	754	331	167	56	167	4. Bihar
5.Goa	53	49	47	149	24	14	20	6	3	7	5.Goa
6. Gujarat	889	882	1,844	3,615	557	236	147	116	34	637	6. Gujarat
7. Haryana	49	8	13	70	4	--	--	--	--	38	7. Haryana
8. Himachal Pradesh	13	8	15	36	2	3	2	1	--	--	8. Himachal Pradesh
9. Jammu & Kashmir	120	129	124	373	19	22	39	11	1	--	9. Jammu & Kashmir
10.Karnataka	434	411	615	1,460	134	74	114	47	16	26	10.Karnataka
11. Kerala	1,978	1,970	2,381	6,329	1,099	275	254	135	81	426	11. Kerala
12.MadhyaPradesh	890	671	1,050	2,611	112	566	152	103	23	15	12.MadhyaPradesh
13. Maharashtra	1,277	1,670	1,022	3,969	761	387	650	272	184	45	13. Maharashtra
14. Manipur	305	186	66	557	318	239	--	--	--	--	14. Manipur
15. Meghalaya	--	--	--	--	--	--	--	--	--	--	15. Meghalaya
16. Mizoram	1	1	--	2	--	--	1	--	--	--	16. Mizoram
17. Nagaland	--	--	--	--	--	--	--	--	--	--	17. Nagaland
18. Orissa	1,065	977	1,400	3,442	225	128	132	113	4	9	18. Orissa
19. Punjab	--	--	--	--	--	--	--	--	--	--	19. Punjab
20. Rajasthan	26	24	37	87	5	9	--	1	--	--	20. Rajasthan
21.Sikkim	--	--	--	--	--	--	--	--	--	--	21.Sikkim
22. Tamil Nadu	1,460	1,325	2,379	5,164	890	145	221	237	48	69	22. Tamil Nadu
23.Tripura	27	17	21	65	8	31	13	4	--	1	23.Tripura
24.UttarPradesh	5,951	5,196	5,146	16,293	301	750	246	89	50	376	24.UttarPradesh
25.WestBengal	2,829	1,181	1,343	5,353	884	1,927	613	320	95	394	25.WestBengal
26. Andaman and Nicobar Islands	80	64	97	241	9	22	5	5	5	1	26. Andaman and Nicobar Is.
27. Chandigarh	3	--	--	3	3	1	3	--	--	--	27. Chandigarh
28. Dadra & Nagar Haveli	--	--	--	--	--	--	--	--	--	--	28. Dadra & Nagar Haveli
29. Daman & Diu	--	--	--	--	--	--	--	--	--	--	29. Daman & Diu
30. Delhi	--	--	--	--	--	--	--	--	--	--	30. Delhi
31. Lakshadweep	174	175	175	524	9	21	--	--	6	2	31. Lakshadweep
32.Pondicherry	127	124	135	386	83	11	31	13	24	89	32.Pondicherry
INDIA	23,861	19,800	23,642	67,303	7,384	7,137	4,647	2,257	875	2,562	INDIA

Source: Indian Livestock Census-1992, Summary Tables Volume-I
 Directorate of Economics and Statistics, Ministry of Agriculture

TABLE 19: FISHING CRAFTS - COASTAL STATES AND UNION TERRITORIES, 1999

State/Union Territory	Non motorised traditional crafts	Motorised traditional crafts	Mechanised boats	Total
1. Andhra Pradesh	53,853	4,164	8,642	66,659
2. Goa	1,094	1,100	1,092	3,286
3. Gujarat	9,222	5,391	11,372	25,985
4. Karnataka	19,292	3,452	2,866	25,610
5. Kerala	28,456	17,362	4,206	50,024
6. Maharashtra	10,256	286	8,899	19,441
7. Orissa	10,993	2,640	1,276	15,854*
8. Tamil Nadu	33,945	8,592	9,896	52,433
9. West Bengal	4,850	270	3,362	8,482
10. Andaman & Nicobar Islands	1,180	160	230	1,570
11. Daman and Diu	252	350	805	1,407
12. Lakshadweep	594	306	478	1,378
13. Pondicherry	7,297	505	560	8,362
Total	181,284	44,578	53,684	280,491*

* Total includes 810 FRP Catamarans and 135 Beach Landing Crafts.

TABLE 20: BRACKISHWATER AREA AND PRODUCTION - COASTAL STATES/UNION TERRITORIES, 1999

State/Union Territory	Total brackish water area (ha)	Area under culture (ha)	Production (MT) - Live weight
1. Andhra Pradesh	150,000	66,200	34,075
2. Goa	18,500	650	500
3. Gujarat	376,000	997	235
4. Karnataka	8,000	3,540	2,640
5. Kerala	65,000	14,595	7,290
6. Maharashtra	80,000	970	700
7. Orissa	31,600	11,332	5,000
8. Tamil Nadu	56,000	670	1,197
9. West Bengal	405,000	42,525	15,121
10. Pondicherry	800	22	20
Total	1,190,900	141,501	66,778

Source: Marine Products Exports Development Authority, Kochi

TABLE 21: FISHING HARBOURS AT MAJOR PORTS

Port	Cost (Rs. Lakhs)*	Year of sanction	Status	Designed Capacity			
				DSV (No)	frWV (No)	Draft (m)	TL
1. Visakhapatnam							
Stage I	2,138	1975	C	90	300	4.5	1,938
Stage II		1978	C				
Stage III		1988	C				
2. Madras							
Stage I	1,334	1973	C	50	500	3.0	1,220
Stage II	850	1994	UC		No change in capacity. Stage II for additional facilities		
3. Cochin							
Stage I	494	1971	C	57	450	6.0	560
Stage II	77 (100)	1993	UC		No change in capacity. Stage II for additional facilities		
4. Calcutta (Roychowk)	370	1971	C	15	--	6.0	120
5. Paradip	2,834 (3,807)	1990	C	50	500	6.0	2335
6. Mumbai (Sassoon Dock)	825 (1,099)	1977	UC	--	700	3.0	1153

* Figures in brackets indicate the revised cost.

C Completed/ Commissioned

UC Under construction

DSV Deep Sea Vessels

MFV Motorised Fishing Vessels

TL Total length of landing + berthing + outfitting + repair quay/wharf (in meters)

**TABLE 22: NUMBER OF MINOR FISHING HARBOURS AND FISH LANDING CENTRES
COMMISSIONED! UNDER CONSTRUCTION BY STATE! UNION TERRITORY**

(As on 31-3-99;

State/Union territory	Minor Fishing Commis- sioned	Harbour Under construction	Fish Landing Coinmis- sioned	Centres Under construction
1. Andhra Pradesh	3	1	1	1
2. Goa	--	--	1	1
3. Gujarat	4	1	20	1
4. Karnataka	5	3	9	5
5. Kerala	5	5	22	6
6. Maharashtra	1	1	29	7
7. Orissa	3	1	21	5
8. TamilNadu	6	1	11	
9. WestBengal	2	1	12	
10. Andaman & Nicobar Islands	1	--	--	--
11. Daman and Diu	--	--	--	2
12. Lakshadweep	--	--	3	--
13. Pondicherry	--	1	1	--
Total	30	15	130	28

**TABLE 23: FISHING HARBOURS AND FISH LANDING CENTRES CONSTRUCTED!
COMMISSIONED**

Location	FH/ FLC	Sanctioned cost (Rs.Lakhs)	Location	FH/ FLC	Sanctioned cost (Rs.Lakhs)
Andhra Pradesh	FLC		3. Tadri	FH	4.590
1. Kakinada	FH	973.170	4. Mangalore	FH	33.000
2. Nizamapatnam	FH	157.660	5. Malpe stage-I	FH	426.000
3. Bhavanapadu	FH	340.000	6. Coondapur	FLC	1.000
4. Calingapatnam	FLC	60.350	7. Kagal Heni	FLC	0.600
Goa			8. Gangolli	FLC	3.700
1. Cortalim	FLC	0.510	9. Belikeri	FLC	0.990
Gujarat			10. Keni	FLC	0.990
1. Veraval	FH	900.000	11. Bhatkal	FLC	6.000
2. Mangrol Stage-I	FH	200.000	12. Moolky	FLC	0.100
3. Porbandar	FH	276.000	13. Sadasivgad	FLC	0.990
4. Mangrol Stage-II	FH	701.000	14. Belambar	FLC	0.990
5. Jafrabad Phase-I	FLC	12.000	Kerala		
6. Jafrabad Phase-II	FLC	13.000	Vizhinjam stage-I	FH	208.000
7. Nansi-borsi	FLC	16.000	2. Puthiappa	FH	962.000
8. Kosamba	FLC	13.000	3. Munambam	FH	1,167.200
9. Mandvi	FLC	16.000	Vizhinjam stage-II	FH	704.000
10. Salaya	FLC	17.000	5. Neendakara	FH	585.000
11. Umarsadi	FLC	5.000	6. Kasaragode	FLC	13.000
12. Jakhau-I	FLC		7. Cannanore	FLC	1.459
13. Sachana	FLC	20.000	8. Neeleswaram	FLC	15.000
14. Madhavadi	FLC	17.760	9. Munakkadavu	FLC	19.000
15. Surajbari	FLC	27.900	10. Beypore	FLC	2.100
16. Magod Dungari	FLC	38.740	11. Palacode	FLC	19.000
17. Dholai	FLC	54.660	12. New Mahe	FLC	24.590
18. Chorwad	FLC	46.120	13. Vellayil Beach	FLC	22.000
19. Port Onjal	FLC	42.000	14. Vallikkunnu	FLC	17.900
20. Rajpara	FLC	43.450	15. Chettuvai	FLC	19.500
21. Umergaon -I	FLC	1.000	16. Arthungal	FLC	32.220
22. Kolak	FLC	4.150	17. Ponnani	FLC	8.000
23. Hirakot	FLC	0.710	18. Beliapatnam	FLC	13.000
24. Navapur	FLC	0.610	19. Thottappally	FLC	30.000
Karnataka			20. Cheruvathur	FLC	18.000
1. Karwar	FH	30.000	21. Dharmadon	FLC	21.000
2. Honnavar	FH	75.000	22. South Paravoor	FLC	24.940
			23. Vizhinjam South	FLC	19.100
			24. Vizhinjam North	FLC	19.100

(Continued)

TABLE 23: FISHING HARBOURS AND FISH LANDING CENTRES CONSTRUCTED/ COMMISSIONED (Continued)

Location	FH/ PLC	Sanctioned cost (Rs. Lakhs)	Location	FH/ FLC	Sanctioned cost (Rs. Lakhs)
Kerala (Contd.)			Orssa		
25. Chalil Gopalpettah	PLC	25.000	1. Gopalpur	PH	805.300
26. Quilandy	PLC	23.000	2. Dhamra	FH	70.000
27. Punnapra	PLC	36.800	3. Naugarh(Astrang)	PH	507.000
Maharashtra			4. Chandipur	PLC	15.000
1. Ratnagiri	PH	1,840.50	5. Pathara	PLC	2.500
2. Karanja	PLC	11.000	6. Nairi.	PLC	5.410
3. Navalgaon	FLC	0.034	7. Nairi-II	PLC	6.000
4. Borli Mandla	FLC	0.520	8. Jamboo	PLC	73.030
5. Nandgaon	FLC	0.095	9. Palaur	PLC	17.000
6. Murad	FLC	0.034	10. Kansabans	PLC	65.100
7. Theorinda	FLC	0.007	11. Soran	PLC	9.970
8. Ajanala	FLC	0.003	12. Sabelia	PLC	2.420
9. Ade-Uttambar	FLC	0.016	13. Chudamani	PLC	14.060
10. Agrao	FLC	0.549	14. Panchubisa	PLC	32.680
11. Boria	FLC	0.029	15. Talchua	PLC	110.700
12. Burondi	FLC	0.049	16. Kharanasi	PLC	99.900
13. Bagamandla	FLC	1.000	17. Chandrabhaga	FLC	8.320
14. Datiware	FLC	0.922	18. Rushikulya	PLC	9.400
15. Dahanu	FLC	0.990	19. Tantiapal	PLC	99.060
16. Dakti-Dahanu	FLC	0.994	20. Sorala	FLC	70.280
17. Kahardanda	FLC	0.822	21. Bandara	FLC	160.500
18. Ekdara	FLC	0.012	22. Khandiapatana	FLC	105.830
19. Mandavi	FLC	0.508	23. Bhusandpur-	FLC	108.600
20. Mulgaon	FLC	1.860	Baliapatpur		
21. Navapur	FLC	0.200	24. Bahabalpur	FLC	98.040
22. Onni-Bhatti	FLC	0.027	Tamil Nadu		
23. Thurnvadi	FLC	0.160	1. Tuticorin	FH	210.000
24. Thai	FLC	0.547	2. Maliipatnam	FH	10.600
25. Utton	FLC	0.020	3. Kodiakarai	FH	14.400
26. Vashi	FLC	0.3 11	4. Valiinokkam	FH	77.000
27. Wadrai	FLC	0.739	5. Tondi	FH	56.560
28. Rajpuri	FLC	0.536	6. Pazhayar	FH	67.000
29. Jeevne Bundar	FLC	0.536	7. Cuddalore	FLC	12.000
30. Mahim Causeway	FLC	23.070	8. Rameswaram	FLC	10.000

(Continued)

**TABLE 23: FISHING HARBOURS AND FISH LANDING CENTRES CONSTRUCTED/
COMMISSIONED (Concluded)**

Location	FH/ FLC	Sanctioned cost (Rs. Lakhs)	Location	FH/ FLC	Sanctioned cost (Rs. Lakhs)
Tamil Nadu (contd.)					
9. Kottaipatnam	PLC	22.000	8. Jalda	PLC	9.500
10. Muttom	PLC	12.600	9. Kharpai	PLC	6.300
11. Vallapallam	PLC	7.140	10. Bamanagar	PLC	4.180
12. Vallavillai	PLC	7.500	11. Akhoynagar	FLC	3.080
13. Nagapattinam	PLC	0.750	12. Soula	PLC	13.270
14. Palk Bay	PLC	1.000	13. Madanganj	PLC	9.600
15. Erawadi	PLC	26.000	14. Brajavallarpur	PLC	9.650
16. Poompuhar	PLC	7.870	Andaman & Nicobar		
17. Kodimurai	PLC	7.500	Islands		
West Bengal			1. Phoenix Bay	PH	67.000
1. Fraser Ganj	PH	452.320	Lakshadweep		
2. Digha stage-I	PH	139.000	1. Kavaratti	PLC	11.000
3. Namkhana	PLC	7.060	2. Minicoy	FLC	15.520
4. New Jalda	PLC	5.000	3. Agathi	PLC	5.000
5. Kalinagar	PLC	7.130	Pondicherry		
6. Ganeshpur	PLC	5.310	1. Mahe	PLC	0.040
7. Junput	PLC	9.800			

(Concluded)

**TABLE 24: FISHING HARBOURS AND FISH LANDING CENTRES
UNDER CONSTRUCTION**

(As on 31-3-99)

Location	FH/ FLC	Sanctioned cost (Rs. Lakhs)	Location	FH/ FLC	Sanctioned cost (Rs. Lakhs)
Andhra Pradesh			10. Kadapra	FLC	18.52
1. Machililipatnam	PH	470.88	11. Kattoor Pollathai	PLC	50.25
2. Mangipudi	PLC	17.00	Maharashtra		
Goa			1. Agra	PH	414.00
1. Malim	PLC	89.25	2. Alibagh Koliwada	PLC	32.53
Gujarat			3. Ekdera Koliwada	PLC	38.66
1. Jakhau	PH	1,143.60	4. Thrkarli	PLC	53.34
2. Navabunder	PLC	33.91	5. Achara Peerwada	PLC	55.16
Karnataka			6. Taramumbri	PLC	97.02
1. Malpe II	FH	1,196.70	7. Rajpuri Koliwada	PLC	73.96
2. Mangalore II	FH	75.00	8. Sarjekot	PLC	30.00
3. Karwar II	PH	130.00	Orissa		
4. Alvekodi	PLC	89.53	1. Dhamra II	PH	640.00
5. Hejmodikodi	PLC	95.00	2. Kirtania	PLC	84.00
6. Belikeri Stage-II	PLC	67.40	3. Panthakata	PLC	80.20
7. Kodibengre	PLC	55.00	4. Talasari	PLC	98.24
8. Gangolli Stage-II	PLC	13.12	5. Gopalpur-on Sea	PLC	96.00
Kerala			6. Hata Baradi	PLC	62.00
1. Vizhinjam	PH	704.00	Tamil Nadu		
2. Thangassery	PH	1,980.50	1. Chinnamuttom	PH	684.00
3. Chombal	PH	556.00	West Bengal		
4. Kayamkulam	FH	624.00	1. Digha	PH	492.52
5. Munambam	FH	1,167.20	Daman and Diu		
6. Moylali-Kaddappuram	PLC	85.20	1. Ghogla	PLC	52.12
7. Kanhangad	PLC	28.42	Vanakbara	PLC	43.80
8. Thikkodi	PLC	49.25	Pondicherry		
9. Poovar	PLC	26.99	1. Pondicherry	FH	423.00

TABLE 25: TREND IN EXPORTS OF MARINE PRODUCTS - 1961-1998

Year	Quantity (Tonnes)	Value (Rs. crores)	Unit value (Rs/tonnes)	Unit value index	Annual growth rate (%)	
					Quantity	Value
1961-62	15,732	3.92	2,491.74	100.00	--	--
1962-63	11,161	4.20	3,763.10	151.02	-29.1	7.1
1963-64	19,057	6.09	3,195.68	128.25	70.7	45.0
1964-65	21,122	7.14	3,380.36	135.66	10.8	17.2
1965-66	15,295	7.06	4,615.89	185.25	-27.6	- 1.1
1966-67	21,116	17.37	8,225.99	330.13	38.1	146.0
1967-68	21,907	19.72	9,00L69	361.26	37	13.5
1968-69	26,811	2470	9,212.64	369.73	22.4	25.3
1969-70	31,695	33.46	10,556.87	423.68	18.2	35.5
1970-71	35,883	35.07	9,773.43	392.23	13.2	4.8
1971-72	35,523	44.55	12,541.17	503.31	- 1.0	27.0
1972-73	38,903	59.72	15,351.00	616.08	9.5	34.1
1973-74	52,279	89.51	17,121.60	687.14	34.4	49.9
1974-75	45,099	68.41	15,168.85	608.77	-13.7	-23.6
1975-76	54,463	124.53	22,865.06	917.64	20.8	82.0
1976-77	66,750	189.12	28,332.58	1,137.06	22.6	51.9
1977-78	65,967	180.12	27,304.56	1,095.80	-1.2	-4.8
1978-79	86,894	234.62	27,00071	1,083.61	31.7	30.3
1979-80	86,401	248.82	28,798.28	1,155.75	- 0.6	6.1
1980-81	75,583	234.84	31,070.48	1,246.94	-12.5	- 56
1981-82	70,105	28601	40,797.38	1,637.31	- 7.2	21.8
1982-83	78,175	36L36	46,224.50	1,855.11	11.5	26.3
1983-84	92,691	373.02	40,243.39	1,615.07	18.6	3.2
1984-85	86,187	384.29	44,587.93	1,789.43	- 7.0	3.0
1985-86	83,651	398.00	47,578.63	1,909.46	- 2.9	3.6
1986-87	85,843	460.67	53,664.25	2,153.69	2.6	15.7
1987-88	97,179	531.20	54,662.02	2,193.73	13.2	15.3
1988-89	99,777	597.85	59,918.62	2,404.69	2.7	12.5
1989-90	110,243	634.99	57,599.12	2,311.61	10.5	6.2
1990-91	139,419	893.37	64,078.07	2,571.62	26.5	40.7
1991-92	171,820	1,375.89	80,077.41	3,213.72	23.2	54.0
1992-93	208,602	1,767.43	84,727.38	3,400.33	21.4	28.5
1993-94	243,960	2,503.62	102,624.20	4,118.58	16.9	41.7
1994-95	307,337	3,575.27	116,330.61	4,668.66	26.0	42.8
1995-96	296,277	3,501.11	118,170.16	4,742.48	- 3.6	- 2.1
1996-97	378,199	4,121.36	108,973.32	4,373.39	27.7	17.7
1997-98	385,818	4,697.48	121,753.78	4,886.30	2.0,	14.0
1998-99	302,934	4,626.87	152,735.24	6,129.66	-21.5	-1.50

Source: Marine Products Export Development Authority, Kochi

TABLE 26: EXPORT OF MARINE PRODUCTS BY MARKET, 1996-1999

Market		1996-97		1997-98		1998-99	
		Q/V	%	Q/V		Q/V	%
Japan	Q	64,656	17.1	70,955	18.4	67,277	22.2
	V	1,886.04	45.8	2,32609	49.5	2,295.48	49.6
U.S.A	Q	29,792	7.9	32,914	8.5	34,472	11.4
	V	436.05	10.6	583.75	12.4	617.32	13.3
European Union	Q	71,192	18.8	34,875	9.0	54,261	17.9
	V	790.11	19.2	412.53	8.8	684.62	14.8
South EastAsia Including China	Q	189,456	50.1	218,263	56.6	116,610	38.5
	V	85444	207	1,13909	24.3	766.06	16.6
Middle East	Q	9,672	2.6	17,618	4.6	17,274	5.7
	V	6356	1.5	144.66	3.1	147.97	3.2
Others	Q	13,431	3.5	11,193	2.9	13,040	4.3
	V	91.16	2.2	91.36	1.9	115.42	2.5
Total	Q	378,199	100.0	385,818	100.0	302,934	100.0
	V	4,121.36	100.0	4,697.48	100.0	4626.87	100.0

Q - Quantity in Metric Tonnes

V - Value in Rs. Crores

**TABLE 27: MONTHLY PER CAPITA CONSUMPTION OF FISH (QUANTITY) BY STATE!
UNION TERRITORY**

State/Union Territory	Quantity consumed(Kg)		No. of households per 1000 households reporting consumption	
	Rural	Urban	Rural	Urban
1. Andhra Pradesh	0.11	0.08	259	206
2. Arunachal Pradesh	0.29	0.48	151	640
3. Assam	0.43	0.54	942	859
4.Bihar	0.12	0.13	349	358
5.Goa	1.36	1.91	862	817
6. Gujarat	0.02	0.04	79	98
7. Haryana	Neg.	Neg.	1	16
8. Himachal Pradesh	Neg.	Neg.	10	9
9. Jammu & Kashmir	Neg.	0.01	7	19
10.Karnataka	0.14	0.14	135	117
11. Kerala	1.35	1.62	857	828
12. Madhya Pradesh	0.06	0.04	200	149
13.Maharashtra	0.11	0.16	167	259
14. Manipur	0.34	0.44	638	784
15. Meghalaya	0.32	0.47	689	800
16.Mizoram	0.17	0.10	341	318
17. Nagaland	0.26	0.39	501	743
18. Orissa	0.29	1.94	586	884
19.Punjab	Neg.	Neg.	4	5
20. Rajasthan	Neg.	0.01	7	12
21. Sikkim	0.01	0.08	47	197
22.TamilNadu	0.17	0.17	272	339
23. Tripura	0.89	0.89	645	945
24. Uttar Pradesh	0.04	0.02	99	55
25. West Bengal	0.54	0.72	907	804
26. Andaman & Nicobar Islands	1.40	1.05	808	691
27. Chandigarh	0.02	0.01	91	35
28. Dadra & Nagar Haveli	0.39	0.28	615	514
29.Daman&Diu	1.07	4.12	520	906
30. Delhi	0.03	0.03	66	73
31. Lakshadweep	3.79	361	938	942
32.Pondicherry	0.69	0.71	913	714

Source: National Sample Survey 50th Round

**TABLE 28: CONTRIBUTION OF FISHERIES SECTOR TO GROSS DOMESTIC PRODUCT
(CURRENT PRICES)**

(Rs. Crores)

Year	Total GDP	GDP from		GDP from fisheries as % of	
		Agriculture	Fisheries	Total GDP	GDP from Agriculture
1970-71	39,708	16,821	245	0.62	1.46
1971-72	42,248	17,105	263	0.62	1.54
1972-73	46,473	18,772	305	0.66	1.62
1973-74	56,954	24,836	393	0.69	1.58
1974-75	67,039	27,057	454	0.68	1.68
1975-76	71,201	26,651	567	0.80	2.13
1976-77	76,536	27,105	601	0.79	2.22
1977-78	87,351	32,238	618	0.71	1.92
1978-79	93,880	32,815	738	0.79	2.25
1979-80	102,442	33,586	768	0.75	2.29
1980-81	122,427	42,466	921	0.75	2.17
1981-82	143,216	47,736	1,008	0.70	2.11
1982-83	159,395	50,527	1,174	0.74	2.32
1983-84	186,723	61,318	1,448	0.78	2.36
1984-85	208,533	65,181	1,716	0.82	2.63
1985-86	233,799	69,964	1,974	0.84	2.82
1986-87	260,030	74,405	2,250	0.87	3.02
1987-88	294,851	83,515	2,686	0.91	3.22
1988-89	352,703	104,103	3,142	0.89	3.02
1989-90	408,661	115,447	3,781	0.93	3.28
1990-91	475,604	135,162	4,556	0.96	3.37
1991-92	551,552	162,317	5,300	0.96	3.27
1992-93	627,913	184,536	6,649	1.06	3.60
1993-94	799,077	242,438	9,074	1.14	374
1994-95	943,408	284,042	11,099	1.18	3.91
1995-96	1,103,238	312,791	12,729	1.15	4.07
1996-97	1,285,259	376,091	15,055	1.17	4.00
1997-98	1,384,446	387,445	19,555	1.41	5.04
1998-99*	1,612,383	469,340	22,223	1.38	4.73

* Quick estimates

Source: *Central Statistical Organisation*

