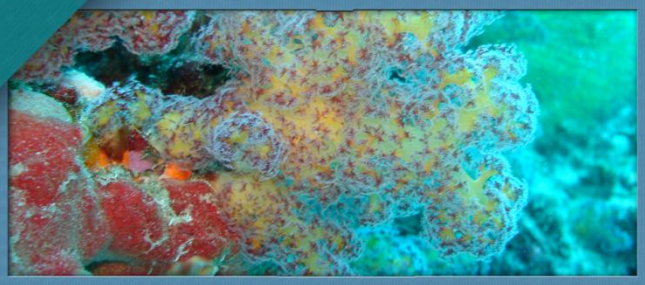
Bay of Bengal Large Marine Ecosystem Project



National Plan of Action for conservation and management of shark fisheries in India

BOBLME-2015-Ecology-65

BOBLME contract: LOA/RAP/2012/70

For bibliographic purposes, please reference this publication as:

BOBLME (2015) National Plan of Action for conservation and management of shark fisheries in India. BOBLME-2015-Ecology-65

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Preface

The development of the 'National Plan of Action for Conservation and Management of Shark Fisheries in India' or in short 'NPOA-Sharks India' has gone through a long and arduous process, at times frustrating but on the whole a very satisfying and useful journey for the Bay of Bengal Programme Inter-Governmental Organisation (BOBP-IGO).

The seeds of the NPOA-Sharks were sown in the Third Meeting of the Governing Council of the BOBP-IGO, held in Malé, Maldives in May 2007. As directed by the Governing Council, the BOBP-IGO Secretariat initiated discussions involving the BOBP-IGO member-countries (Bangladesh, India, Maldives, Sri Lanka) and organized two regional consultations- the first in Beruwala, Sri Lanka in March 2008 and the second in Kulhudhuffushi in Maldives in August 2009. These two consultations helped in better understanding the national scenarios as also in building a regional picture of shark fisheries in the Bay of Bengal Large Marine Ecosystem.

The second regional consultation brought in the newly established Bay of Bengal Large Marine Ecosystem (BOBLME) Project as a partner in the initiative. This partnership also allowed the BOBLME Project to partially fund the preparation of NPOA-Sharks India, which is duly acknowledged.

Sharks occupy an important place in the marine fisheries sector of India. The exalted position that tigers occupy on land, sharks have it in the seas. Fishers consider them with awe. Shark fishing has historical roots and the fishery has served both as a source of food and livelihoods for a large section of the coastal population in the country. In many places shark meat, both fresh and dried/salted is considered a delicacy. Indian cusine books contain many such preparations. The pivotal role of sharks in the marine ecosystem and food web is also well-recognized and acknowledged by the fisher community and other concerned stakeholders.

As evident from this document, except the Thoothoor fishers from Kanyakumari district of southern Tamil Nadu and fishers from Veraval, Gujarat, shark landings by and large take place as by-catches and not through targeted fishing. The aforementioned two groups of dedicated shark fishers have also in the recent years changed their strategy. The Thoothoor fishers are now targeting tunas and tuna-like species. In Veraval, after the ban on catching of whale shark (*Rhincodon typus*), the focus has moved from sharks to other commercial species. Consequently, shark landings have also drastically reduced in Veraval and its neighbouring areas. However, in certain other areas, particularly in Andhra Pradesh, shark landings as by-catch are increasing, which is becoming a matter of concern.

Addressing the multi-dimensional requirements of an NPOA, especially bearing in mind the sub-continental proportions of India and a gigantic fisheries sector set in a tropical multi-gear, multi-species fisheries, necessitated involvement and cooperation of a large number of stakeholders, ranging from government agencies to non-governmental and community-based organizations and fisher associations/cooperatives. Their engagement in the process also took this exercise to a series of stakeholder consultations, field-level assessments and personal discussions. The underlying objective of this extensive engagement was first to give the stakeholders a sense of 'ownership' of the NPOA, as and when it

was ready for implementation, and second to make the fishers active partners and a part of the solution of this complex task.

The NPOA-Sharks India has been attempted as a comprehensive document providing if not all, most of the relevant information to the practitioners of marine fisheries in the country. In other words, our attempt has been to provide a 'wholesale' coverage to the issues concerning the plan of action. The report provides a succinct description of the Indian marine fisheries sector, which is essential in the context of sharks being predominantly caught as 'by-catch' and not through targeted fishery. This section then flows into the 'Assessment of Shark Fisheries in India', which can also be considered as the backbone of the NPOA-Sharks. This section assiduously analyses the various facets of shark fisheries in the country and *inter alia* covers the global and national context; biological attributes and status of shark fisheries; international binding and non-binding legal frameworks applicable to migratory and straddling fish stocks and the soft laws that profess responsible fisheries; the national legal framework and applicable policies; trade and related economic aspects; stakeholder dimensions and their viewpoints; research and developmental inputs; and a 'Bibliography' of publications on various aspects of shark fisheries in India. The concluding section is the 'operational' part of the report - the National Plan of Action - Sharks, which also includes the 'Implementation Plan' for consideration of the Government.

On the whole, the report makes a humble attempt to enhance our understanding and knowledge on shark fisheries in India and also on those who derive their livelihoods from this resource. We are confident that this report will allow the Government of India to take considered decisions with regard to shark fisheries and conservation in the country.

The making of this document enlisted support from a range of organizations/ agencies, fisher associations/cooperatives and individuals. To begin with, we made extensive use of published data of the Central Marine Fisheries Research Institute (CMFRI) and the Fishery Survey of India (FSI). In this regard, FSI deserves special thanks. The Institute made available its raw data on hooking rates and catch per unit effort from the longlining and trawling exploratory surveys, covering the period 1985 – 2014. This valuable data has helped in locating the hotspots of shark fishery in the Indian EEZ, which would be useful in implementing many management measures in the times to come.

The Thoothoor-based Association of Deep Sea Going Artisanal Fishermen (ADSGAF) has been a strong collaborator of the BOBP-IGO and provided unstinted support at all stages of this interesting journey. The Association spearheaded the State-level Consultations, bringing in a range of stakeholders – from fishers to politicians to sadhus and priests – offering their unequivocal support towards conservation of shark fisheries in the Indian waters. Many individuals also joined hands with us in this work, the list is long and thus the names are not being mentioned here.

The NPOA-Sharks India is largely based on secondary data/information. Due care has been exercised while quoting facts and figures from published sources. Text or data borrowed from such documents has also been cited and duly acknowledged. However, omissions if any, would be solely on account of oversight or would have crept in inadvertently.

The NPOA-Sharks India is a living document, a dynamic plan that can be re-visited and revised as and when need arises. It is suggested that after five years of its implementation life, the NPOA-Sharks India may be subjected to a formal revision, after reviewing the progress of implementation against the agreed performance indicators, and also taking into account the other developments in the sector.

As the long process has now reached its concluding phase and as I write this Preface, it can be said with great satisfaction that the NPOA-Sharks India has been developed in a participatory mode, with the active engagement of a range of stakeholders. It charts a road map for the country to begin implementing the various components of the Plan, and in the process ensuring sustainability of shark populations in the Indian EEZ.

Chennai, India
09 December 2015

Yugraj Singh Yadava
Director, BOBP-IGO

Executive Summary

The NPOA-Sharks India is the first step towards ensuring continuity of ecological services supported by sharks and also its economic services. It is also a step towards meeting India's commitment to the 1973 Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES); 1979 Convention on the Conservation of Migratory Species of Wild Animals (CMS); the 1982 United Nations Law of the Sea (UNCLOS); the 1992 Convention on Biological Diversity (CBD); the 1995 United Nations Fish Stocks Agreement relating to Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA); the 1995 FAO Code of Conduct for Responsible Fisheries (CCRF); the 1999 International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks); and the resolutions of the regional fisheries bodies, the Indian Ocean Tuna Commission (IOTC); BOBP-IGO and BOBLME.

India is one of the largest marine fishing nations with 8,118 km of coastline and 2.02 sq. km of Exclusive Economic Zone (EEZ). The marine fisheries potential of the country is 4.41 million metric tonnes (mmt), against which the current production level (2012) is estimated at 3.94 mmt. The marine fishing fleet comprises about 199 141 fishing craft of which 52 982 (26 %) are traditional and 73 410 (37 %) motorized traditional crafts. The mechanized fishing vessels (MFVs) comprise 72 749 vessels – 37 percent of the total. The sector contributed Indian Rupees (Rs.) 57 369 crores (Rs. 574 billion) to the GDP (at current prices) during 2010-2011, which is 0.79 percent of the total GDP and 4.39 percent of the GDP from agriculture, forestry and fishing at current prices. The fisheries sector is also one of the major contributors of foreign exchange earnings. The country has exported marine products worth Rs. 12 901.46 crores (Rs. 129 billion) in 2010-11.

It is estimated that approximately 4 million people depend on the marine fisheries sector for their livelihoods (2010). About 200 thousand people are estimated to depend on shark fisheries for a major share of their livelihoods and thousands others derive part of their livelihood from shark fisheries in India. Shark meat is a local delicacy and enjoys a large clientele, especially along the southern Indian coast. Presently, India is the second largest shark fishing nation after Indonesia. The country lands about 9 percent of global shark catches in terms of weight.

Sharks, comprising true sharks, rays, skates and *chimaeras* (chondrichthyans), are traditionally caught in coastal artisanal fisheries in India. Sharks are particularly vulnerable to over-exploitation because of their life-history strategy characterized by slow growth, late attainment of sexual maturity, long life spans, low fecundity, and natural mortality, and a close relationship between the number of young ones produced and the size of the breeding biomass. Most sharks are found on the continental and insular shelves and slopes, with a much lower diversity below the slopes and in the open ocean. A recent analysis of threat for a globally distributed lineage of 1,041 species of sharks found that one-fourth of species could be termed as 'threatened' according to IUCN Red List criteria due to overfishing (targeted and incidental). Large-bodied, shallow-water species are at greatest risk and five out of the seven most threatened families are rays. Overall, extinction risk for sharks is substantially higher than for most other vertebrates, and only one-third of species are considered safe.

At the national level, India harvested about 75,757 tonnes of shark in 2012 (Handbook of Fisheries Statistics, 2014 of the Government of India). Andhra

Pradesh is the largest producer of sharks, followed by Tamil Nadu, Gujarat and Maharashtra. Most of sharks harvested in India are a part of mixed (non-targeted) catch, which is a general feature of a tropical fishery. Targeted shark fisheries were developed earlier (1980 – 2000) in Thoothoor in southern Tamil Nadu and Veraval in Gujarat. These fisheries are also now moving towards a mixed strategy with fishermen from Thoothoor going for tuna and tuna like species and fishermen from Veraval going for ribbonfishes and other species.

The waning of targeted shark fisheries could be viewed as a result of factors including declining population of sharks and growing awareness and policy measures. In terms of status of shark stocks, recent estimates put the number of shark species occurring in the Indian commercial fisheries at 160 from 73 genera. It comprises 88 species of true sharks from 44 genera; 53 species of rays from 19 genera and 19 species of skates from 10 genera (CMFRI). While species-level information is not available for most of the species; aggregate data from landings and exploratory surveys shows that:

- *Alopias pelagicus (pelagic thresher shark); Carcharhinus limbatus (blacktip shark) and the Alopias superciliosus (Bigeye Thresher Shark) are the most frequently caught species during the exploratory longline surveys.*
- *Between 1985-89 and 2010-14, the hooking rate has declined from 1.16 per cent to 0.26 per cent while CPUE has declined from 12.64 kg per hour to 3.35 kg per hour.*
- *Out of nine coastal States and the Union Territory (UT) of Puducherry; shark (true sharks) fisheries is declining or depleted in nine, except West Bengal where it is less abundant. Skate fisheries has declined; depleted or collapsed in all states, excluding Gujarat, Karnataka and Goa; Ray fisheries is declining all along the coastline, except in Tamil Nadu, Puducherry and Andhra Pradesh, where it is now less abundant.*
- *Most of the shark species (59%) occurring in the Indian waters are globally threatened.*

Sharks are usually landed as non-targeted catch. Exploratory surveys shows that sharks comprised about 53 percent of the longline catch (in numbers) and 8 percent of the trawl catch in weight. However, as the fisheries is transforming from artisanal non-powered near-shore fisheries to mechanized fisheries with larger area of operation, more species including oceanic species are being caught now as compared to two decades ago. Landing data from the Cochin Fisheries Harbour shows that the number of species landed has increased from 13 to 24 during 1986 to 2007. At the national level, trawls contribute nearly half of the shark catch and together with gill nets about 80 percent of the shark catch. Lines contribute about 13 percent of the catch.

The gross value of shark landed in India stood at Rs. 278 crores in 2010. *E*xport of shark products has increased in value terms from US$ 0.65 million in 1976 to US$8.34 million in 2011. Shark fins are by far the largest contributor to export earnings, contributing over 95 percent of the revenue. However, India's share in global shark trade is volatile, ranging between 3.50 percent in 1970s to about 0.1 percent at present.

Worsening status of shark stocks is a matter of increasing global concern. The global effort to conserve sharks started with voluntary measures, such as Listing

in UNCLOS; IPOA-Shark and UNFSA. However, with not much sign of success, the global initiative is tilting towards more direct measures, such as recent listing of five *shark* species and all manta rays in Appendix II of CITES, requiring their trade to be controlled by non-detrimental findings.

In terms of policy measures, India recently prohibited shark finning at sea and also prohibited export and import of shark fins, which has led to substantial decline in price of the sharks. Earlier, in 2001, protection was provided to the Pondicherry shark *Carcharinus hemiodon*, the Ganges sharks *Glyphis gangeticus* and *G. glyphis*, and the whale shark *Rhincodon typus*, the sawfishes *Anoxypristis cuspidatus*, *Pristis microdon* and *P. zijsron*, the rays *Himantura fluviatilis* and *Urogymnus asperinus*, and the skate *Rhynchobatus djiddensis* under the Wild Life (Protection) Act of 1972. The protection provided to whale shark led to demise of whale shark fishing in Gujarat.

India also has an elaborate legal and policy framework to manage fisheries. The marine fisheries come under governance of both the coastal States (waters up to 12 nautical miles) and the Union Government (12 – 200 nautical mile and international waters). At the State/UT-level, the Marine Fishing Regulation Act provides the necessary legal framework for licensing of fishing vessels, zonation and gear regulation, etc. At the Union level, while no such Act exists, the Comprehensive Marine Fishing Policy of 2004 impresses upon sustainable development of fisheries. However, lack of an effective fisheries Monitoring, Control and Surveillance (MCS) is a major bottleneck, hindering the effective implementation of law.

During consultations carried out with fisher groups and other primary stakeholders, fishermen have pointed out that they understand and support the need to conserve sharks, and various fishermen associations such as the Association of Deep Sea Going Artisanal Fishermen of Thoothoor are encouraging their members to practice sustainable shark fishing. However, at the same time they also need to ensure that their livelihoods are secured. The fishermen suggested that a realistic and scientific plan should be adopted to conserve sharks with active stakeholder participation.

Taking into account the scientific work on sharks, trends emerging from landing data and views of the stakeholders, the following issues are identified to be addressed during the formative years of NPOA-Sharks India:

Arresting decline in shark biomass and species diversity;

Improving monitoring, control and surveillance, including gaps in data collection and identification of species;

Setting the stage for agreed conservation measures;

Identifying research needs; and

Suggesting a holistic framework to address the above issues.

The NPOA-Shark is based on the Ecosystem Approach to Fisheries and Precautionary Principles. It directly contributes to the basic tenets of the IPOA-

Sharks. Two basic approaches are suggested in the NPOA-Sharks India; first, to bridge the information gap through research and improved data collection, and second, to set up a fisheries MCS for better implementation of the policies and laws. The NPOA-Sharks India suggests the following specific measures:

- *Do not promote direct catching of sharks till sufficient scientific evidence is available to suggest increase in exploitation.*
- *Implement comprehensive fisheries MCS Plan at the earliest.*
- *Identify and ascertain shark breeding grounds and shark breeding period and agree on conservation measures, such as seasonal ban or area closure.*
- *Initiate research to catalogue sharks in Indian waters through genetic coding. Develop species-specific indicators using fisheries and exploratory survey data wherever feasible.*
- *Initiate awareness drive among stakeholders; share research findings with fishermen and encourage fishermen associations/cooperatives to monitor and report shark catches.*
- *Initiate research on value addition for sharks and share findings with the community.*
- *Encourage ecotourism and reef shark diving.*
- *Ensure effective implementation of fin-attached policy of the Government and initiate research on value addition for sharks and share the findings with the community.*
- *Review shark export policy, encourage value addition.*
- *Introduce logbook system; develop national shark identification kit; build awareness; mobilize fishermen association and build research skill in taxonomy as well as data collection skills of enumerators from agencies involved in data collection.*
- *Review policy on reporting of catch of prohibited species or species protected under Wild Life (Protection) Act; encourage regional integration.*

To implement the Plan it is suggested that the Plan is accepted and notified at the earliest to initiate the process. This should be followed by setting up of a high level committee to supervise the process. The detailed implementation plan is given as a part of the NPOA-Sharks.

The implementation challenges mainly include ensuring effective coordination between the Union and the States; between different Ministries and Departments; and between community, scientists and Government. On a positive note, recent policy measures by the Government of India show increasing concern over shark fisheries and it is expected that a holistic approach in the form of NPOA-Sharks will create necessary initiatives within the Government for discussion and adoption of the same.

The total cost of NPOA-Shark for first three years is estimated at Rs. 23.73 crores or US$ 3.65 million, which is about 9 percent of the gross revenue from sharks. Considering that such measures will have fishery-wide positive impacts, the actual cost of NPOA-Shark is expected to be feasible and viable.

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Acronyms

ADSGAF	Association of Deep Sea Going Artisanal Fishers
ANI	Andaman and Nicobar Islands
APFIC	Asia-Pacific Fishery Commission
BOBLME	Bay of Bengal Large Marine Ecosystem
BOBP-IGO	Bay of Bengal Programme Inter-Governmental Organisation
CBD	Convention on Biological Diversity
CBO	Community-Based Organization
CCRF	Code of Conduct for responsible Fisheries
CIFE	Central Institute of Fisheries Education
CIFNET	Central Institute of Fisheries Nautical and Engineering Training
CITES	Convention on Trade in Endangered Species
CMFP, 2004	Comprehensive Marine Fishing Policy of 2004
CMFRI	Central Marine Fisheries Research Institute
CMP	Coastal Marine Police
CMS	Convention on the Conservation of Migratory Species of Wild Animals
COFI	Committee on Fisheries
CoP	Conference of Parties
CPUE	Catch Per Unit Effort
DAHD&F	Department on Animal Husbandry, Dairying and Fisheries
DoF	Department of Fisheries
EAFM	Ecosystem Approach to Fisheries Management
EEZ	Exclusive Economic Zone
EXIM	Export-Import
FADs	Fish Aggregating Devices
FAO	Food and Agriculture Organization of the United Nations
FSI	Fishery Survey of India
FYP	Five-Year Plan
GDP	Gross Domestic Product
ICAR	Indian Council of Agricultural Research
ICG	Indian Coast Guard
ILO	International Labour Organization
INFOFISH	Intergovernmental Organization for Marketing Information and Technical Advisory Services for Fishery Products in the Asia and Pacific Region
IOTC	Indian Ocean Tuna Commission
IPOA	International Plan of Action
IUCN	International Union for Conservation of Nature
IUU	Illegal, Unreported and Unregulated
LoA	Letter of Agreement
MCS	Monitoring, Control and Surveillance
MFVs	Mechanized Fishing Vessels
MHA	Ministry of Home Affairs
MoCI	Ministry of Commerce and Industry
MoD	Ministry of Defence

MoES	Ministry of Earth Sciences
MMD	Mercantile Marine Department
MMT	Million Metric Tonne
MoA&FW	Ministry of Agriculture & Farmers Welfare
MoEF&CC	Ministry of Environment, Forests & Climate Change
MoU	Memorandum of Understanding
MPA	Marine Protected Area
MPEDA	Marine Products Export Development Authority
MSY	Maximum Sustainable Yield
MZI Act	Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981
NDF	Non-Detrimental Findings
NEBOB	North-eastern Bay of Bengal
NM	Nautical miles (1 NM = 1,852 meters)
NMFC	National Marine Fisheries Census
NPOA	National Plan of Action
NWAS	North-western Arabian Sea
OAL	Overall Length
OBM	Outboard motors
RFBs	Regional Fisheries Bodies
RFMO	Regional Fisheries Management Organization
RPOA	Regional Plan of Action
SEAFDEC	South-east Asian Fisheries Development Centre
SEBOB	South-eastern Bay of Bengal
SWAS	South-western Arabian Sea
US$	US Dollar
ToR	Terms of Reference
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on Law of the Sea
UNFSA	United Nations Fish Stocks Agreement
UT	Union Territory

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1.0 Background

This Section details the process adopted and the time line for preparation of NPOA-Sharks. The Process started in 2007, with the Governing Council of the BOBP-IGO adopting a work programme to develop RPOA and NPOA-Sharks. Subsequently, two regional consultations were held involving Bangladesh, India, Maldives and Sri Lanka in 2008 and 2009, reviewing the status of shark fisheries in the BOBP-IGO member-countries. The process further bolstered with BOBLME joining the initiative in 2009. Subsequently, BOBLME and BOBP-IGO entered into an agreement under which BOBP-IGO was entrusted to develop NPOA-Sharks with the concurrence of the Government of India.

1.0 Background

1.1 The process adopted for development of the National Plan of Action

Sharks, rays and skates (together comprise the class Chondrichthyes), hereafter simply referred to as 'sharks', are amongst the oldest known living organisms on earth. Sharks play an important role in the marine food web as the top predator. They also form an important group of commercial species. The global trade of sharks is estimated at 632 million US dollar (US$) in 2011. It has increased over 19 folds since 1976 (US$33 million)[1].

In 2007, appreciating the ecological and economic value of shark fisheries in the Bay of Bengal region, the Governing Council of the Bay of Bengal Programme Inter-Governmental Organisation (BOBP-IGO) agreed to consolidate national and regional efforts for sustainablity of shark fisheries in the Bay of Bengal and directed the Secretariat to assist the BOBP-IGO member-countries (Bangladesh, India, Maldives and Sri Lanka) in developing their National Plan of Action (NPOA) for the Conservation and Management of Sharks as thereafter a Regional Plan of Action (RPOA), based on the national outcomes. This was also in line with the larger global agenda of the International Plan of Action (IPOA) on Conservation and Management of Sharks approved by the Committee on Fisheries (COFI) of the Food and Agriculture Organization (FAO) of the United Nations (UN) in 1999.

Based on the decision of the Governing Council, the initial work-plan was prepared with the following agenda:

- *To compile, collate and disseminate scientific data on shark fisheries.*
- *To study and compile the socio-economics of shark fisheries in Bangladesh, India, Maldives and Sri Lanka.*
- *To suggest management options for maintaining sustainable fisheries of sharks in the Bay of Bengal.*

It was also decided that in case of India, the Fishery Survey of India (FSI), Mumbai and the Central Marine Fisheries Research Institute (CMFRI), Kochi of the Indian Council of Agricultural Research (ICAR) would provide the necessary scientific and technical backstopping for preparation of the Plan (Anon 2008).

The First Regional Consultation on 'Preparation of Management Plan for Shark Fisheries' was convened in Beruwala, Sri Lanka from 24 – 26 March 2008. This was followed by the Second Regional Consultation on 'Preparation of Management Plan for Shark Fisheries', held in Kulhudhuffushi, Maldives from 9 - 11 August 2009. At the Second Regional Consultation, the Bay of Bengal Large Marine Ecosystem Project (BOBLME) also joined the initiative, and suggested that the BOBLME Project could assist the BOBP-IGO member-countries, who were also members of the BOBLME, in areas such as capacity building, data collection, etc. This collaboration subsequently resulted in the BOBLME and the BOBP-IGO signing a Letter of Agreement (LoA) in 2012 to undertake work on socio-economic assessment of shark targeted fisheries and preparing a draft NPOA on sharks in India. The Terms of Reference of this collaborative work are placed as ***Annexure 1***.

[1] ***Estimated from FAO Fishstat J Database***

Following the two regional consultations, the CMFRI and the FSI prepared the first status report on shark fisheries in India, identifying the state of knowledge, knowledge gaps and management options for sustainable exploitation of sharks. Subsequently, the BOBP-IGO also started actively engaging with shark fishing communities in India, such as the deep sea going artisanal fishermen operating from Thoothoor area in the southern-most district of Kanyakumari in Tamil Nadu. The objective of engaging these fishers (through the Association of Deep Sea Going Artisanal Fishermen or in short ADSGAF) was to raise their awareness on sustainable exploitation of shark resources and moving towards a consensus in management of shark fisheries.

During the same time, major shark trading centres in India were identified and discussions were held with shark traders to collate and analyse trade information in order to understand the economic implications of shark fisheries in India. While initially the engagement was concentrated on aggregate trade information, subsequently, in line with the international development, specific information was also sought from the traders at species level.

As a part of the process of engagement with different stakeholders, two major initiatives were undertaken. Firstly, an 'Atlas of Elasmobranch Fishery Resources of India[2]' was procured from CMFRI and shared with the community in India (and also the other member-countries of the BOBLME Project and the South-East Fisheries Development Centre or SEAFDEC) to set up a process of development of field identification procedures. In the same vein, a pilot-testing of 'Species Identification Card' developed by the Indian Ocean Tuna Commission (IOTC) was shared with the fishermen from Thoothoor to measure the efficacy of such guidebooks and identifying the scope of improvement in field identification of the shark genera/species.

The information required for assessing the status of shark fishery in India was collected from different sources, as shown below:

(i) India's submission to IOTC and reports published by CMFRI provided fishery-related data on shark fishery;

(ii) Fishery-independent data on shark fishery was collected from different publications of FSI, who is responsible for conducting exploratory surveys in the Indian Exclusive Economic Zone (EEZ) at regular intervals to gauge the status of resources;

(iii) Information on international fishery and trade dimensions of shark was collected from the FAO database; and

(iv) Information on shark trade, dependence of fishermen on shark fisheries and their views on management of sharks were collected through focus group discussions and workshops involving fishermen from across the country.

Adopting a broad consultative approach for development of NPOA-Shark is essential for a polycentric country like India. Like any other fishery, shark fishery, targeted and non-targeted, is carried out along the 8,116 km long coastline of the country. The responsibility of fisheries management is shared between the Union and the State/Union Territory (UT) Governments, with the State/UTs primarily responsible for management of fish landing centres and

[2] Raje, S.G., S. Sivakami, G. Mohanraj, P.P. Manoj Kumar, A. Raju and K.K. Joshi, 2007. An Atlas on the Elasmobranch Fishery Resources of India. CMFRI, Spl.Publ.No.95.253 pp.

fishing harbours where shark landings take place. There is considerable variation in capacity, pattern of governance and characteristics of fishing along the coastline. Therefore, to be effective, it was considered essential to capture these variations and integrate them in the NPOA-Shark. The Gantt chart of project activities is given in ***Figure 1***.

1.2 Parallel development at national and international levels contributing to NPOA-Sharks

At the international level, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) during its 2013 Conference of the Parties (CoP) brought five species of sharks and all manta rays under its Appendix 2. Enlistment in Appendix 2 of CITES links trade of these species to the status of their stocks. The countries are required to submit a scientific report assessing the status of the listed species in its national waters and ensuring that their trade will not hamper the status of their stock (Non-Detrimental Findings - NDF) to continue trade of the listed species. This has possibly led to two major policy initiatives by the Government of India (GoI) introducing controls on shark fishing practices. First, in August 2013, the Ministry of Environment, Forest and Climate Change (MoEF&CC) brought out a policy circular against shark finning at sea, and, second, in February 2015, the Ministry of Commerce and Industry (MoCI) issued two notifications banning export and import of all types of shark fins from India. The documents are placed as ***Annexures 2, 3 & 4*** respectively.

Parallel to these developments, the CMFRI in 2012 instituted an ICAR funded five year research programme on "Assessment of Elasmobranch Resources in the Indian Seas". The study is expected to shed light on distribution of sharks and their status to design specific policy measures. In 2015, CMFRI also published a guideline for development of NPOA-Sharks. The guideline provides detailed information on biological and economic attributes of shark fisheries in India[3].

Bearing in mind the 'Allocation of Business' between the Union and the State/UT Governments and the consequent legal pluralism in the fisheries sector in the country, the diversity in fishing communities and fishing practices along the long coastline of the country as also the two Island Territories (Andaman & Nicobar Islands or ANI and the Lakshadweep Islands), the BOBP-IGO in cooperation with the ADSGAF also initiated the 'National Mission on Conservation of Sharks' involving representatives of the Department of Fisheries (DoF) of the State/UT Governments, academia, NGOs and Community-based Organizations (CBOs). The objective of the Mission was to organize consultations in each of the 09 coastal States, the outcomes of which would contribute to the process and accelerate the development of NPOA-Sharks. Further, a separate exercise was also initiated to get the FAO's 'International Plan of Action for the Conservation and Management of Sharks' translated in vernacular languages spoken in the 13 coastal States/UTS of the country (***see Image 1*** on page 23).

1.3 Summary

Summing up the initiatives of the BOBP-IGO since the 2007, significant developments have taken place with respect to shark fisheries in both the

[3] ***Kizhakudan S.J., Zacharia P.U., Thomas S., Vivekanandan E. and Muktha M. 2015. Guidance on National Plan of Action for Sharks in India. CMFRI Marine Fisheries Policy Series No. 2, 104p. (Abbreviated as CMFRI NPOA Shark Guidelines, 2015)***

national and international arena. The positive side of these developments is that institutional processes at the level of Government, academia and community have now set in and begun taking shape. Besides the Government, the community is equally sensitized on the need for sustainable utilization of shark resources. In other words, the process of achieving the long-term objectives of NPOA-Sharks is already in progress. The following timeline graphics shows the major achievements during the developments of the NPOA-Sharks **(*Figure 2*)**.

Image 1: Vernacular versions of IPOA-Shark prepared by BOBP-IGO

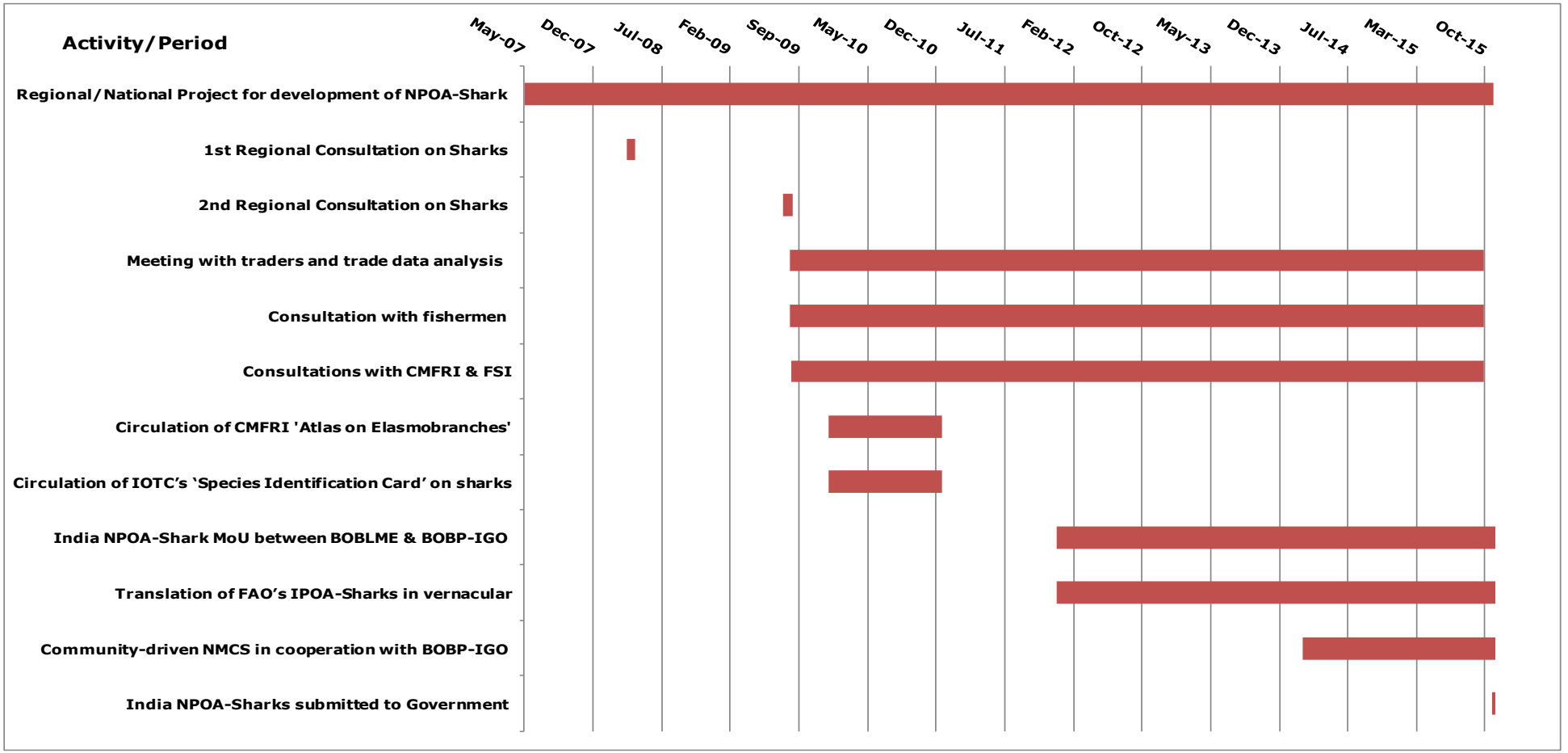

Figure 1: Timeline of project activity

1.4 Objectives and organisation of NPOA-Shark

This NPOA-Sharks for India has been prepared by the BOBP-IGO as per the directions of the Governing Council and in collaboration with the BOBLME Project. The latter also provided partial funding for carrying out certain activities contributing to the preparation of the NPOA-Sharks. The primary beneficiary of the NPOA-Sharks will be the Department of Animal Husbandry, Dairying and Fisheries (DAHD&F)[4], Ministry of Agriculture and Farmers Welfare, Government of India and other related Ministries in the Union Government (*e.g.* MoEF&CC and the MoCI) and the DoF in the State/UT Governments. The other beneficiaries would be the R&D Organizations dealing with conservation and sustainable utilization of the fisheries resources, the NGOs and CBOs dealing with fisher community and finally the fisher community themselves.

The prime objective of this document is to fulfil India's commitment and responsibility towards conservation and sustainable use of sharks as delineated in different international voluntary and non-voluntary agreements and arrangements, such as the 1979 Convention on the Conservation of Migratory Species of Wild Animals (CMS); the 1982 United Nations Law of the Sea (UNCLOS); the 1992 Convention on Biological Diversity (CBD); the 1995 United Nations Fish Stocks Agreement relating to Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA); the 1995 FAO Code of Conduct for Responsible Fisheries (CCRF); the 1999 International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks); and the resolutions of the Regional Fisheries Management Organization (RFMO), the Indian Ocean Tuna Commission (IOTC).

The Report is organized in five chapters. Chapter 1.0 provides information on the process followed to develop the NPOA-Sharks. Chapter 2.0 gives an overview of the marine fisheries sector of India. Chapter 3.0 presents an assessment of shark fishery in India from both biological and trade angles. This assessment also covers the views of stakeholders and their livelihood aspects. Chapter 4.0 outlines the NPOA-Sharks developed on the basis of needs identified during assessment of shark fishery in India. The NPOA-Sharks is also followed by an Implementation Plan, providing who does what, timelines, outputs and indicative budget. Chapter 5.0 contains the annexures, which also includes a 'Bibliography of Publications', primarily focused on shark fishery in India and which will be useful for identifying sources of information, expertise and areas of further research. Finally, NPOA-Sharks is a living document and periodic review is necessary in light of the new information on the status of shark fisheries. Therefore, a broadly defined feedback loop has been integrated with the NPOA-Sharks to deal with future possibilities.

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[4] ***As per the Constitution of India, DAHD&F, Ministry of Agriculture and Farmers Welfare is responsible fisheries management including development of overall policies and programmes for the sector in India. However, waters up to 12 nautical miles (the Territorial Waters) come under the jurisdiction of the respective coastal States/UTs. The MoEF&CC, Government of India on the other hand is responsible for conservation of biodiversity including protection of endangered species while the MoCI is responsible for fisheries trade and implementation of trade-related issues. Therefore, DAHD&F is primarily responsible for implementation of NPOA-Sharks.***

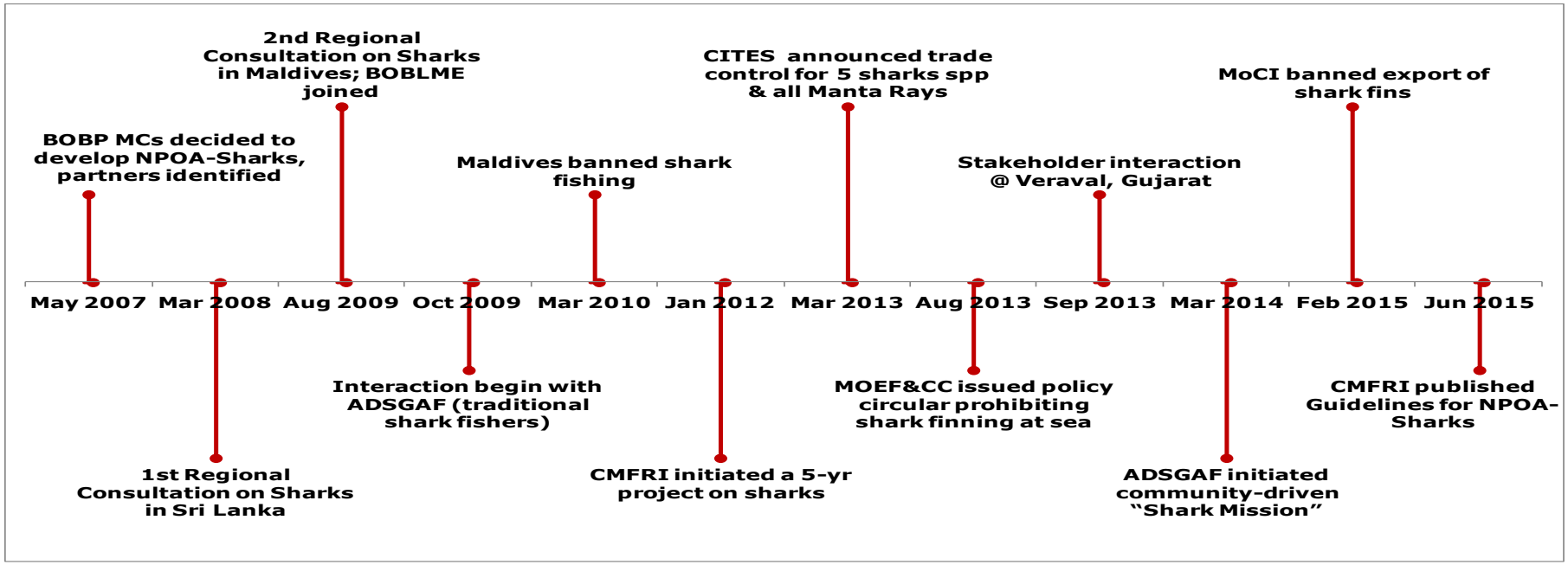

Figure 2: Timeline of major events during development of NPOA-Sharks

2.0 Marine Fisheries Sector in India

This section gives an overview of the marine fisheries sector of India - the setting within which shark fisheries takes place. Starting from a purely traditional activity, marine fisheries sector has now become a commercial enterprise – though scale still remain small. With a coastline of 8118 km and EEZ of 2.02 million sq. km. India is one of the largest fisheries producers in the World. The fisheries, set in a tropical ecosystem, is mixed comprising multiple species and gear. The fishing fleet comprises about two hundred thousand fishing vessels mostly mechanized. India has untapped potential in deep sea resources such as tuna. However, there needs to be caution while expanding fishing effort in deep sea regions as tuna fisheries will also affect shark stocks in the Indian waters.

2.0 Introduction

The fisheries sector occupies a very important place in the socio-economic development of India. The potential of the fisheries sector in general and the marine fisheries sector in particular was recognized quite early in the Indian development planning and since then a considerable amount of public effort has been channelized into the sector for developing it as a vehicle of growth. Apart from the prime consideration of securing food and nutritional requirements of the population, the fisheries sector plays an important role in trade and commerce and in the process promotes creation of millions of livelihoods for people who are often living at the margin.

Starting from a purely traditional activity in the fifties, fisheries have now transformed to commercial enterprises. The sector contributed Indian Rupees (Rs) 57 369 crores[5] to the GDP (at current prices) during 2010-2011, which is 0.79 per cent of the total GDP and 4.39 per cent of the GDP from agriculture, forestry and fishing at current prices. The fisheries sector has also been one of the major contributors of foreign exchange earnings and generated revenue worth Rs 12 901.46 crores in 2010-11[6] through export of marine products.

Marine fisheries hold a special position in the development experience of the fisheries sector in India. Owing to the long coastline of the country and a set of skilled operators, marine fisheries made rapid progress contributing to the bulk of fisheries production in India. However, since 1990s the share of marine capture fisheries in total production has declined from about 60 percent in the early 1990s to about 40 percent in 2000s, due to significant increase from aquaculture. Despite these intra-sectoral changes in the last two decades, marine fisheries is still a major production system, especially in terms of livelihoods in remote and far-flung coastal areas of the country, creation of opportunities in a number of ancillary areas and most importantly for the variety and uniqueness of its products that have world-wide demand (***Figure 3***).

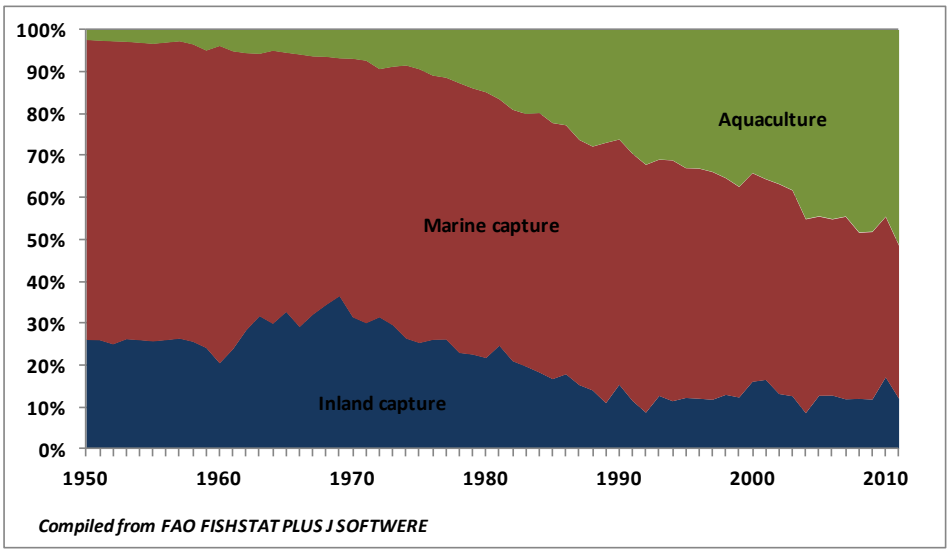

Figure 3: Sectoral composition of fisheries production in India, 1950 - 2010

[5] 1 crore = 10 000 000; 1.0 US $ = INR or Rs 66.7 (accessed from Currency Convertor, 10.12.2015).

[6] This has increased to Rs 18 856.26 crores in 2012-13.

2.1 Marine fisheries resources (physical)

After declaration of the EEZ in 1976, the oceanic resources available to India are estimated at 2.02 million sq. km, comprising 0.86 million sq. km (42.6 % of the total) on the west coast, 0.56 million sq. km (27.7%) on the east coast and 0.60 million sq. km (29.7%) around the Andaman and Nicobar Islands (***Figure 4***). The continental shelf area amounts to 530 000 sq. km of which 71 percent area is available in the Arabian Sea (west coast) and the remaining 29 per cent in the Bay of Bengal (east coast). With the absolute right on the EEZ, India has also acquired the responsibility to conserve, develop and optimally exploit the marine living resources within this area.

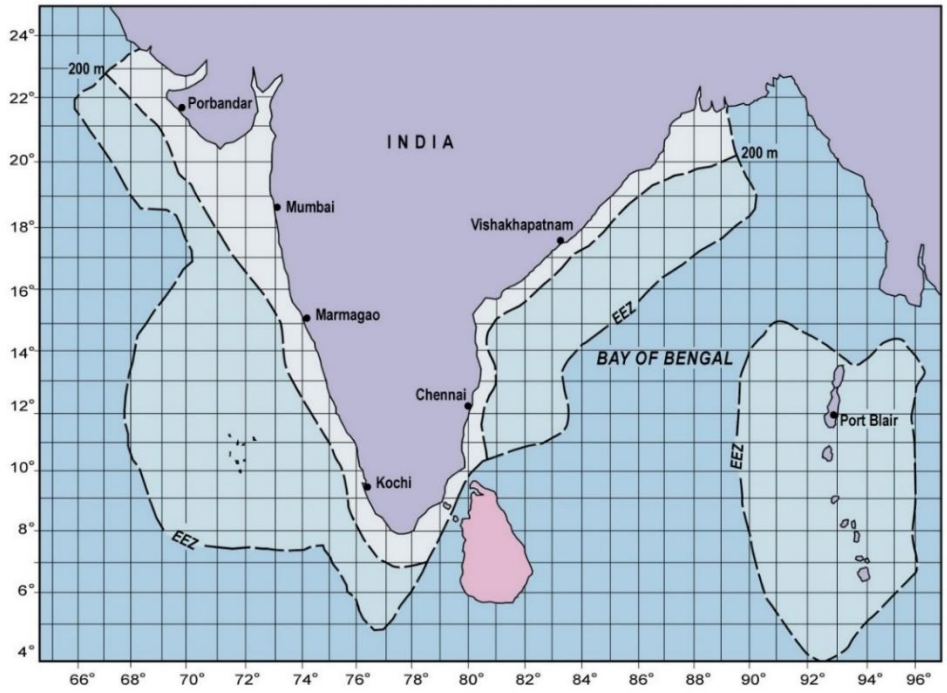

Figure 4: Exclusive Economic Zone of India

The country has a long coastline of 8 118 km and an equally large area under estuaries, backwaters, lagoons, etc, which is highly amenable for developing capture as well as culture fisheries. Marine fisheries activities are spread in approximately 1 376 fish landing centres and 3 322 fishing villages located along the coastline on the mainland and the two island territories of Lakshadweep and the Andaman & Nicobar Islands (ANI Islands).

2.2 Some historical references to development of marine fisheries sector in India

Although fish is an integral part of the Indian culture and mythology, there was no significant effort to develop fisheries till India gained independence in 1947. The first attempt to do so was through the planning exercise (Five-Year Plans) initiated in post-Independent India. The First Five-Year Plan (FYP) (1951-56), which focused on increasing growth, identified agricultural sector as the primary driver and hence fisheries sector also gained focus in the form of technology diffusion through mechanization of indigenous fishing craft. During the same time the Central Fisheries Research Institute was also established to develop home-grown technology to support fisheries sector. Subsequently, in the Second FYP focus was more on industrial development but the activities initiated during

the First FYP continued. During the Fourth FYP, emphasis was again on increasing agricultural growth. During this Plan period, the potential of fisheries sector in earning foreign exchange was revalidated, leading to the establishment of the Marine Products Export Development Authority (MPEDA)[7] in 1972. The role envisaged for MPEDA under the statute is comprehensive - covering fisheries of all kinds, increasing exports, specifying standards, processing, marketing, extension and training in various aspects of the industry.

However, an important landmark event in the Indian fisheries experience was during the Fifth FYP (1974-79), when the Government took a more holistic view of the marine fisheries sector. During this period India also declared its EEZ of 200 nautical miles gaining exclusive access to the marine area of 2.02 million square kilometers. In this backdrop, development of deep sea fishery featured prominently in the Fifth FYP. To cite an example, it was suggested that *'A special Trawler Development Fund will be created in order to help, in particular, smaller entrepreneurs and cooperatives to purchase and operate trawlers for marine fisheries.*[8]*'* Among other programmes, the Fifth FYP also spelt out the importance of increasing fish production to meet the protein requirements in the Indian diet; improvement of socio-economic conditions of fishermen; and realization of enhanced foreign exchange earnings through export of selected marine products. Focus was also on developing fisheries infrastructure, especially fishing harbours and related infrastructure. This also led to development of line industries, such as boat building, net making and marine diesel engine manufacture[9].

A marked shift in the FYP's approach to fisheries development was observed from the Ninth FYP (1997-2002) onwards. Although, the sector was identified as having high growth potential, emphasis was also laid on conservation of resources. The approach paper to the Ninth FYP asserted that 'Natural resources are a patrimony of the nation and it would not be desirable to excessively deplete the natural resource endowments of the country and thereby expose future generations to vulnerabilities over which they may have no control.'

2.3 Objectives of marine fisheries development in the 12th Five Year Plan

The Twelfth FYP (2012-17) was launched with the objective of 'Faster, sustainable and more inclusive growth'. It lays emphasis on *in situ* conservation and sustainable use of biodiversity to enhance livelihood security, promotion and evaluation of ecosystem services in the national planning process. This includes the study of the economics of ecosystem and biodiversity; abatement of marine pollution and prevention of traffic in marine resources. It has proposed that a multi-disciplinary autonomous body namely 'National Environment Assessment and Monitoring Authority (NEAMA)' will be set up for strengthening the processes for grant of environmental clearances and monitoring thereof. The NEAMA is also envisaged to grant clearances under the Environment (Protection) Act, 1986, including the coastal zone regulations and marine fisheries regulations. It also proposes to implement central schemes for better implementation of the Rules under the Marine Fishing Regulation Act by the Union and State Governments.

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[7] MPEDA was set up under the Marine Products Export Development Authority Act of 1972 (No 13 of 1972). The Act is administered by the Ministry of Commerce, Government of India.

[8] http://planningcommission.nic.in/plans/planrel/fiveyr/5th/5planch5.html (Art 5.20).

[9] Silas, E G (1977) Indian fisheries 1947 - 1977. Technical Report. CMFRI, Kochi (Pp 2).

The report of the Working Group on 'Development and Management of Fisheries and Aquaculture' during the Twelfth FYP, while accepting the present situation of over-exploitation of the coastal resources, has highlighted on the need for increased effort in offshore waters. To achieve this, the report has suggested up-gradation of the fleet as well as skills and capacities of the fishers and incentives to promote diversified fishing in offshore waters; use of Fish Aggregating Devices (FADs) and Artificial Reefs (ARs) for stock enhancement; improved infrastructure; and promotion of mariculture to increase production. Further, to bring discipline and orderliness in the sector and regulate the activities, the report has suggested implementation of Monitoring, Control and Surveillance (MCS) so that the growth can be achieved in a sustainable manner.

Summing up, the developmental approaches to the fisheries sector in general have remained 'production-driven'. This is logical given the low production and localized nature of fisheries during the early years. However, with marine fisheries having grown in leaps and bounds in the last four decades, a greater emphasis is now required on conservation and good governance of the sector.

2.4 Trend in marine fish production

The marine fisheries production broke out of its inertia in the early 1970s with technological innovations and increasing pace of mechanization and motorization of the fishing fleet. Result - it found itself into a high growth trajectory during the 1980s. However, this growth trajectory did not last very long and during the 1990s production seemed to have flattened. It was believed that the volume of the catch was approaching the potential from known fishing grounds and the sector was maturing. However, from mid-2000 onwards, the sector seems to have again catapulted into a higher growth path, which is still continuing (***Figure 5***).

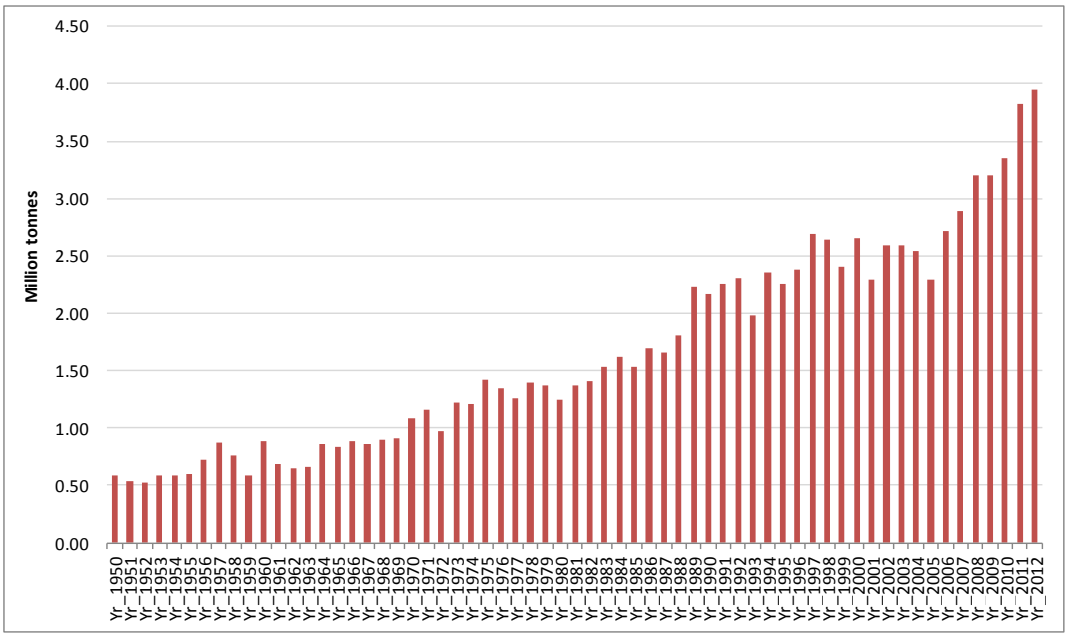

Figure 5: Growth of marine fish production in India, 1950 - 2012 *(Source: CMFRI[10])*

[10] The data used for analysis is compiled from CMFRI website, except for 2012 which is taken from CMFRI Annual Report. It may also be noted that as CMFRI does not report catch from oceanic fishery, therefore, the total catch of some oceanic species such as tuna is likely to be higher than reported here.

This development could be attributed to various factors, such as the encouragement provided to the sector in terms of assistance to go deeper, increasing mechanization and efficiency gained and also climate-related factors, which have led to expansion of some fisheries such as oil sardines in both volumes of landings as well as geographical spread along the Indian coastline.

An analysis of the marine fisheries production during the last five years (2008-12) shows increase in production from 3.22 million tonnes in 2008 to 3.94 million tonnes in 2012, at a growth rate of 4.56 percent per year. If this trend continues in the coming period, the production is likely to reach 5 million tonnes in another 5-6 years. In terms of catch composition, pelagic species contributed to the majority of the catch (average 54% during the last five years), followed by demersal (27%) and shellfishes (19%). In terms of trends in production, demersal and pelagic fisheries have shown above average growth of 5.79 percent and 5.32 percent respectively during the last five years, while growth of shellfish fishery has remained nearly constant (***Table 1***)

Table 1: Contribution of different fisheries in total marine fisheries production, 2008-12

Year	2008	2009	2010	2011	2012	Growth (%)
Pelagic fin fishes	16,85,001	16,68,987	18,39,008	21,33,26	21,33,347	5.32
Demersal fin fishes	8,66,311	9,17,708	8,63,093	9,91,988	11,17,226	5.79
Shell fishes	6,63,930	6,18,758	6,44,557	6,94,950	6,98,365	1.04
Total	***32,15,242***	***32,05,453***	***33,46,658***	***38,20,206***	***39,48,938***	***4.56***

Source: Compiled and calculated from Annual Reports of CMFRI, Kochi

In terms of individual fisheries, clupeids constituted the largest fishery in India with an average production of 0.96 million tonnes during the last five years, followed by crustaceans, perches, mackerels and croakers. In terms of growth, silverbellies have emerged as the fastest growing fisheries during the said period along with barracudas and ribbon fishes. Although most of the fisheries are experiencing a positive growth, some fisheries such as mullets and pomfrets are declining while that of crustaceans is nearly static (***Table 2***).

Table 2: Species-wise composition of marine fish landing in India, 2008-12

#	Species Groups	Production (in tonnes): 2008-12			Growth (%)
		2012	Total Production	Average production	
1.	***Clupeids***	***11,41,737***	***48,03,380***	***9,60,676***	***5.79***
2.	Crustaceans	4,99,824	24,83,357	4,96,671	0.46
3.	Perches	3,41,318	13,07,385	2,61,477	7.21
4.	Mackerels	1,70,410	10,61,219	2,12,244	1.45
5.	Croakers	2,14,438	10,05,102	2,01,020	3.59
6.	Carangids	2,16,447	9,38,899	1,87,780	9.11
7.	Ribbon fishes	2,36,541	9,33,359	1,86,672	12.54
8.	Molluscs	1,98,542	8,33,018	1,66,604	3.21
9.	Bombay duck	1,15,296	5,56,554	1,11,311	1.97
10.	Eel & catfishes	1,03,106	5,26,339	1,05,268	-0.01
11.	***Silver bellies***	***1,40,843***	***4,37,762***	***87,552***	***20.21***
12.	Tunnies	81,375	3,51,687	70,337	0.43
13.	Lizard fishes	70,004	2,95,638	59,128	6.70
14.	Pomfrets	47,303	2,65,404	53,081	-1.80

15.	Flatfishes	63,264	2,57,896	51,579	12.04
16.	Seer fishes	56,170	2,56,250	51,250	-0.25
17.	Elasmobranchs	52,602	2,52,876	50,575	1.71
18.	Goatfishes	31,014	1,47,061	29,412	7.88
19.	Barracudas	33,929	1,26,416	25,283	15.45
20.	Threadfins	12,588	52,362	10,472	5.17
21.	Big-jawed jumper	8,298	52,091	10,418	-0.76
22.	Billfishes	6,216	39,877	7,975	0.54
23.	Mullets	5,932	37,639	7,528	-5.89
24.	***Half beaks & full beaks***	***4,096***	***26,393***	***5,279***	***-7.49***
25.	Flying fishes	2,157	6,845	1,369	7.67
26.	Unicorn cod	1,081	3,355	671	7.47

Source: Compiled and calculated from Annual Reports of CMFRI, Kochi

In terms of sectoral contributions, the mechanized sector contributes about 78 percent of the landings and motorized sector the balance 20 percent. The contribution of the mechanized sector is increasing. In 2009, the mechanized sector reported 74 percent of the landings while the motorized sector contributed 22 percent. This highlights the fact that the increasing production is a result of efficiency gained in the mechanized sector.

However, the reported data is landing data, which is lower than the volume of catch. The catch data and landing data varies significantly depending on the type of fisheries. Generally, non-motorized traditional sector has the least amount of discards, while the mechanized trawlers and gillnetter have larger amount of discards. A study on low value by-catches (LVB) and discards mounted by the CMFRI, Kochi during 2007-12 found that in Mumbai the average rate of discards was to the tune of 188 kg per haul with a range of 100 to 250 kg per haul, which is about 56 per cent of the total catch. The multiday trawlers especially discard a considerable volume of LVB during the first part of their voyage. The rate of discards is also reported to be high in key fishing centers such as Visakhapatnam and Mangalore (***Table 3***).

Table 3: Fish discarded by trawlers in different landing centres

Place/Year	2009	2010	2011	2012
Veraval	2,269	2,269	2,269	2,269
Mangalore	14,837	11,776	7,359	11,324
Calicut	1,794	3,347	1,957	2,366
Chennai	193	193	193	193
Visakhapatnam	15,040	40,089	27,565	27,565
Total	**36,142**	**59,684**	**41,354**	**45,729**

Source: CMFRI

As mentioned earlier, discard is more among trawlers and multi-day vessels. As per the National Marine Fisheries Census (NMFC), 2010, conducted by the CMFRI for the mainland and the fishery survey of India, Mumbai for the two groups of Islands, trawlers constitute about 50 per cent of the mechanized fishing fleet and about 18 per cent of the total fishing fleet. Also considering the existing landing pattern of different categories of fishing vessels, it is assumed that about 5 per cent of the total catch is discarded at the national level.

In addition, catch from oceanic waters for species like tuna (and tuna like species) is not included here. In 2008, about 92 139 tonnes of tuna was caught in coastal fishery, while about 2 839 tonnes of tuna was caught in oceanic waters. In 2010, about 53 000 tonnes of tuna was caught in coastal fishery, while about 24 000 tonnes of tuna was caught in oceanic fishery as per the reports submitted to the IOTC by the Ministry of Agriculture & Farmers Welfare, Government of India in 2011.

Therefore, incorporating the fish discarded (and also those consumed on-board fishing vessels or self-consumed) at 5 percent level of the total landings and including production from oceanic fisheries, the present total marine fisheries catch is estimated at 4.17 million tonnes (***Figure 6***).

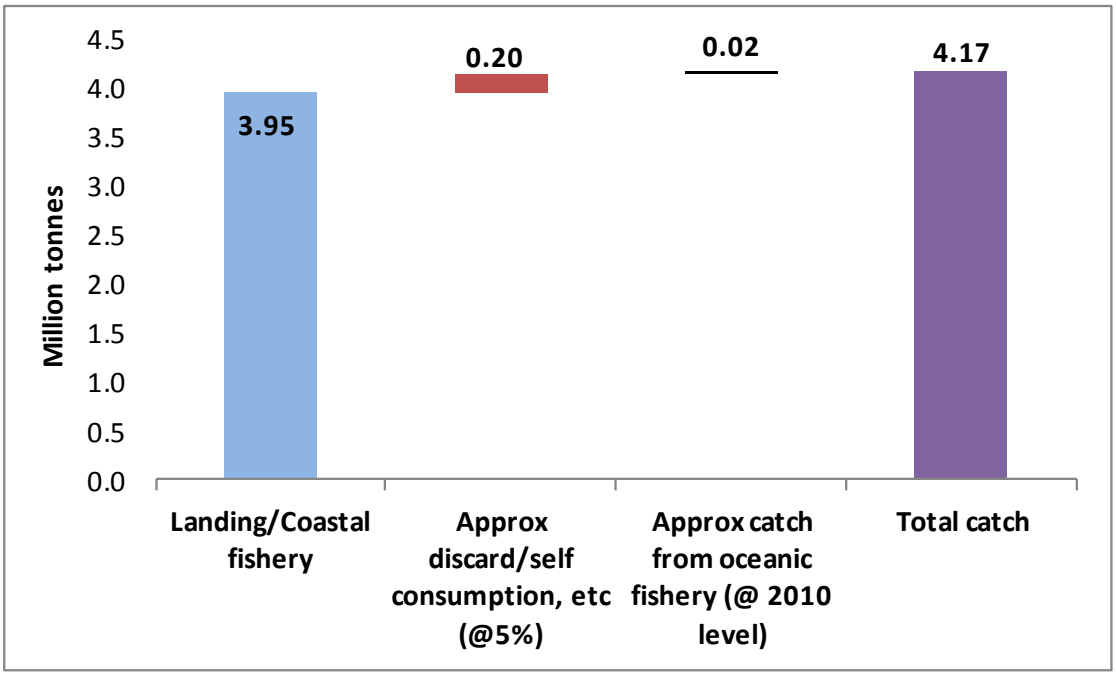

Figure 6: Approximate catch from Indian waters in 2012

2.5 Fishing crafts

The marine fishing fleet[11] comprises about 199 141 fishing craft of which 52 982 (26 %) are traditional and 73 410 (37 %) motorized traditional crafts. The mechanized fishing vessels (MFVs) comprise 72 749 vessels – 37 percent of the total (***Table 4***). As compared to the west coast, concentration of traditional craft (including motorized) is more on the east coast (about 62 % of the total). In the case of MFVs, the trend is reverse (about 58 % of the total). The scale of mechanization is also reflected in the total fish landings of the two coasts.

The Government of India has also undertaken a nation-wide on-line registration programme of fishing crafts for creation of a database known as 'ReALCraft". The data available from ReALCraft shows that as of now 194 460 fishing vessels have been registered. The registered fleet comprises 50 298 (25.87%) non-motorized fishing vessels; 92 906 (47.78%) motorized fishing vessels and 51 256 (26.36) mechanized fishing vessels (***Table 5***).

[11] ***Source: National Marine Fisheries Census, 2010, Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, Government of India.***

Image 2: Fishing crafts of India

At the end of the First FYP (1951-1956), there were 863 MFVs operating along the Indian coast. Presently, the number is 72 749. At the national level, the mechanized sector contributes about 78 percent of the landings. In 1969 it was a mere 20 percent. With the advent of mechanization, use of traditional harvesting gear like bag net, cast net, small meshed gill net has declined and more efficient gear like purse seines have become popular. As seen by the number of traditional craft and small mechanized vessels, the major fishing activities are still concentrated in marine waters within 0 to 100 meter depth zone.

Table 4: State-wise detail of fishing vessels in India (NMFC, 2010)

#	State/Union Territory	Existing fishing fleet			
		Traditional	Motorized	Mechanized	Total
1	Andhra Pradesh	17,837	10,737	3,167	31,741
2	Goa	227	1,297	1,142	2,666
3	Gujarat	1,884	8,238	18,278	28,400
4	Karnataka	2,862	7,518	3,643	14,023
5	Kerala	5,884	11,175	4,722	21,781
6	Maharashtra	2,783	1,563	13,016	17,362
7	Odisha	4,656	3,922	2,248	10,826
8	Tamil Nadu	10,436	24,942	10,692	46,070
9	West Bengal	3,066	-	14,282	17,348
10	Andaman & Nicobar Islands	1,637	1,491	61	3,189
11	Daman and Diu	321	359	1000	1,680
12	Lakshadweep	727	606	129	1,462
13	Puducherry	662	1,562	369	2,593
	Total	**52,982**	**73,410**	**72,749**	**1,99,141**

Table 5: Number of registered fishing craft in the marine fisheries sector

#	Name of State	Total applications entered (RealCraft) as of March 2014			
		Non-motorized	Motorized	Mechanized	Total
1	Goa	354	0	2,360	2,714
2	Orissa	6,305	5,739	1,735	13,779
3	Andhra Pradesh	14,190	11,213	1,585	26,988
4	Andaman and Nicobar	1,898	1,882	108	3,888
5	Puducherry	1,227	1,479	765	3,471
6	Karnataka	7,439	6,508	2,869	16,816
7	Daman & Diu	0	285	1,381	1,666
8	Lakshadweep	235	1,072	5	1,312
9	West Bengal	4,594	4,218	1,814	10,626
10	Kerala	1,869	25,021	3,798	30,688
11	Maharashtra	7,135	0	16,030	23,165
12	Gujarat	101	9,797	13,133	23,031
13	Tamil Nadu	4,951	25,692	5,673	36,316
14	**Total**	**50,298**	**92,906**	**51,256**	**1,94,460**

15	**Share**	25.87	47.78	26.36	100.00
16	***West Coast***	***17,133***	***42,683***	***39,576***	***99,392***
17	***East Coast***	***33,165***	***50,223***	***11,680***	***95,068***

Source: ReALCraft Database, DAHD&F

2.6 Fisher population

The NMFC, 2010 conducted by CMFRI, Kochi (for mainland coastal States/UTs) and the FSI, Mumbai (for the two Island groups) has estimated that the marine fisheries sector provides employment to about 0.9 million fishers in active fishing and to about 0.7 million fishers in various other fishing operations. The number of people involved in marine fisheries related activities include nearly 0.2 million in fish marketing, 0.1 million in repair of fisheries requisites, around 0.2 million in fish processing and 0.1 million in other ancillary activities.

Compared with the previous NMFC undertaken in 1980 and 2005, it is seen that the marine fisher population has nearly doubled from 1.87 million in 1980 to 3.51 million in 2005 and further to 4.06 million in 2010.

Among those engaged in active marine fishing, majority (80%) are in full-time fishing. Fishing as a full time profession is relatively popular in the west coast States/UTs (Gujarat, Goa, Daman & Diu, Maharashtra, Karnataka, Lakshadweep and Kerala) where 84 percent of active fishers are engaged in full-time fishing as compared to the east coast States (West Bengal, Orissa, Andhra Pradesh, Puducherry, ANI Islands and Tamil Nadu), where 78 percent fishers engage in full-time fishing. This is also supported by the fact that fishing operations are more capital-intensive in the west-coast States than in the east-coast States. Further, this also implies that fishing as a livelihood option is more remunerative and profitable in the west coast States/UTs.

2.7 Fish exports

In early 1970s, when marine fisheries was still in the artisanal state in terms of technology, the Government put forward the constitution of the Marine Products Export Development Authority (MPEDA), with the objective of providing necessary incentives to fisheries trade, which at that stage was minimal. Owing to this and other export promotion incentives, export of marine products increased from a meagre 15 732 tonnes in 1961-62 to a record 928 215 tonnes in 2012-13. In relative terms, it has increased from about 1.79 percent of the total landings to 28.56 percent of the total landings. Apart from the quantitative growth, there is also improvement in the product basket with addition of commercially important species such as tuna, squids, etc. This growth trajectory has also led to the creation of a large processing capacity in accordance with global standards, which can further fuel the export of fish and fisheries products from India. In the long run, as domestic demand and preference for processed fish increases, this processing capacity will be of much use.

In terms of export earnings, frozen shrimp continue to be the largest export item (54% in value), followed by frozen fish (17%), cuttlefish (10%), squid (7%), dried items (2%), etc. Japan, USA and European Union were the major buyers of Indian marine products. The exports are now taking place through 18 sea ports in the country. The maximum exports (about 29.1%) are from Pipavav Port in Gujarat, followed by Jawahar Lal Nehru Port in Maharashtra (22.4%) and Kochi Port in Kerala (17.4%).

2.8 Fisheries potential

In India, traditionally fisheries has been a low-tech activity. Therefore, in the initial Five-Year Plan periods, focus was on technical development and in the process of mechanization and motorization of fishing craft was facilitated. Status of stocks was not a concern to begin with, as subsequent to declaration of its EEZ in 1976; India owned a vast body of national waters largely unexplored. However, with increasing numbers of fishers and also their fishing efficiency, fishing effort has increased to a point of caution. This concern stems from two factors, first the effort is still largely concentrated in near-shore waters and second, if the trend continues many stocks in the near shore waters are likely to be over-exploited and may collapse in the near future.

Pursuant to the declaration of the Indian EEZ in 1976, estimation of potential yield became a necessary condition for sustainable management of fisheries. The United Nations Convention on Law of the Sea of 1982 (UNCLOS, 1982), which provides a validation for declaration of EEZ also came with the rider that while doing so (declaring EEZ), the coastal nations should ensure sustainability of the resources. Since India's ratification to the UNCLOS, 1982, various scientific studies have been carried out to estimate the fisheries potential in the marine waters of the country. In this regard the first attempt was made in 1980 and thereafter the potential is being regularly revalidated through decadal exercises, the latest being conducted during 2010. While these estimates are *prima facie* comparable, there are also some changes from time to time. The 2010 Expert Committee tasked with the revalidation work noted that between the latest and the past potential estimates, there are some significant changes, such as increase in depth of fishing operations and fishing area and also likely impacts of climate change, especially on pelagic species.

Based on the decadal exercises, in 2010, the Ministry of Agriculture & Farmers Welfare revalidated the potential of marine fisheries adjusting the yield to an upper limit of 4.41 million metric tonnes (mmt) from the previous estimate of 3.94 mmt. However, presently this potential yield has almost been fully utilized from the near shore waters (up to about 200 metre depth range). In terms of revenue, the high value species occurring in deeper waters are left under-exploited.

As seen in ***Table 6*** below, the 2010 revalidation brought about an upward revision in the potential yield from the Indian EEZ by about 12 percent. This increase is largely due to increase of 27 percent in the estimated potential yield of pelagic resources. However, on the other hand, there is a decline in the potential yield of oceanic resources by 11 percent.

Table 6: Change in potential yield from the Indian EEZ

Realm	2010	2000	Change (%)
Pelagic	21,28,424	16,73,545	27.18
Demersal	20,66,763	20,17,071	2.46
Oceanic	2,16,500	2,43,800	-11.20
Total	**44,11,687**	**39,34,416**	**12.13**

In the current estimates of 4.41 million metric tonnes (mmt)[12], the depth-wise potential shows that about 87 percent of the resources (3.82 mmt) are available in 0-100 meter depth; about 6 percent (0.25 mmt) in 100-200 meter depth zone and about 3 percent in 200-500 (0.11 mmt) meter depth zone. The resources in depths beyond 500 meter have been estimated at 0.216 mmt, which is about 5 percent of the total resources (***Table 7***). The oceanic resources are largely composed of tuna and tuna like species, deep sea lobsters, etc.

Table 7: Potential yield in Indian EEZ

Depth (m)	Resource	Potential yield (Tonnes)	Share (%)
0-100	Demersal	18,25,115	41.37
	Pelagic	19,96,393	45.25
	Total	***38,21,508***	***86.62***
100-200	Demersal	2,05,104	4.65
	Pelagic	53,935	1.22
	Total	***2,59,039***	***5.87***
200-500	Demersal	98,205	2.23
	Pelagic	16,435	0.37
	Total	***1,14,640***	***2.60***
> 500	Oceanic	2,16,500	4.91
0 - 500+	**Total**	**44,11,687**	**100.00**

Source: Report of the Revalidation Committee, 2010

Looking at the potential of both the Arabian Sea and the Bay of Bengal, it is seen that the South-east Arabian Sea (SEAS) has a potential yield of about 1.70 mmt comprising demersal fishery resources of about 0.42 mmt and pelagic fishery resources of about 1.28 mmt; the North-east Arabian Sea (NEAS) has a potential of about 1.25 mmt comprising demersal fishery resources of about 0.21 mmt and pelagic fishery resources of about 1.04 mmt; the Northern Bay of Bengal (NBOB) has a potential of about 0.61 mmt comprising demersal fishery resources of about 0.07mmt and pelagic fishery resources of about 0.54 mmt; the Southern Bay of Bengal (SBOB) has a potential of about 0.36 mt comprising demersal fishery resources of about 0.12 mmt and pelagic fishery resources of about 0.24 mmt and the Andaman Sea has a potential of 0.40 mmt comprising demersal fishery resources of about 0.04 mt and pelagic fishery resources of about 0.36 mmt (Figures 7 & 8[13]).

[12] The potential has been revalidated to 4.41 MT in year 2010. The estimate of 3.93 mmt was worked out by a Working Group in 2000.

[13] The estimate of depth-wise potential presented earlier and region-wise potential were arrived at following different approaches. Although they are comparable, they are not equal.

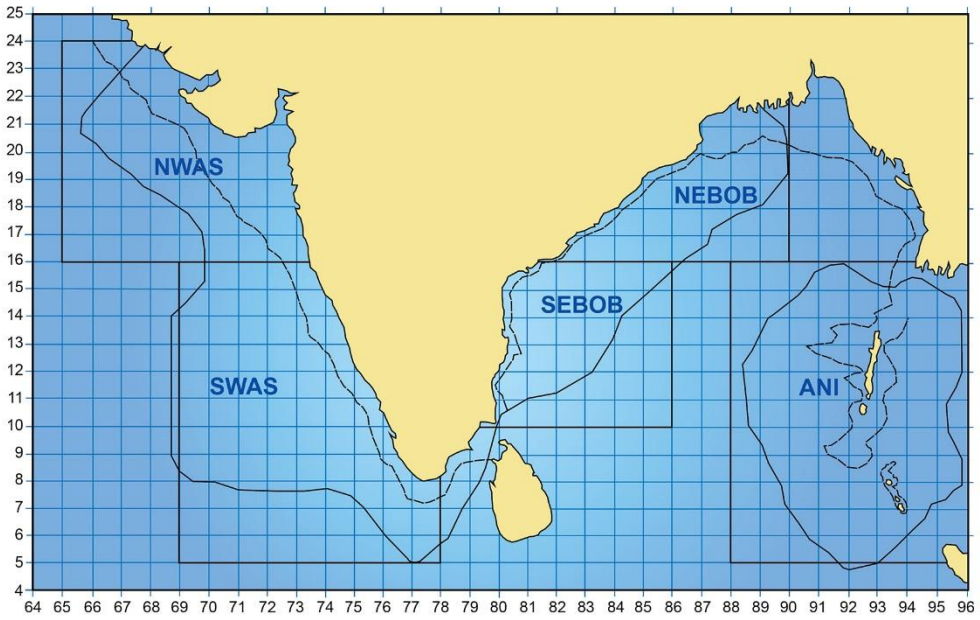

Figure 7: Marine production zones of the Indian seas

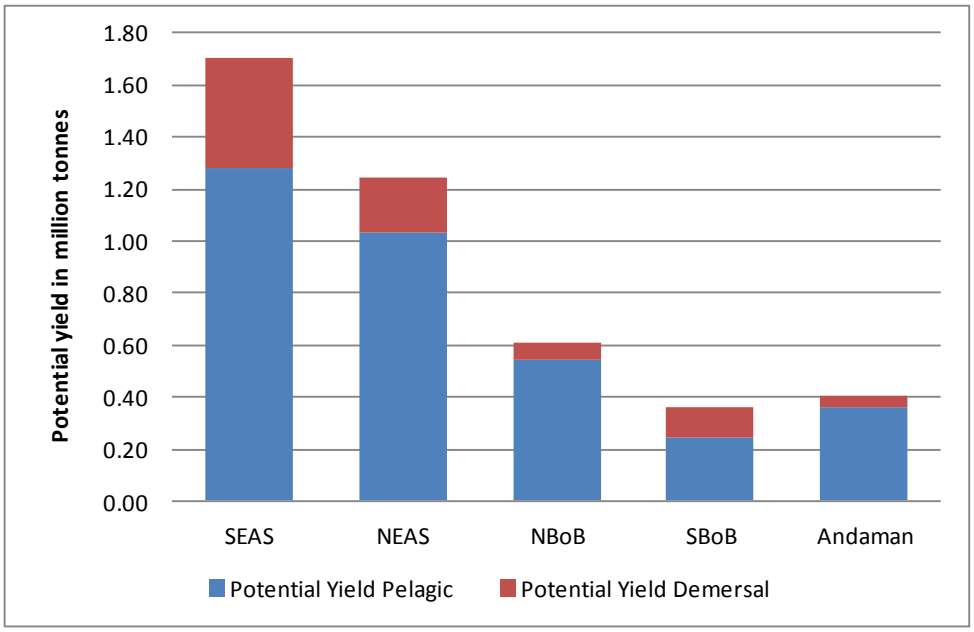

Figure 8: Summary of the potential yield in different seas of the Indian EEZ

In terms of species-wise potential, perches (ribbonfish, threadfin breams, etc) and clupeids (oil sardine, etc) and crustaceans (shrimps, etc) comprise 47 percent of the resource potential. These resources are concentrated in waters up to 100 meters. Elasmobranchs and tunas constitute about 12 percent of the potential and are the main oceanic resources (***Figure 9***).

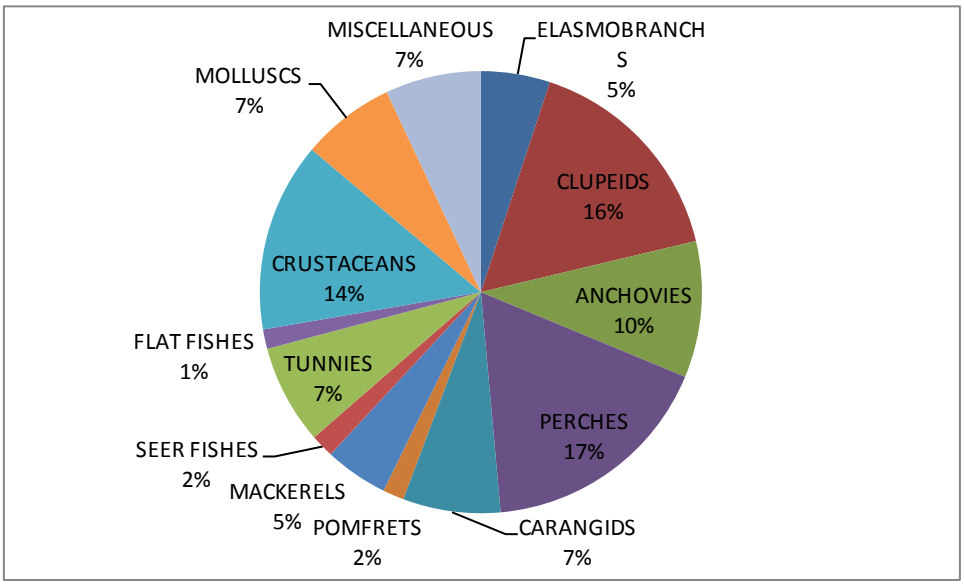

Figure 9: Species-wise composition of fisheries potential

2.9 Major oceanic resources and scope of their exploitation

As a renewable natural resource, marine fisheries have limits to growth. Technically, a fish stock can be harvested to a limit where it still retains the capacity for breeding and replenishing the population. Apart from fishing mortality and other anthropogenic shocks, fish stocks are also subjected to various natural shocks and mortalities. Further, as compared to terrestrial resources, fish stocks are under water and not visible. This makes our knowledge and information on fish biology, status of stocks and other population parameters imperfect and, therefore, estimates are based on fish landings, surveys and other indirect methods such as productivity estimates. To compensate this gap in information, it is often necessary to have 'precautionary limits' that can balance any action, which is contrary to the tenets of sustainable exploitation. Depending on the state of science, information and knowledge, such precautionary limits can be readjusted.

Based on the report of the 2010 Revalidation Report, the total potential of oceanic waters is estimated at 216 500 tonnes, including yellowfin tuna (37%) and skipjack tuna (46%). Other major species include bigeye tuna, billfishes, sharks, barracuda, dolphin fish, wahoo, etc., and comprise about 17 percent of the total (***Figure 10***).

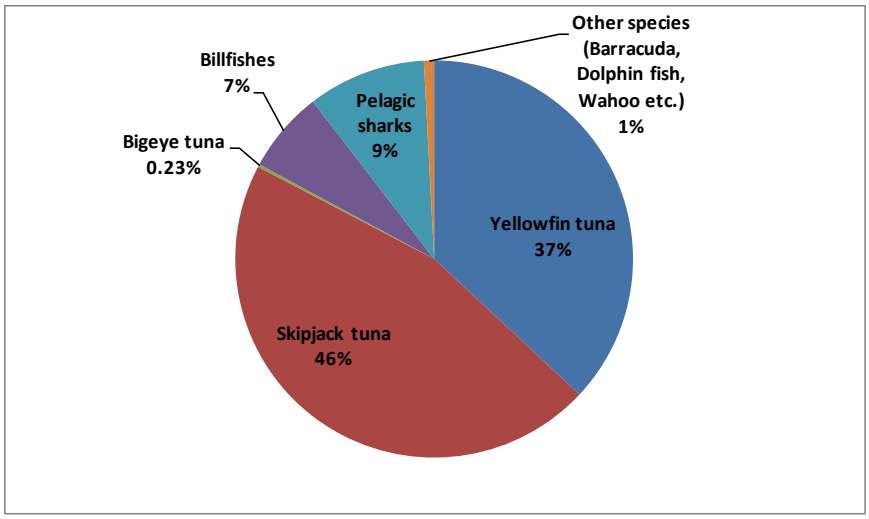

Figure 10: Composition of oceanic resources

From the species composition it is clear that the primary objective of exploring oceanic fishery by the Indian fleet would be to exploit quality yellowfin tuna resources and complement this with skipjack tuna and other resources such as bigeye tuna and billfishes. However, as sharks constitute an important by-catch of tuna long-lining operations, there would be a need to follow the guidance as detailed in the subsequent chapters of this document.

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3.0 Assessment of Shark Fisheries in India

This chapter delineates the status of shark fisheries in India, drawing reference from global perspective, in terms of species diversity; stock status; production and trade as well as socio-economic underpinning as explained by the fishermen. The recent estimate shows that India has about 160 species of sharks in its water. However, further details on species are scanty. The landing and exploratory survey figures show that there is considerable decline in shark population over the past few decades. There is also a marked decline in species composition, with species in the IUCN threatened list also declining in India. Although, at macro-level, shark fisheries constitute a minor fishery, at micro-level it creates considerable remuneration for fishermen and people engaged in post-harvest activities. All parts of shark fetch a price and this has made the fisheries important.

3.0 Importance of shark fisheries

Sharks are an ecologically important common pool resource in the Indian EEZ. The word 'shark' in the present document and corresponding global documents is used as an 'envelope term' and comprises true sharks, rays, skates, and chimaeras (together comprising the class Chondrichthyes). They are amongst the known oldest living organisms on earth. With a history of over 400 million years, sharks predate and outlived the dinosaurs.

Sharks are apex predators – different species play the role of the apex predators in their respective ecosystems. It is also an important commercial species. The global trade of shark is estimated at US$632 million in 2011. It has increased over 19 folds since 1976 (US$33 million) (FAO 2011). ***Table 8*** below summarizes the different ecological and economic services provided by the sharks.

Table 8: Ecological and economic services provided by sharks

Ecological services	Economic services
Maintaining the energy flow in marine food web - The ocean ecosystem is made up of very intricate food webs. Sharks are at the top of these webs and are considered by scientists to be "keystone" species, meaning that removing them causes the whole structure to collapse. For this reason, the prospect of a food chain minus its apex predators may mean the end of the line for many more species. A number of scientific studies demonstrate that depletion of sharks result in the loss of commercially important fish and shellfish species down the food chain, including key fisheries such as tuna, which maintain the health of coral reefs. ***Example:*** Declines in large shark populations on the East Coast of the US led to the collapse of North Carolina's century-old bay scallop fishery *(Source: Cascading Effects of the Loss of Apex Predatory Sharks from a Coastal Ocean - Ransom A. Myers - Dalhousie University - 2007).*	***Shark meat*** - Sharks have traditionally been used as food in coastal areas since the earliest times. Consumption of shark meat has been recorded in literature as early as the fourth century. Shark meat was more familiar to inhabitants of fishing villages and nearby settlements in the coastal areas of Asia, Africa, Latin America and the Pacific Islands. It was also eaten by the Inuit people of Arctic region and in Europe and Japan. Apart from consuming fish fresh, the most common preservation methods were drying, salting or smoking. According to FAO data in 2011, 102 412 tonnes of shark was produced in different forms (frozen, fillet- fresh or chilled, salted, dried, etc.)
Sharks keep prey populations healthy - sharks prey on the sick and the weak members of their prey populations, and some also scavenge the sea floor to feed on dead carcasses. By removing the sick and the weak, they prevent the spread of disease and prevent outbreaks that could be devastating. Preying on the weakest individuals also strengthens the gene pools of the prey species.	***Shark fins*** - Shark fins are one of the most expensive fish products in the world. They are used to prepare shark fin soup and have a traditional and virtually exclusive market among Chinese ethnic groups established in different parts of the world, but little elsewhere. Thus, domestic sales in primary producing countries, such as India, Indonesia, Japan and the USA are negligible. Their production is almost totally exported to major markets, especially Hong Kong and Singapore, where shark fins fetch very good prices. In 2011, 3,123 tonnes of shark fin has been produced globally.
Sharks keep sea grass beds and other	***Shark oil products*** - Oil from the shark's

vital habitats healthy - Through intimidation; sharks regulate the behaviour of prey species, and prevent them from overgrazing vital habitats. ***Example:*** A study by Enric Sala of Scripps Institute of Oceanography suggests that the loss of sharks may have contributed to the decline of reefs in the Caribbean, most of which are now dominated by algae *(Source: New Scientist - April 23, 2005).*	liver is rich in vitamin A. Since vitamin A has been produced synthetically and therefore more cheaply, the demand for this product has luckily declined. Shark liver oil is used in the textile industry, as a lubricant and for producing paint and cosmetics. Shark oil is also used in some pharmaceutical products, and squalene was a component of some swine flu vaccines used for vaccination in the autumn of 2009. According to FAO statistics, global production of shark oil has declined from about 724 tonnes in 1977 to 44 tonnes in 2011
Conserving biodiversity - Studies of remote, pristine ecosystems demonstrate the positive impacts of the presence of sharks, including greater biodiversity, larger numbers of fish and healthier sea grass beds in areas with healthy populations of sharks as compared to similar systems in which the sharks have been overfished *(Source: High apex predator biomass on remote Pacific Islands. Stanford University).*	***Shark tourism*** – Shark tourism is now a major form of eco-tourism generating the tagline that a 'live shark is much more valuable than a dead shark'. While a global estimate is not available, different studies have estimated the values of shark tourism in Maldives at US$ 38.6 million (2006); in West Australia at US$ 5.5 million (2009) and in Fiji at US$ 42.2 million (2011).
Compiled from: WildAid: http://www.sharksavers.org/en/home/ ***Vannuccini, S. Shark utilization, marketing and trade. FAO Fisheries Technical Paper. No. 389. Rome, FAO. 1999. 470p.*** ***Sources mentioned in the parenthesis are in the original text.***	

However, over the last few decades increasing exploitation of sharks owing to the rising demand for shark products, such as shark fins and meat coupled with improved fishing technology and a weak regulatory regime has led to decline in many shark populations. Sharks appear to be particularly vulnerable to over-exploitation because of their K-selected life-history strategy (characterized by slow growth, late attainment of sexual maturity, long life spans, low fecundity, and natural mortality, and a close relationship between the number of young ones produced and the size of the breeding biomass)[14]. The prominence of shark fishing for commercial purpose could be traced back to early 1940s, when several target shark fisheries were developed in response to the market for oil from shark liver (containing the famous "squalene"). However, presently, sharks have been mostly targeted for their highly priced fins.

There are approximately 1,168 different species of sharks, rays, skates, and chimaeras of which about 160 varieties occur in Indian waters.[15, 16] Considering the common pool nature of the shark resources and as many shark species are

[14] Stevens, J. D., Ramon Bonfil, N. K. Dulvy, and P. A. Walker. "The effects of fishing on sharks, rays, and chimaeras (chondrichthyans), and the implications for marine ecosystems." ICES Journal of Marine Science: Journal du Conseil 57, no. 3 (2000): 476-494.

[15] Musick, J.A.; Musick, S. Sharks. FAO Fisheries and Aquaculture Reviews and Studies. Rome, FAO. 2011. 13p. [Online].

[16] Bineesh, K K and Gopalakrishnan, A and Jena, J K and Akhilesh, K V and Basheer, V S and Pillai, N G K (2013) Sharks and rays in Indian commercial fisheries: need for revision of taxonomy. In: Regional Symposium on Ecosystem Approaches to Marine Fisheries & Biodiversity, October 27-30, 2013, Kochi.

highly migratory, collective action is needed at the regional and global levels to conserve shark fishery. It is beyond the capacity of a country to ensure sustainability of sharks occurring in its waters. However, if every country does its part to conserve sharks in their waters, the global agenda can also be achieved.

3.1 Biology, distribution and status: Global scenario

Sharks are all chondrichthyans, or cartilaginous fishes. Chondrichthyan fishes are poorly known taxonomically. New species and, less commonly, new genera and even families, have been regularly discovered by researchers over the past few decades. At present the class Chondrichthyes consists of about 60 families, 188 genera and 1,168 living species. It is divided into two unequal groups, the sub-class Holocephali or chimaeras and the sub-class Elasmobranchii or shark-like fishes (including modern sharks and rays).

The Holocephali includes the order Chimaeriformes and three families, six genera and 34 – 40+ species of chimaeras, ratfishes and elephant fishes. The Elasmobranchii includes as its modern representatives the highly diverse sharks and rays of the cohort Euselachii, sub-cohort Neoselachii and the super-orders Squalomorphii and Galeomorphii. There are between 954 and 1,125 species of living elasmobranchs in at least nine major groups, 57 families and 182 genera. Non-batoid sharks comprise about 34 families, 106 genera and 417 – 494 species; batoids comprise 23 families, 76 genera and 537 – 631 species.

Species of sharks for which age and growth have been estimated and verified generally exhibit strongly K-selected life history strategies, especially when compared with the vast majority of r-selected, highly fecund teleost fishes. With few exceptions, these cartilaginous fishes exhibit the following, to a greater or lesser degree:

- *slow growth;*
- *late age at maturity;*
- *low fecundity and productivity (small, infrequent litters);*
- *long gestation periods;*
- *high natural survivorship for all age classes; and*
- *long life.*

Of those chondrichthyan fishes that have been aged, most are relatively long-lived (up to about 75 years) and very slow to reach maturity. Age to maturity ranges from the unusually short 1–2 years in the Australian sharpnose shark *Rhizoprionodon taylori* to 20 – 25 years in the spiny dogfish and the dusky shark *Carcharhinus obscurus*. However, due to paucity of validated age and growth studies coupled with comprehensive information on reproductive habits, such information is not known for most chondrichthyan species.

There are three main patterns of embryonic development in sharks. Depending on the species, females may bear from one or two (in the case of sand tiger shark *Carcharias taurus* and manta ray *Manta birostris*) to 300 young (in the whale shark *Rhincodon typus*).

Gestation rates are unknown for most species, but range from around three months (*e.g*. rays in the genus *Dasyatis* and *Urolophus halleri*) to more than 22

months for the ovoviviparous spiny dogfish (longest gestation period known for any living vertebrate).

Many sharks give birth in sheltered coastal or estuarine nursery grounds, where predation risks to the pups (primarily from other sharks) are reduced, or deposit eggs in locations where they are most likely to survive undamaged until the pups emerge.

Most sharks are predators, and the variety of their prey is great. Some species of skates may specialise on small benthic infaunal animals, such as polychaetes or amphipods. Some rays, particularly the myliobatids, may consume hard-shelled bivalve molluscs. Most sharks eat a wide variety of fishes and crustaceans, although white sharks *Carcharodon carcharias* prefer marine mammals, and basking sharks *Cetorhinus maximus* and whale sharks *Rhincodon typus* filter zooplankton from the sea. Despite an extensive literature on the food habits of sharks, very little is known of the dynamic function they serve in their ecosystems.

Sharks range from the immediate sub-tidal zone offshore to coastal, bathyal (200–2,000 meters) and even abyssal habitats (>2,000 meters). Some species are strictly benthic, like the skates (Rajoidei) and angel sharks (Squatinidae), whereas others like the mako shark *Isurus oxyrinchus* (Lamnidae) are pelagic, restricting most of their activities to the upper layers of the ocean.

Sharks live in a wide range of habitats, from fresh and intertidal waters to the open ocean, from waters of the continental shelf and the deep slope to the ocean floor at depths of over 4,000 meters. Most favour temperate to tropical seas, but about 5 percent of the species live in fresh water and some species range into Arctic and Antarctic waters. Most sharks are found on the continental and insular shelves and slopes, with a much lower diversity below the slopes and in the open ocean.

Shark species richness was found to be highest on continental shelves and markedly lower in the open ocean. A recent analysis of threat for a globally distributed lineage of 1,041 species of sharks found that one-fourth of species could be termed as 'threatened' according to IUCN Red List criteria due to overfishing (targeted and incidental). Large-bodied, shallow-water species are at greatest risk and five out of the seven most threatened families are rays. Overall, extinction risk for sharks is substantially higher than for most other vertebrates, and only one-third of species are considered safe (***Figure 11*** and ***Table 9***) [17].

[17] Dulvy, Nicholas K., Sarah L. Fowler, John A. Musick, Rachel D. Cavanagh, Peter M. Kyne, Lucy R. Harrison, John K. Carlson et al. "Extinction risk and conservation of the world's sharks and rays." Elife 3 (2014): e00590.

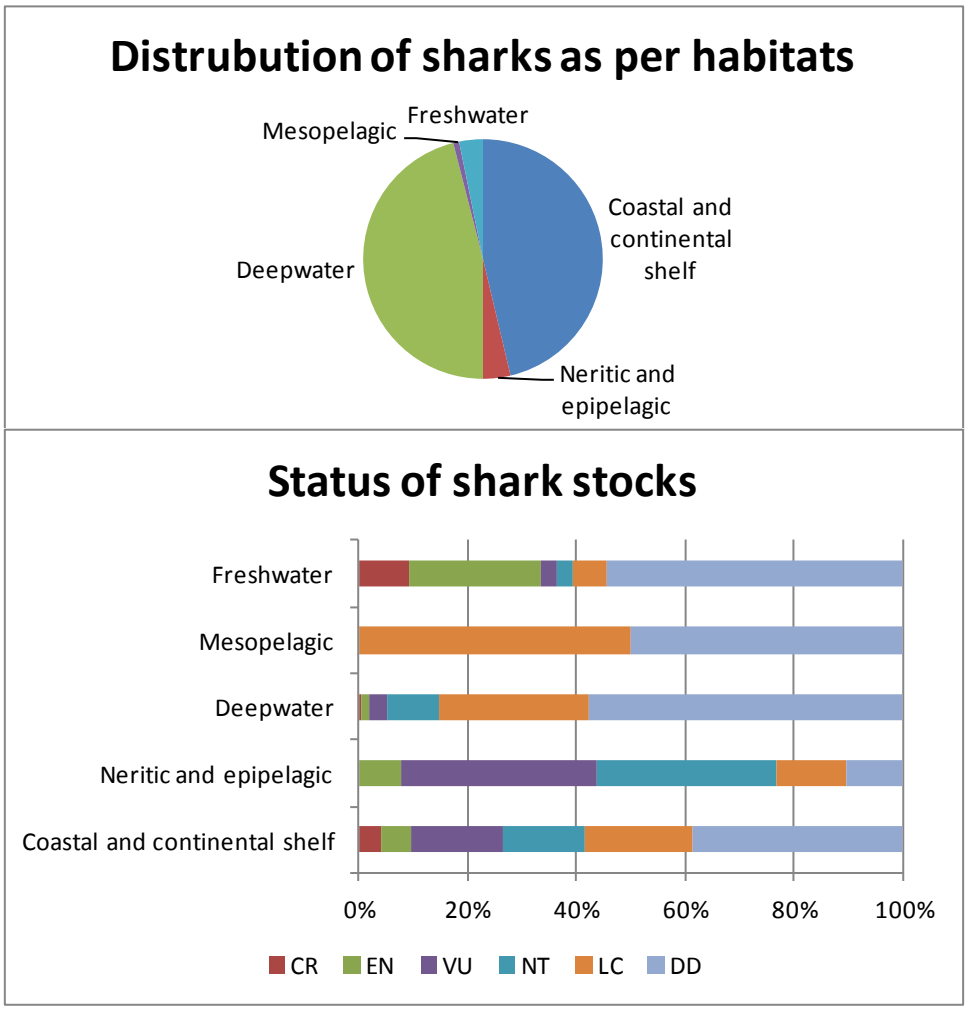


Figure 11: Distribution and status of sharks stocks

Source: Drawn from Dulvy, Nicholas K., Sarah L. Fowler, John A. Musick, Rachel D. Cavanagh, Peter M. Kyne, Lucy R. Harrison, John K. Carlson et al. "Extinction risk and conservation of the world's sharks and rays." Elife 3 (2014): e00590

CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient.

Table 9: IUCN Red List Status of major species

Family/Species		Status
Hammerhead sharks (*Sphyrna spp.)*	Scalloped hammerhead (*Sphyrna lewini*)	Endangered Globally
	Great hammerhead (*S. mokarran*)	
	Smooth hammerhead (*S. zygaena*)	Vulnerable Globally
Giant devilrays (*Mobula mobular*)		Endangered Globally
Porbeagle shark (*Lamna nasus*)		Vulnerable Globally
Shortfin and longfin mako shark (*Isurus spp*.)		Vulnerable Globally
Oceanic whitetip shark (*Carcharhinus longimanus*)		Vulnerable Globally
Common, bigeye and pelagic thresher shark (*Alopias spp*.)		Vulnerable Globally
Blue shark (*Prionace glauca*)		Near Threatened

Source: Reproduced from Source: Drawn from Dulvy, Nicholas K., Sarah L. Fowler, John A. Musick, Rachel D. Cavanagh, Peter M. Kyne, Lucy R. Harrison, John K. Carlson et al. "Extinction risk and conservation of the world's sharks and rays." Elife 3 (2014): e00590

3.2 Production and trade: Global scenario

Globally, the estimated landings of sharks were 0.77 mmt in 2012. They have increased at an average rate of 2 percent per year since 1950 when landings were about 0.27 mmt[18] (***Figure 12***). Landings reached a peak at 0.89 mmt in 2000 and since then seem to stabilize around 0.79 mmt. However, various studies show that this is an under reporting. It is estimated that actual shark catch (excluding other related species) could be about 4 times higher than reported by FAO and was about 1.44 mmt in 2000 and declined slightly to 1.41 mmt in 2010. This is translated into the fact that about 100 million sharks were killed every year to meet different anthropogenic needs (targeted) or as by-catch[19,20].

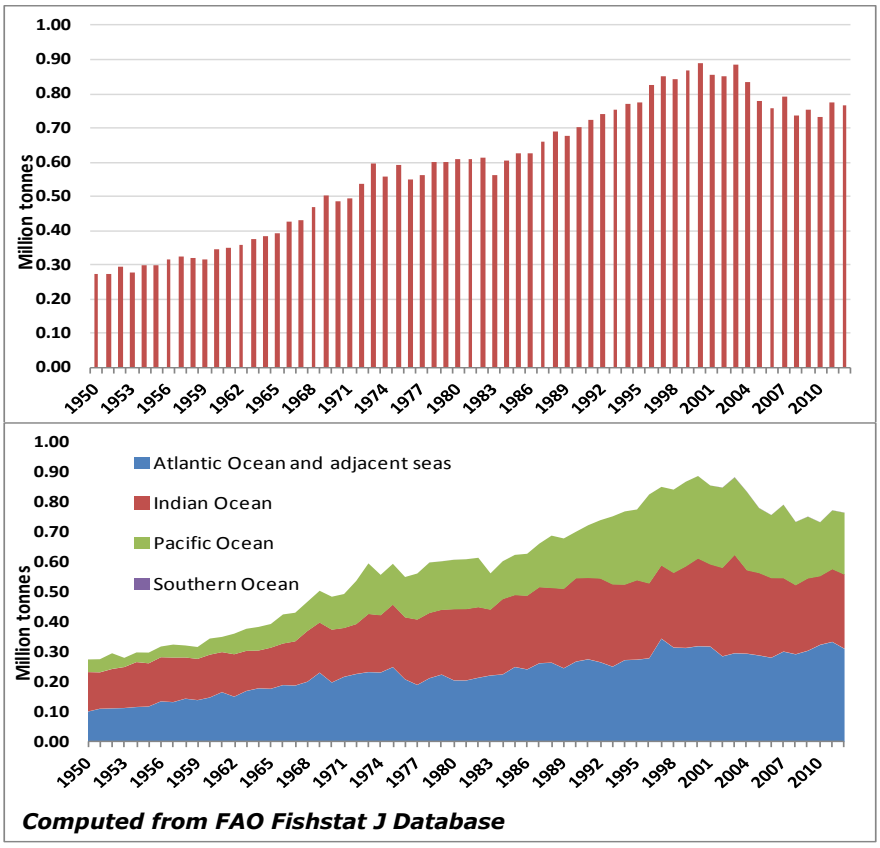


Figure 12: Total and ocean-wise estimated landing of sharks, 1950-2012

The Atlantic Ocean and its surrounding seas produce about 40 percent of global shark catches, followed by Indian Ocean and Pacific Ocean. Catch across all the oceans seems to be slowing down post the peak periods. In Pacific Ocean, catch reached a peak in 1996 and in Atlantic Ocean in 1997. In Indian Ocean catch reached a peak in 2003. The current catch levels are at 90 percent of the peak

[18] ***Based on FAO FISHSTAT J Dataset.***

[19] ***Clarke, Shelley C., Murdoch K. McAllister, Eleanor J. Milner-Gulland, G. P. Kirkwood, Catherine GJ Michielsens, David J. Agnew, Ellen K. Pikitch, Hideki Nakano, and Mahmood S. Shivji. "Global estimates of shark catches using trade records from commercial markets." Ecology letters 9, no. 10 (2006): 1115-1126.***

[20] ***Worm B, Davis B, Kettermer L, Ward-Paige CA, Chapman D, Heithaus MR, Kessel ST, Gruber SH (2013) Global catches, exploitation rates, and rebuilding options for sharks. Marine Policy 40: 194–204.***

level catch in Atlantic Ocean, 76 percent of the peak level catch in Indian Ocean and 70 percent of the peak level catch in Pacific Ocean.

Indonesia, India, Spain, Taiwan, Argentina, Mexico, USA, Pakistan, Malaysia and Japan were among the top shark fishing nations between 2000 and 2012. During this period, these ten countries together removed on an average 46 000 tonnes of sharks per year. India remains a prominent shark fishing nation throughout the last six decades with a relatively stable contribution to global shark fisheries. On the other hand, data shows a substantial rise in Indonesian shark fisheries since the mid-1970s and decline in relative contribution of Japan, the leading shark fishing nation in 1950s and 1960s during last three decades.

Relative contribution of some European nations such as France has also declined during the period (1950-2012) (***Table 10 & Figure 13***). As compared to the landings from Indonesia, India and Mexico, which were primarily from coastal artisanal and industrial fisheries, a substantial proportion of the catches from Spain and Taiwan came from their high seas longline fleets.

Table 10: Top 10 shark fishing nations over the decades

1950-59	1960-69	1970-79	1980-89	1990-99	2000-12	1950-2012
Japan	Japan	Pakistan	India	Indonesia	Indonesia	India
UK	Norway	Japan	Indonesia	India	India	Japan
India	India	India	Taiwan	Taiwan	Spain	Indonesia
France	France	Taiwan	Japan	Pakistan	Taiwan	Taiwan
Norway	UK	Former USSR	Pakistan	USA	Argentina	Pakistan
Taiwan	Pakistan	Norway	France	Mexico	Mexico	France
Spain	Taiwan	France	Mexico	Spain	USA	Spain
South Korea	Spain	UK	Brazil	Japan	Pakistan	UK
Pakistan	South Korea	Indonesia	UK	Argentina	Malaysia	Mexico
Indonesia	Former USSR	South Korea	Peru	Sri Lanka	Japan	USA

Source: Computed from FAO Fishstat J Database

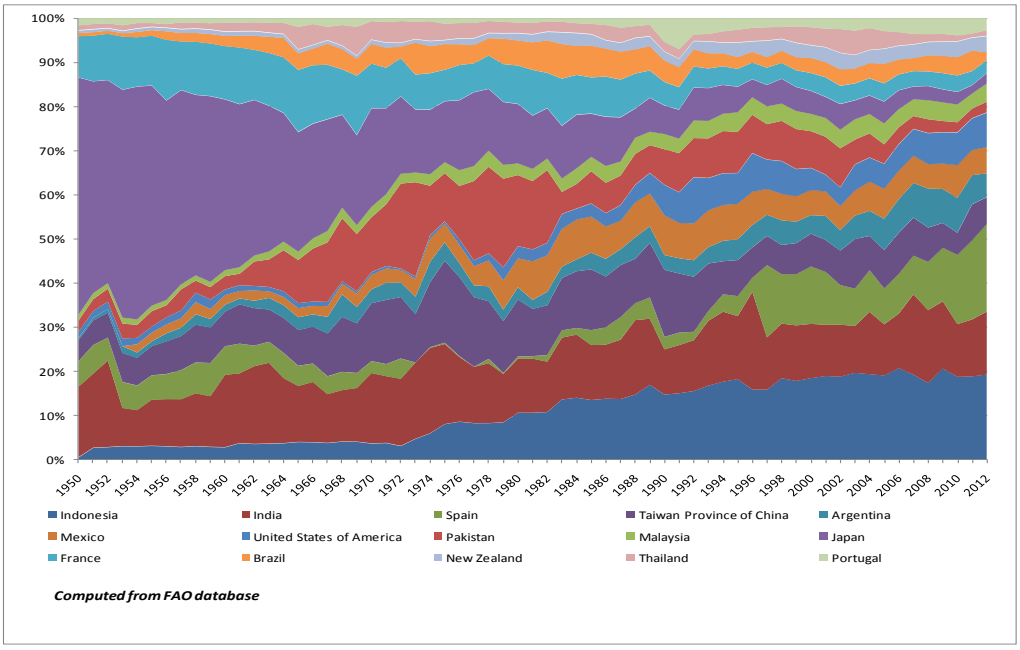


Figure 13: Relative contribution of major shark fishing nations during 1950-2012

The global values of shark landings from the FAO Fisheries Commodities database rose from around US$ 400 million in 1990 to over US$ 1 billion in 2000, declining to around US$ 800 million in 2006. The value of shark landings in Asia far surpassed that of all other areas together because six of the top ten countries landing sharks are in Asia. Also Hong Kong has been the center of the shark fin trade, and shark fins are the most valuable shark product by far.

There is a dearth of information on catch statistics of different species of sharks. Major shark fishing countries like India do not provide species-wise statistics but data is collected and presented for the whole group. Even in developed countries, barring a few important species in the shark fishery, for other species information is provided as a group. Apart from the problems in reporting, as mentioned earlier, often catch is under-reported. In view of the above it is difficult to estimate the relative contribution of different species in the shark fishery.

According to a recent FAO study (*Musick and Musick,* 2011), only 20 percent of the reported catch was identified to species level in 2007[21]. The situation has not improved far from there. At the global level, shark fisheries may be classified into four main categories: high seas pelagic, coastal cold-temperate, coastal tropical and deep sea. High seas pelagic fisheries are driven by international longline fleets, which target tunas and billfishes, but which have a huge bycatch of sharks. Blue sharks (*Prionace glauca*) are by far the most common of the dozen commercially important shark species captured, and have the largest global landings of all sharks (***Figure 14***). Global trends in the blue shark catch from 1997 to 2008 show a peak of more than 16 000 tonnes in 2000, followed by a decline, and then a rise again to 2008.

Coastal cold-temperate shark and ray fisheries in both hemispheres are dominated by the spiny dogfish, smooth hounds (*Triakidae*) and several species of rajid skates. Spiny dogfish catches are second only to blue shark in the FAO database and is likely to be over-exploited.

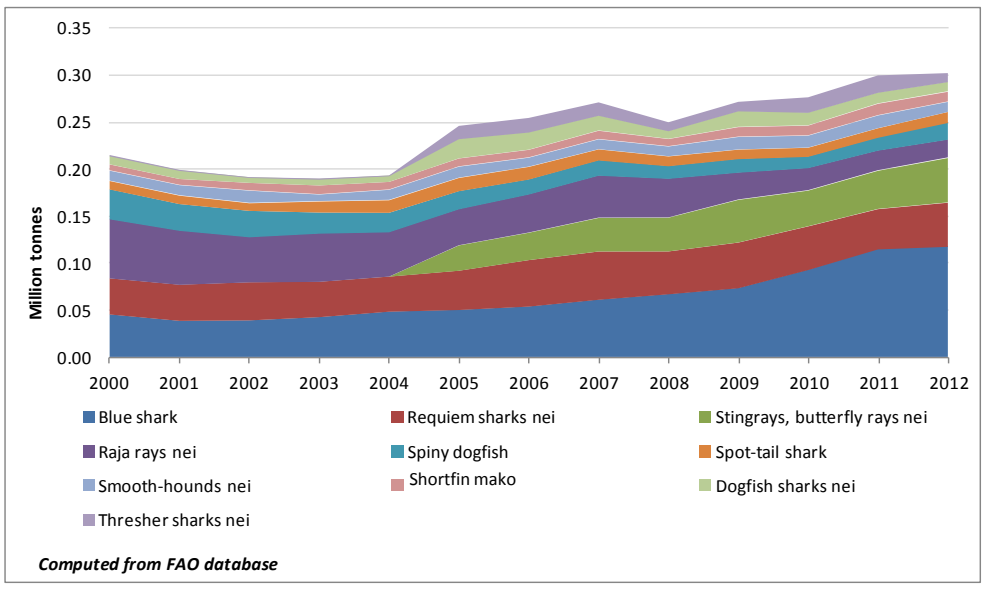


Figure 14: Global trend in species-wise shark catch, 2000-12

[21] ***This paragraph draws information from Musick, J. A., Musick, S. Sharks. FAO Fisheries and Aquaculture Reviews and Studies. Rome, FAO. 2011. 13p. [Online].***

Trade is often identified as the major global driver of shark fishery. The value of shark trade (import and export combined) has increased by nearly 200 percent during the period 1976 to 2011 for which data is available from the FAO database. Shark fins are the largest contributor in shark trade and importance of shark fin trade in total shark trade seems to have increased over time (***Figure 15***). On the other hand, trade of shark oil and shark liver oil, once a prominent commodity seems to have declined relatively. In quantitative terms, export of shark fins has increased from 2,463 tonnes in 1976 to 20,287 tonnes in 2007, before declining.

The current level of shark fin exports stood at 14,528 tonnes in 2011. The trade of shark fins is also driven by its increasing price. The unit price of per tonne of shark fin exported has increased from US$ 4,532 per tonne in 1976 to US$ 32,563 per tonne in 1995. The average unit price of shark fins for the last five years (2007-11) is about US$ 12,744 per tonne (***Figure 16***). However, this is only indicative as different types of and different preparations of shark fins fetch different prices.

In terms of shark trade driving production, basic plotting of production and trade data shows that there is a similarity in their movement (***Figure 17***). However, post-2000, in spite of sharp increases in export value, production (landings) seems to be flattening out. This could be either owing to the positive measures, such as growing measures for conservation of sharks or could be a result of depleted stock or a mix of both. From an economic perspective, it may be said that shark fishery has probably already surpassed the level where management is more necessary to ensure the continuity of flow of economic benefits as also conservation of the species.

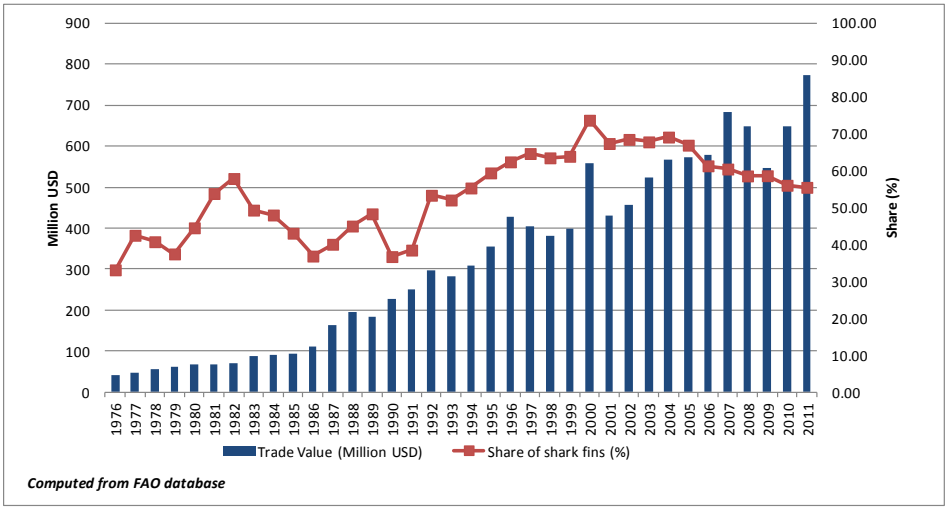


Figure 15: Development of trade in sharks and shark fins, 1976-2011

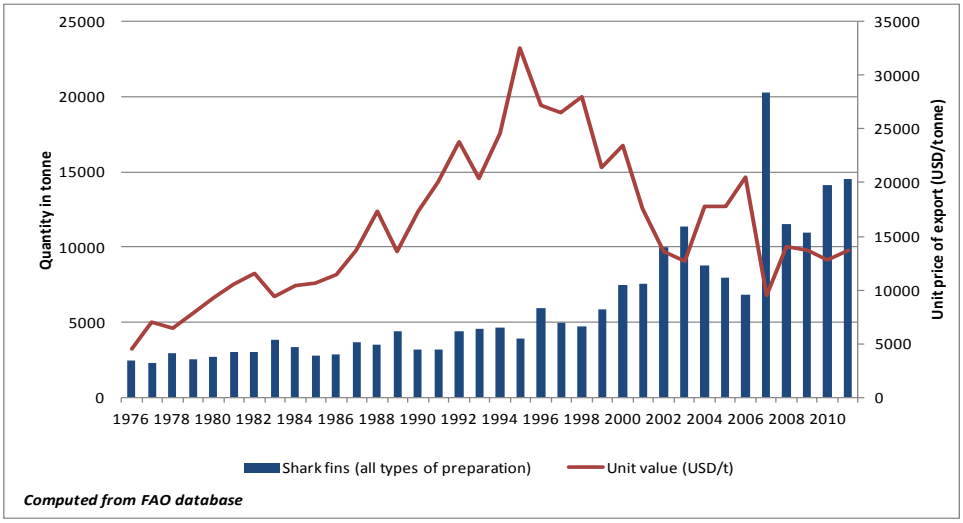


Figure 16: Quantity export and value realization of shark fins, 1976-2011

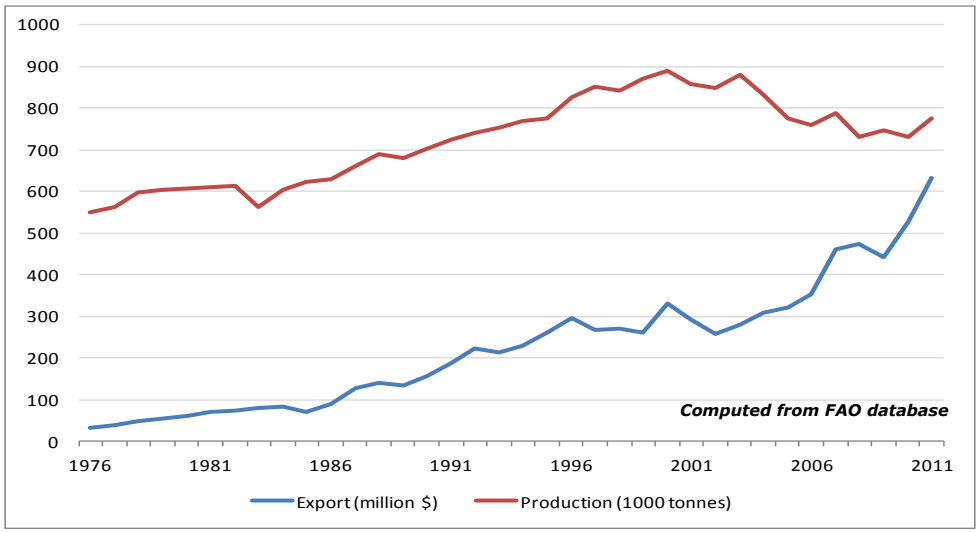


Figure 17: Export earnings and landings of sharks

3.3 International institutional mechanism

Restricting the trade of species for their conservation can be traced back to the London Convention of 1933[22] (Convention Relative to the Preservation of Fauna and Flora in their Natural State), which is also referred to as the Magna Carta of wildlife conservation[23]. This Convention is also the first institutionalised global nature protection attempt before the Second World War. Designed to ensure the conservation of various species of plants, mammals, birds and fish in Africa, the signatories of the 1933 convention were Belgium, Egypt, France, Italy, the Anglo-Egyptian Sudan, the Union of South Africa and the United Kingdom and its dependencies. All but France and Spain ratified the agreement

*22 The convention was first concluded and signed on 19 May 1900 by **France, Germany, the United Kingdom, Italy, Portugal, Spain, and the Congo Free State.** The treaty required all signatory states to ratify it before entering into force; because most of the signatories did not ratify the agreement, it never entered into force.*

23 Philippe Sands, Principles of International Environmental Law (Cambridge: Cambridge University Press, 2003) at 524.

in 1935, and British India acceded partially in 1939. In 1950, it was ratified by Portugal and in 1963, then-independent Tanganyika acceded to the Convention. The 1933 London Convention was superseded by the African Convention on Conservation of Nature and Natural Resources in 1968.

Subsequently, in 1960, at the behest of IUCN a process was initiated to develop an international instrument for conservation of species. The effort resulted in the Convention on International Trade in Endangered Species (CITES) in 1975. Although, initially terrestrial species were of most concern, CITES has evolved to cover any species which is considered endangered. CITES work in two ways: (1) by restricting trade it tries to reduce demand for a particular species, and (2) it helps in developing a better management and monitoring framework.

The global concern for sharks followed the increasing volume of shark fisheries since 1980s. In November 1994, the CITES passed a resolution requesting the FAO and other international organizations to establish programmes to collect and assemble the necessary biological and trade data on sharks. This CITES resolution reflected the concern that shark stocks were being depleted rapidly and an attempt was necessary to be made to understand and quantify the effects of the world trade on shark populations[24].

However, prior to this CITES resolution, a general framework for conservation and sustainable use of marine resources came into existence under the provisions of the United Nations Convention on Law of the Sea 1982 (UNCLOS). UNCLOS has established overarching rules governing all uses of the world's oceans and seas and their resources. Of particular relevance to fisheries are their Part V (articles 55 to 75) on the EEZ, and Part VII on the High Seas (articles 86 to 120). The basic premise of UNCLOS is that right to use fishery resources comes with the duty of doing so responsibly.

Subsequently, more international instruments, both voluntary and non-voluntary, were developed to solidify an institutional mechanism to ensure that resources were exploited sustainably. The UN Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks of 1995 (UNFSA) led to the development of regional fisheries management bodies (RFBs and RFMOs), which became instrumental in driving regional cooperation and management of high seas.

The Convention on Biological Diversity (CBD) which entered into force in 1993 is another overarching arrangement that aims at "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding". While past conservation efforts were aimed at protecting particular species and habitats, the CBD recognizes that ecosystems, species and genes must be used for the benefit of humans. However, this should be done in a way and at a rate that does not lead to the long-term decline of biological diversity.

[24] Castro, J.I.; Woodley, C.M., Brudek, R.L. A preliminary evaluation of the status of shark species. FAO Fisheries Technical Paper. No. 380. Rome, FAO. 1999. 72p.

The International Plan of Action for Conservation and Management of Sharks or the IPOA-Sharks produced by FAO in 1999 within the framework of the 1995 Code of Conduct for Responsible Fisheries (CCRF) builds on these overarching binding instruments. It provides a framework for managing sharks at national, regional, and international level. Although voluntary, adhering to IPOA-Sharks leads to national duty of responsible utilization of marine resources, specified in the UNCLOS 1982, sustainable trade practices and also conservation of biodiversity. However, the instrument needs to be fine-tuned to address the socio-economic realities of implementing countries such as effectively sharing the short-run cost of conservation amongst the stakeholders. The brief details of the provisions contained in these international instruments are placed as ***Annexure 5***.

3.4 State of shark fishery in India

3.4.1 Introduction

Sharks are traditionally harvested in India from distant past. Many shark-based industries were developed along the western and southern coasts of India. While in Gujarat, extraction of oil from whale shark flourished, in southern coasts, sharks were also valued for their meat. Shark fishing and bravery of shark fishers are part of many folklore and art in these southern States. However, some folklore also suggested that development of shark fishery in India took place through naval connections with the Arab peninsula. With the establishment of naval routes and as trade developed, Arabians, who were also hunting sharks for long enough brought their skills to southern India.

Apart from being a traditional harvester, India is also a leading extractor of sharks. Global shark catch data available from FAO shows that India accounts for about 9 percent of the global catch during the last decade. On the domestic front, India has produced 75 757 tonnes of shark in 2012 (Handbook of Fisheries Statistics, 2014 of the Government of India). Today, Andhra Pradesh is the largest producer of sharks, followed by Tamil Nadu, Gujarat and Maharashtra.

In terms of livelihoods, sole dependency on shark fisheries is waning, since the ban on whale shark fisheries which flourished during the 1990s. Although, many fishermen groups, such as fishermen from Thoothoor in Kanyakumari district of Tamil Nadu still identify themselves with shark fisheries, they are also diversifying their startegies by focussing their attention on other deep water species such as tuna. The shark fishery also generates livelihoods, especially for fisher women in post-harvest activities such as drying, sorting and processing of fins.

However, it seems that the slow growing shark stock is increasingly becoming vulnerable to fishing. Different studies and anecdotal information collected from practicing shark fishers are indicating a marked decline in average sizes of some of the commonly available species, shark biomass and consequent loss of species diversity in the Indian EEZ.

Given the nature of Indian fisheries, which is mixed in terms of gear, it would be difficult to completely avoid the harvesting of sharks. However, strong management measures are needed to monitor the status of the stocks coupled with seasonal and area-based closures to bring in long-term measures for conservation of the shark species.

3.4.2 Issues

Based on the review of literature and extensive discussions with fisher-communities along the Indian coastline on matters relating to shark fisheries, the following major issues emerge, which need to be addressed through the NPOA-Shark.

Indications of decline in shark biomass and species diversity

Inadequate monitoring, control and surveillance including gaps in data collection and identification of species

Fractured view of different stakeholder groups in status of shark and acceptable conservation measures

Research gaps

Lack of a holistic framework to address the above issues.

3.4.3 Sources of information on sharks

There are three main sources of fisheries-related information from India. These are the Department of Fisheries (DoF) of the coastal States/UTs; the Fishery Survey of India (FSI) and the Central Marine Fisheries Research Institute (CMFRI). The DoF and CMFRI collect primary data on fish landings and related biological parameters, while FSI monitors stock through 'at-sea' exploratory surveys. Apart from these sources, information is also collected by other agencies (such as fisheries academic institutions) for projects and research-based works. The main sources of information and the information available from these sources are given in the following ***Table 11***.

Table 11: Sources of fishery-related information in India

Source	Information available	Frequency
Department of Fisheries, Coastal States and Union Territories	Fish landing data – Data for sharks as a group	Monthly/annual district and State/UT-level data
	Number of fishing craft	Periodic district and State/UT-level data
	Government policies and schemes	Periodic
Fishery Survey of India	Handbook on Fisheries Statistics containing information on State/UT-level production - Data for sharks as a group	Annual
	Survey data from longline and trawling, including hooking rate; catch composition; species and their length, weight, etc.	Monthly – Latitude-Longitude-wise from the Indian EEZ
	Knowledge products (reports; research papers; etc.)	Periodic

Central Marine Fisheries Research Institute	Landing data at State/UT-level	Annual
	Number of fishermen, craft and gear	5-Yearly Census
	Price of fish in different landing centres	Daily/Web-based
	Knowledge products (reports; research papers; etc.)	Periodic
Marine Product Export Development Authority	Trade statistics especially port-wise and country-wise export; shark fin trade, etc.	Annual
Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture & Farmers Welfare, Government of India	Policy; Schemes; Guidelines Brings out the Annual Handbook on Fisheries Statistics, compiled by the Fishery Survey of India	Periodic
Ministry of Environment, Forest and Climate Change, Government of India	Policy; Schemes; Guidelines; Information on protected areas and species, information on climate change, etc.	Periodic
Indian National Centre for Ocean Information Services	Preferred Fishing Zone Notification	Daily

Note: Information sources mentioned here are available publicly and accessible through internet without any protocol. More detailed data could be accessed from these agencies on request.

The DoF and CMFRI use a multi-stage stratified random sampling method, developed by CMFRI to collect fisheries data. The stratification is over space and time. Over space, each maritime State/UT is divided into suitable, non-overlapping zones on the basis of fishing intensity and geographical considerations. The number of centres may vary from zone to zone. These zones have been further stratified into sub-strata, on the basis of the intensity of fishing. There are some major fisheries harbours/centres which are classified as '*single centre zones'* for which there is an exclusive and extensive coverage.

The stratification over time is a calendar month. One zone and a calendar month is a space-time stratum and primary stage sampling units are landing centre days. If in a zone, there are 20 landing centres, there will be 20 x 30 = 600 landing centre days in that zone for that month (of 30 days). From the boats, the catches are normally removed in baskets of standard volume. The weight of fish contained in these baskets being known, the weight of fish in each boat under observation is obtained.

While both DoF and CMFRI presumably use the same sampling design, the final estimates on most occasions markedly differ. This difference in findings is more often attributed to the inefficient implementation of the design. Therefore, there is a need to establish a procedure by the Government to find out the reason for such differences and addressing it. Meanwhile, it is also necessary to ensure the reliability of one dataset over the other at ground-level for reporting purposes, such as reported in the Ministry of Agriculture and Farmers Welfare's 'Handbook of Fisheries Statistics'. For the purpose of assessing shark fisheries in India, data from all the major sources were used, and as mentioned above while the data

from different sources may not match exactly, importance in this document is given to the trend it suggests.

3.5 Shark fishery in India: Species diversity, distribution and status

3.5.1 Species diversity

Sharks are one of most diverse groups of marine animals. Identification of sharks is still an active area of research with emphasis now being on genetic barcoding to differentiate the variations in different species of sharks. In case of India, initial efforts to understand shark diversity date back to 1878. The estimate of diversity of sharks has also been refined with time. In addition, as fishery expanded, more species have been observed and recorded.

The recent estimates put number of shark species occurring in Indian commercial fisheries at 160 from 73 genera. It comprises 88 species of true sharks from 44 genera; 53 species of rays from 19 genera and 19 species of skates from 10 genera (***Table 12***). The earlier studies (Day, 1878; Raje *et al.,* 2002) have put number of shark species in India from 67-110 species (***Table 13***).

On the other hand, from the exploratory survey data of FSI (2010-14), 34 species of sharks have been reported. *Alopias pelagicus (*pelagic thresher shark); *Carcharhinus limbatus (*blacktip shark) and the *Alopias superciliosus (*Bigeye Thresher Shark) were the most frequently caught species during the experimental surveys (forming 51% of the counts) (***Table 14***).

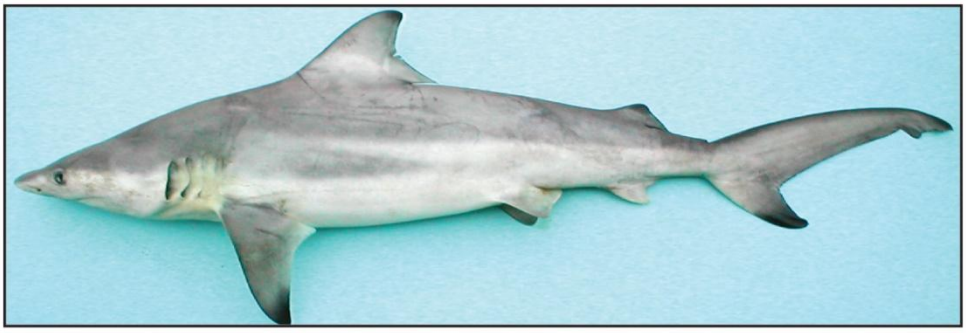
Another recent study has been carried out using Molecular Identification Technique to shed light on the diversity of shark population in India (Bineesh *et al.* 2014). In this study, 105 species of chondrichthyans from 56 genera, 34 families, 10 orders from two sub-classes, the Holocephali (Rhinochimaeridae and Chimaeridae, two species) and the Elasmobranchii (sharks and rays, 103 species) have been barcoded. The study shows that at least 150 valid species of elasmobranchs occur in the Indian waters.

Diversity in the Indian seas is higher than that reported in many other tropical Indian Ocean countries or regions such as the Arabian Gulf (43 sharks), Sri Lanka (92 elasmobranchs), Maldives (51 elasmobranchs) and Thailand (145 elasmobranchs). However, a higher number (137-207 species) has been reported from the seas around Indonesia[25].

Thus there is some element of confusion and inconsistencies in species identification, which is an impediment for arriving at conclusions on species listing and protection. Detailed taxonomic and genetic studies, over a longer period, are required to catalogue the sharks existing in Indian waters. In addition, both fishery and survey data collections needs to be improved from a taxonomic perspective to ensure proper monitoring of shark biodiversity in the country.

[25] ***Akhilesh, K V and Bineesh, K K and Gopalakrishnan, A and Jena, J K and Basheer, V S and Pillai, N G K (2014)*** **Checklist of Chondrichthyans in Indian waters.** ***Journal of the Marine Biological Association of India, 56 (1). pp. 109-120.***

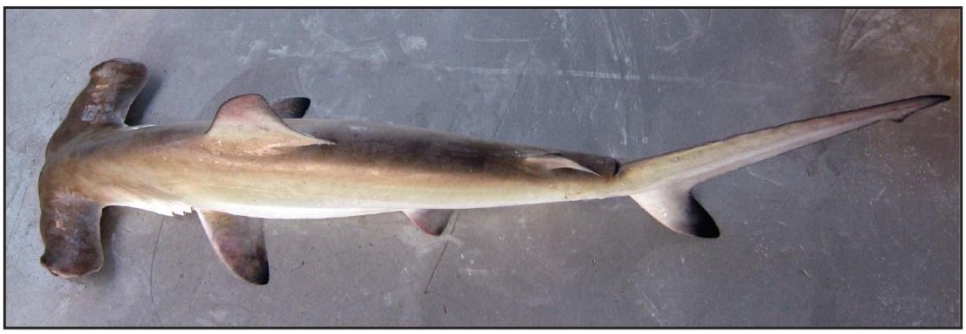
Image 3: Different shark species of India



Carcharhinus amblyrhynchoides

Carcharhinus leucas

Rhizoprionodon acutus



Sphyrna zygaena

Table 12: Number of shark species occurring in India's commercial fishing zone

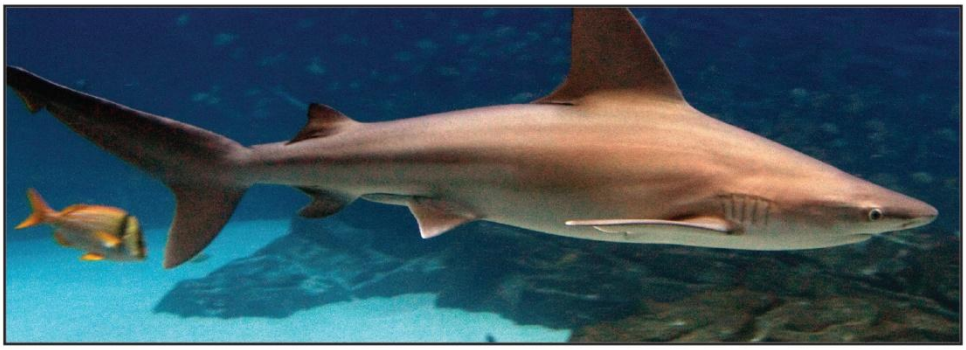
	Order	Family	Genus	Species
SHARKS	Hexanchiformes	Hexanchidae	2	2
	Squaliformes	Centrophoridae	2	6
		Echinorhinidae	1	2
		Etmopteridae	1	2
		Somniosidae	2	2
		Squalidae	1	2
	Orectolobiformes	Hemiscyllidae	1	5
		Ginglymostomatidae	1	1
		Rhincodontidae	1	1
		Stegostomatidae	1	1
	Lamniformes	Alopiidae	1	3
		Lamnidae	1	2
		Odontaspididae	2	3
		Pseudocarcharhiidae	1	1
	Carcharhiniformes	Carcharhinidae	10	31
		Hemigaleidae	4	4
		Proscyllidae	2	2
		Scyliorhinidae	4	4
		Sphyrnidae	2	5
		Triakidae	2	5
	Pristiformes	Pristidae	2	4
	Total		**44**	**88**
RAYS	Torpedeniformes	Narcinidae	2	4
		Narkidae	1	1
		Torpedinidae	1	4
	Myliobatiformes	Hexatrygonidae	1	1
		Plesiobatidae	1	1
		Dasyatidae	7	23
		Gymnuridae	1	4
		Myliobatidae	2	6
		Mobulidae	2	7
		Rhinopteridae	1	2
	Total		**19**	**53**
SKATES	Rajiformes	Rajidae	6	7
		Rhinidae	1	1
		Rhinobatidae	2	8
		Rhynchobatidae	1	3
	Total		**10**	**19**
	Grant total		**73**	**160**

Source: Kizhakudan S.J., Zacharia P.U., Thomas S., Vivekanandan E. and Muktha M. 2015. Guidance on National Plan of Action for Sharks in India. CMFRI Marine Fisheries Policy Series No. 2, 104p. (Abbreviated as CMFRI NPOA Shark Guidelines, 2015)

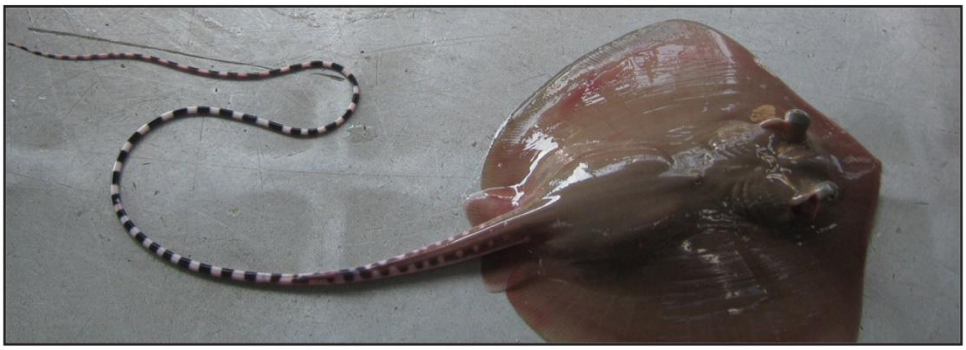
Image 4: Endangered protected and other sharks and rays of India

White tip shark

Gangetic shark



Sandbar shark



Himantura gerrardi

Table 13: Historical effort to estimate shark species diversity in India

Source	Sharks	Rays	Skates	Total
Day (1878)	41	19	7	67
Misra (1951)	51	20	7	78
Raje *et al.*(2002)	66	32 + (8 spp. guitar fish and 4 spp. saw fishes)		110
CMFRI (2015)	88	53	19	160

Table 14: Shark reported by FSI from longline surveys during 2010-14

Species	Count	Species	Count
Alopias pelagicus	106	*Carcharinus dussumieri*	4
Alopias superciliosus	59	*Carcharinus hemiodon*	3
Alopias vulpinus	34	*Carcharinus limbatus*	10
Carcharhinus albimarginatus	14	*Carcharinus macloti*	3
Carcharhinus amblyrhinchus	3	*Carcharinus melanopterus*	2
Carcharhinus amblyrhynchos	30	*Carcharinus sorrah*	1
Carcharhinus brevipinna	26	*Carcharinus sp.*	2
Carcharhinus dussumieri	9	*Galeocardo cuvier*	1
Carcharhinus falciformis	29	*Galeocerdo cuvier*	2
Carcharhinus limbatus	101	*Galeocordo cuvier*	6
Carcharhinus longimanus	3	Hammer Head Shark	1
Carcharhinus macloti	16	Isurus oxyrhinchus	1
Carcharhinus melanopterus	21	*Isurus oxyrhincus*	2
Carcharhinus obscurus	1	*Isurus oxyrinchus*	2
Carcharhinus obsucrus	1	*Loxodon macrorhinus*	11
Carcharhinus sorrah	11	*Makaria mazara*	1
		Sphyrna lewini	2
Total	**34 spp**		**519 counts**

Source: FSI (2015)

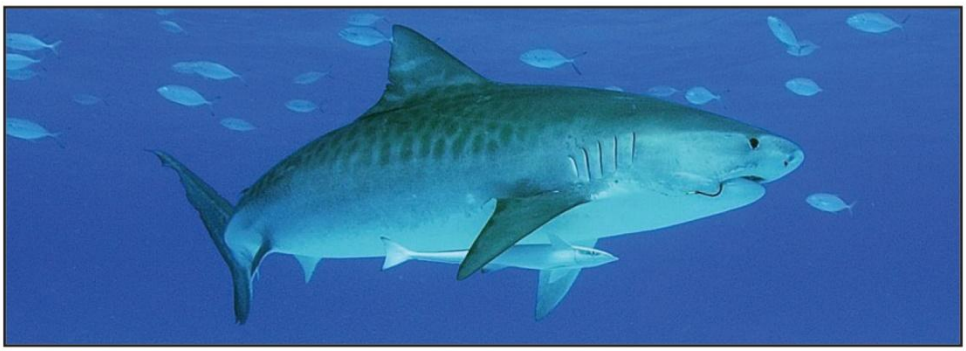
3.5.2 Distribution and status of stocks

Results of exploratory surveys conducted by FSI, landing data and anecdotal information from fishermen show that there is a considerable decline in shark populations in the Indian waters over the last three decades. In addition, as CMFRI has noted, most of the shark species (59%) occurring in the Indian waters are globally threatened. Many of the shark species being highly migratory, global status of the species is also of concern.

Sharks are caught in shallow waters by near-shore artisanal fisheries to deeper water mechanized logline fishery. It indicates that sharks are more or less distributed all along the Indian EEZ (***Tables 15 & 16***).

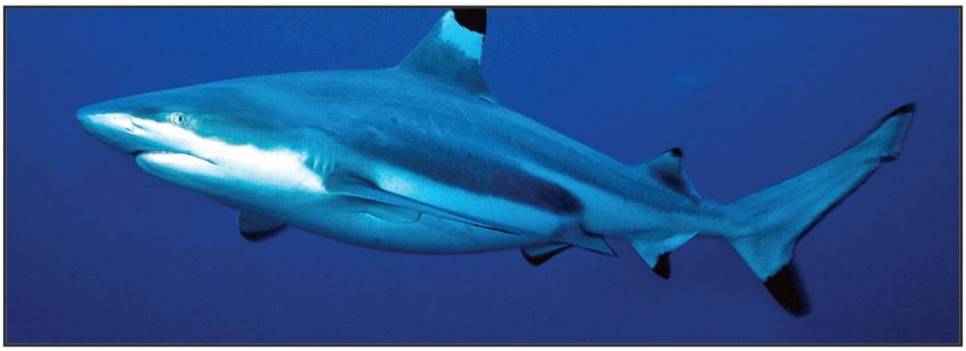
Image 5: Protected and other sharks species of India

Thresher shark



Tiger shark

Whale shark



Black tip shark

Table 15: Latitude and Longitude-wise Total Number of Sharks caught in Exploratory longline Surveys during 1985-2014

Lat/Long	6	7	8	9	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	45	0	0	0	0	0	0	0	0	0	0	0	0	0	41	38	42	0	5	182
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	7	41	13	25	0	0	0	0	0	0	0	3	0	0	0	43	109	74	84	53	0	460
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	44	31	10	0	8	0	0	0	0	0	0	0	0	0	0	25	71	218	259	434	79	5	1187
8	0	0	0	0	0	0	0	0	0	0	0	0	0	8	41	40	42	11	40	32	6	0	0	0	0	0	1	0	0	0	0	0	0	33	58	160	350	201	70	26	1119
9	0	0	0	1	0	0	0	0	0	0	0	0	0	9	18	17	35	77	90	22	0	0	0	0	0	0	0	0	0	0	0	0	0	18	43	105	383	144	39	10	1011
10	0	0	0	0	0	0	0	0	0	0	0	0	0	32	61	46	44	15	46	10	0	0	0	0	80	83	6	0	0	0	0	0	0	13	63	227	907	142	69	9	1853
11	0	0	0	0	0	0	0	0	0	0	0	0	0	39	70	54	36	32	14	0	0	0	0	0	296	141	157	117	0	0	0	0	0	36	128	271	506	260	71	14	2242
12	0	0	0	0	0	0	0	0	0	0	0	0	5	99	99	31	26	204	0	0	0	0	0	0	568	375	281	99	0	0	0	0	0	26	75	138	131	570	166	1	2894
13	0	0	0	0	0	0	0	0	0	0	0	0	0	52	147	87	182	90	0	0	0	0	0	0	254	283	171	111	7	0	0	0	0	14	27	58	96	325	116	19	2039
14	0	0	0	0	0	0	0	0	0	0	0	0	0	33	86	148	639	1	0	0	0	0	0	0	90	183	246	231	113	11	0	0	0	5	13	28	18	8	0	0	1853
15	0	0	0	0	0	0	0	0	0	0	0	0	0	12	153	272	485	0	0	0	0	0	0	0	14	57	149	199	63	20	0	0	0	0	0	0	0	0	0	0	1424
16	0	0	0	0	0	0	0	0	0	0	0	0	0	8	153	697	116	0	5	0	0	0	0	0	0	0	31	66	18	26	7	0	0	0	0	0	0	0	0	0	1127
17	0	0	0	0	0	0	0	0	0	0	0	0	1	100	360	628	0	0	0	0	0	0	0	0	4	0	1	20	29	22	9	1	0	0	0	0	0	4	0	0	1179
18	0	0	0	0	0	0	0	0	0	0	0	0	69	216	189	0	0	0	0	0	0	0	0	0	0	0	0	0	1	26	25	8	1	0	0	0	0	0	0	0	535
19	0	0	0	0	0	0	0	0	0	0	3	84	296	292	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	4	4	2	3	0	0	0	0	0	0	695
20	0	0	4	0	3	0	0	0	0	3	91	174	243	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	627
21	1	0	0	0	0	0	0	0	0	34	137	277	102	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	553
22	0	0	0	0	0	0	0	0	0	10	59	82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	151
Total	1	0	4	1	3	0	0	0	0	47	290	617	716	1011	1377	2020	1608	438	239	102	68	58	33	0	1306	1122	1043	843	231	112	48	13	3	173	526	1355	2762	2214	663	89	21136

Table 16: Latitude and Longitude-wise Total Number of Sharks caught in Exploratory Trawl Surveys during 1985-2014

Lat/Long	6	17	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	92	93	Total
6	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**50**
7	0	0	0	0	0	0	0	0	0	0	15	15	1226	8	0	0	0	0	0	0	0	0	0	0	0	0	0	**1264**
8	5	0	0	0	0	10	0	0	0	0	1379	2090	383	887	80	0	0	0	0	0	0	0	0	0	0	0	0	**4834**
9	0	0	0	0	0	0	0	5	0	0	2470	3284	0	4	75	0	0	0	0	0	0	0	0	0	0	0	0	**5838**
10	0	0	0	0	0	0	0	0	0	0	2240	46	0	0	3	1546	0	0	0	0	0	0	0	0	0	10	0	**3845**
11	0	0	0	0	0	0	0	0	0	614	697	0	0	8	614	975	0	0	0	0	0	0	0	0	0	120	15	**3043**
12	0	0	0	0	0	0	0	0	0	3129	189	0	0	0	0	1570	0	1	0	0	0	0	0	0	0	180	257	**5326**
13	0	0	0	0	0	0	0	25	261	676	0	0	0	0	0	2078	0	0	0	0	0	0	0	0	0	0	60	**3100**
14	0	0	0	0	0	0	0	0	2584	608	0	0	0	0	0	3031	0	0	0	0	0	0	0	0	0	0	0	**6223**
15	0	0	0	0	0	0	0	76	5356	1	5	0	0	0	0	2752	3339	0	0	0	0	0	0	0	0	0	0	**11529**
16	0	0	0	0	0	0	0	1497	2027	0	10	0	0	0	0	6	3852	2973	250	0	0	0	0	0	0	0	0	**10615**
17	0	0	0	0	0	0	80	2417	234	0	0	0	0	0	0	0	0	925	848	2	0	0	0	0	0	0	0	**4506**
18	0	40	0	0	0	300	1493	24409	50	0	0	10	0	0	0	0	0	5	1222	2053	30	0	0	0	0	0	0	**29612**
19	0	0	0	0	46	106	991	1633	0	0	0	0	0	0	0	0	0	0	0	55	1372	1469	0	0	0	0	0	**5672**
20	0	0	0	7	7930	15289	3212	28	0	0	0	0	0	0	0	0	0	0	0	0	0	137	4184	877	25	0	0	**31689**
21	0	0	0	4767	7631	170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	**12570**
22	0	0	899	2915	82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**3896**
23	0	0	5	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**45**
Total	**5**	**40**	**904**	**7689**	**15689**	**15915**	**5776**	**30090**	**10512**	**5028**	**7005**	**5495**	**1609**	**907**	**772**	**11958**	**7191**	**3904**	**2320**	**2110**	**1402**	**1606**	**4184**	**877**	**27**	**310**	**332**	**143657**

Findings from the exploratory trawl and longline surveys carried out by FSI during the period 1985 – 2014 show that while shark fishery exists throughout the EEZ, there are some hotspots from where more sharks have been harvested as compared to the others (the green boxes in ***Tables 15 & 16*** depict this). In the deeper waters where the exploratory data was collected using longlines, such hotspots could be observed between latitudes 10 to 14 degree and in case of trawl fishery, which were conducted in relatively shallow waters, the hotspots occurred between latitudes 15 to 21 degree.

At the aggregate level, between 1985-89 and 2010-14, the hooking rate has declined from 1.16 percent to 0.26 percent while CPUE has declined from 12.64 kg per hour to 3.35 kg per hour (***Figure 18***).

However, plotting of hooking rate (number of sharks caught per 100 hooks operated) and catch per unit of effort (CPUE: total weight of shark per hour of trawling) shows that there is a gradual decline over the years (1985 to 2014), both in hooking rate and the CPUE (***Figures 19-30***).

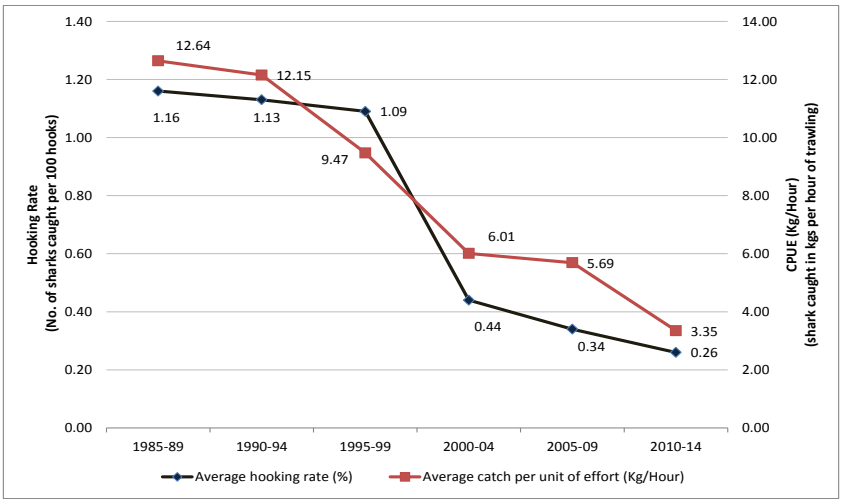


Figure 18: Trend in Hooking Rate and CPUE for sharks from the Indian EEZ

According to CMFRI, out of 160 species of sharks in India, leaving about 14 shark species (7 true sharks and 7 rays), other species occurring commonly in fisheries are listed by IUCN under different categories of threatened species (***Table 17***) and ***Annexure 6***.

Table 17: IUCN Red list Status of Sharks Occurring in Indian waters

IUCN status	Shark	Skates	Rays	Total
Critically Endangered	2	0	2	4
Endangered	4	1	4	9
Vulnerable	23	5	14	42
Near Threatened	30	0	9	39
Total Threatened	59	6	29	94
Data Deficient	13	9	16	38
Least Concern	7	0	7	14
Not Estimated	5	3	6	14
Total	**84**	**18**	**58**	**160**

Source: Compiled from CMFRI NPOA Shark Guidelines, 2015

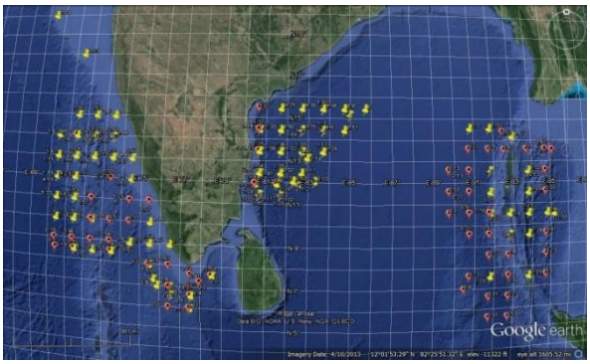


Figure 19: Hooking Rate 1985-89

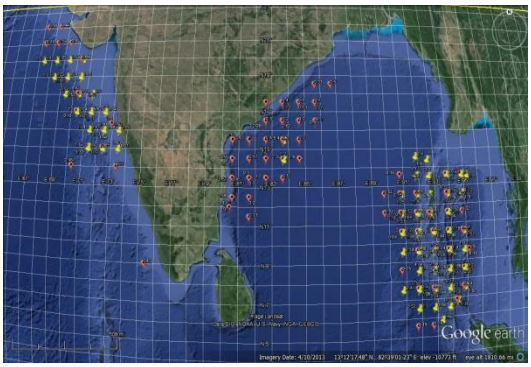


Figure 20: Hooking Rate 1990-94

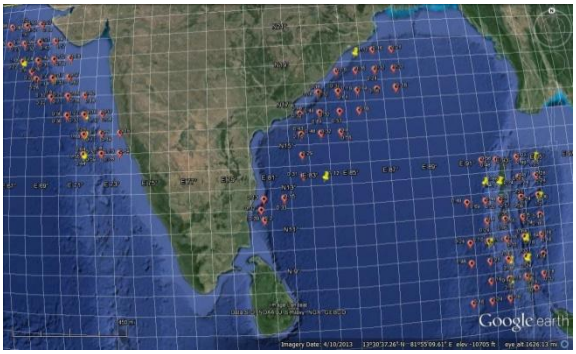


Figure 21: Hooking Rate 1995-99

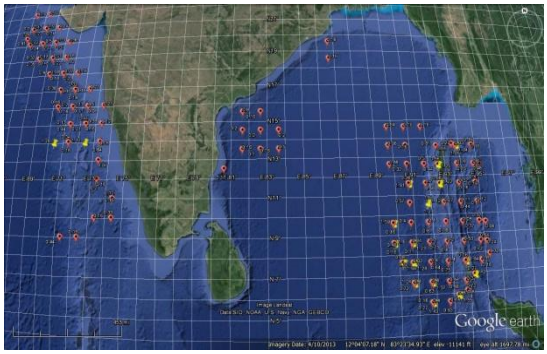


Figure 22: Hooking Rate 2000-04

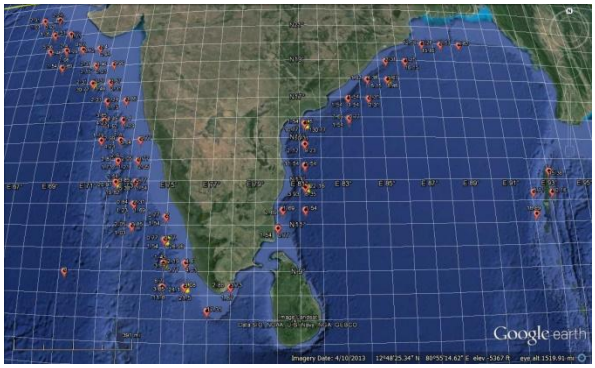


Figure 23: Hooking Rate 2005-09

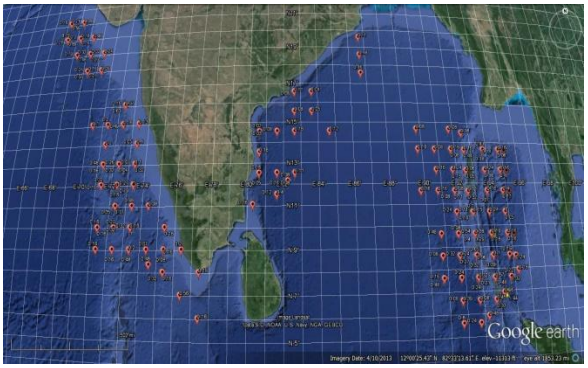


Figure 24: Hooking Rate 2010-14

Legends:		= Hooking rate > 1%		= Hooking rate < 1%

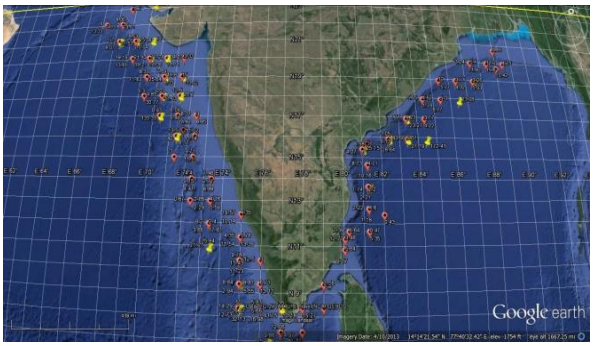


Figure 25: CPUE for sharks 1985-89

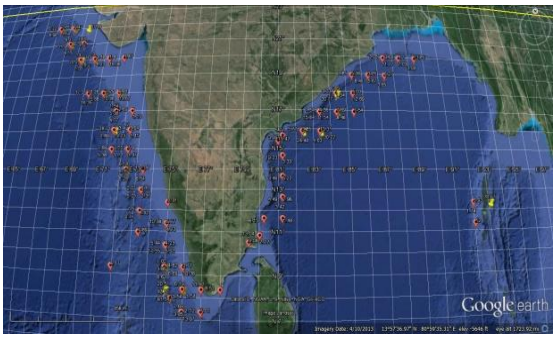


Figure 26: CPUE for sharks 1990-94

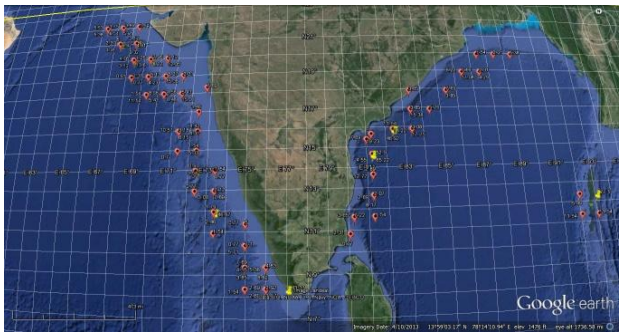


Figure 27: CPUE for sharks 1995-99

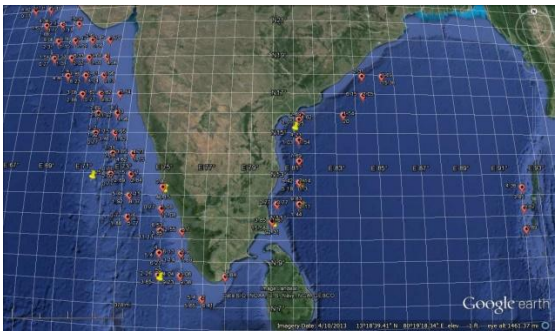


Figure 28: CPUE for sharks 2000-04

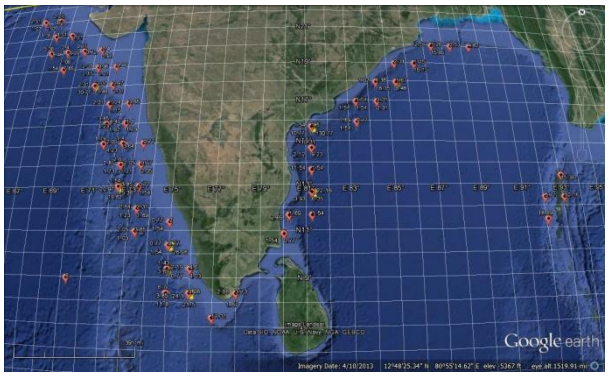


Figure 29: CPUE for sharks 2005-09

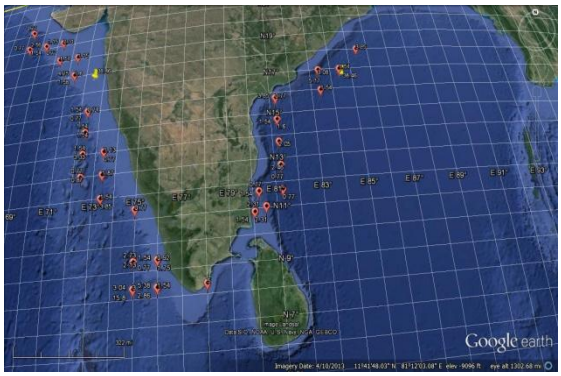


Figure 30: CPUE for sharks 2010-14

Legends:		= CPUE > 20 kg/Hr		= CPUE < 20 Kg/Hr

Source: Figure 19 – 30; FSI; Plotting- C Babu, FSI

In summary, during the last three decades, hooking rate has declined by 78 percent and CPUE has declined by 73 percent for shark fisheries in the Indian EEZ. Although imprecise, hooking rate and CPUE can be considered as indicators of abundance or health of the stock. The hooking index was found to be relatively high in the Nicobar waters between latitude 6°N - 10°N and longitude 91°E - 94°E. The analysis of catch rates separately for nearshore and distant waters indicated marginally higher hooking rates in the inshore waters. The seasonal pattern of abundance of sharks indicated that the hooking rate varied from 0.6 percent to 1.7 percent during different months. The high hooking rate in the range of 1.5 to 1.7 percent was recorded during the period October to November when sharks formed 63 to 68 percent of total catch in the exploratory surveys. During February to March also, sharks accounted for over 50 percent of the catch. Therefore, even after accounting for seasonality, the decreases seem to be quite significant and also of concern, as far as the abundance of shark populations in the Indian EEZ is concerned.

Table 18: Results of the Rapid Stock Assessment (RSA) of sharks, skates and rays along the Indian coast

Resource	Coast	HMC (t)	3YA (T)	% of HMC	Status
SHARKS	Gujarat	27,985	11,069	39.6	DC
	Maharashtra	12,929	4,034	31.2	DC
	Karnataka & Goa	2,829	749	26.5	DC
	Kerala	5,151	2,328	45.2	DC
	Tamil Nadu & Puducherry	10,934	827	7.6	DP
	Andhra Pradesh	6,871	1,572	22.9	DC
	Orissa	3,077	1,128	36.6	DC
	West Bengal	5,482	3,196	58.3	LA
SKATES	Gujarat	1,412	1,132	80.2	A
	Maharashtra	1,927	131	6.8	DP
	Karnataka & Goa	307	229	74.6	A
	Kerala	875	257	29.4	DC
	Tamil Nadu & Puducherry	1,613	426	26.4	DC
	Andhra Pradesh	685	119	17.4	DC
	Orissa	351	6	1.6	C
	West Bengal	601	57	9.4	DP
RAYS	Gujarat	7,012	2,446	34.9	DC
	Maharashtra	2,660	498	18.7	DC
	Karnataka & Goa	2,398	345	14.4	DC
	Kerala	4,070	1,082	26.6	DC
	Tamil Nadu & Puducherry	16,429	10,487	63.8	LA
	Andhra Pradesh	9971	6746	67.7	LA
	Orissa	1971	906	45.9	DC
	West Bengal	2059	831	40.4	DC

HMC - Historic Maximum Catch (1985-2013); 3YA - 3-year average (2011-13)
A-Abundant LA-Less abundant; DC-Declining; DP-Depleted; C-Collapsed
Reproduced from CMFRI NPOA Sharks Guidelines, 2015

Separately, CMFRI also carried out a Rapid Stock Assessment (RSA) of sharks based on data for the period 1985-2013 in the coastal States and the UT of Puducherry. The RSA was done by comparing historic high catch with the

average catch of last three years. The RSA shows that shark fishery is on an average declining or depleted all along the Indian coastline. However, skate fishery seems to be still abundant in Gujarat and in Karnataka and Goa. On the other hand, shark fishery has entered into depleted phase in Tamil Nadu and Puducherry and skate fishery has entered into collapse or depleted phase in Orissa and West Bengal (***Table 18 above***).

3.5.3 Sharks as associated fisheries and catch composition

Sharks are caught in nearly all type of fishing gear – from long lines to trawl. Results from exploratory surveys show that sharks contribute >50 percent in longline fishery and about 8 percent in trawl fishery (***Table 19***). However, the exploratory survey also indicates that while there is substantial decline in hooking rate and CPUE during the last three decades, the catch composition remains more or less same (***Table 19***).

Table 19: Share of shark in total catch from longline and trawler fishery in exploratory surveys

Period	Catch composition (Longlining: % in total number of fishes caught)	Catch composition (Trawling: % in total weight of the catch)
1985-89	52.43	9.65
1990-94	59.1	7.38
1995-99	47.18	10.09
2000-04	52.92	7.7
2005-09	48.75	6.32
2010-14	60.44	8.99
Average	**53.47**	**8.355**

Source: FSI

The records available with CMFRI show that the species composition in the shark landings has changed significantly in the last few years. Several oceanic sharks, which were rarely noticed in the landings about two decades ago, are regularly recorded in recent years. For instance, 13 species of sharks were recorded in the landings (613.5 t) during 1986 and 1987 at Cochin Fisheries Harbour in Kerala (***Table 20***). The dominant species were scalloped hammerhead, *Sphyrna lewini* (27.1%), blacktip shark, *Carcharinus limbatus* (24.5%), milk shark *Rhizoprionodon acutus* (15.4%) and spottail shark *C. sorrah* (11.1%). Two decades later (2006 and 2007), the quantity of landings remained almost the same (699.8 t), but 24 species were recorded in the catch. The dominant species were blacktip shark, *C. limbatus* (29.7%), bigeye thresher, *Alopias superciliosus* (23.9%), bramble shark, *Echinorhinus brucus* (17.2%) and scalloped hammerhead, *S. lewini* (11.0%). Very large–sized oceanic sharks were also observed in the catches. The total length of bigeye thresher shark, *A. superciliosus* was recorded in the range of 2.5 to 3.0 meter. The catch consisted of very rare species, such as the nurse shark, *Nebrius ferrugineus*, the sicklefin lemon shark, *Negaprion acutidens* and the blackbelly lanternshark, *Etmopterus lucifer*, which are now recorded at frequent intervals in the catch.

Changes in the species composition have been observed in other major landing centers also, such as the Chennai Fisheries Harbour in Tamil Nadu. This trend shows that (i) shark fishery is shifting from an artisanal coastal fishery towards an oceanic fishery employing drift gillnets and hooks and lines operated from

mechanized craft; (ii) extension of the fishery to oceanic waters has not increased the total catch; and (iii) the coastal stocks have declined to a large extent, as evident from the reduction in the landings of the coastal species.

Table 20: Composition in shark landings at the Cochin Fisheries Harbour in Kerala (%)

Species	1986 & 1987	2006 & 2007
Sphyrna lewini	27.1	11.0
Carcharinus limbatus	24.5	29.7
C. sorrah	11.1	0.2
C. hemiodon	3.7	0.8
C. amboinensis	0.0	0.002
C. longimanus	4.2	0.1
C. albimarginatus	0.0	0.1
C. brevipinna	0.0	0.002
C. leucas	3.6	0.1
Centrophorus uyato	0.0	5.6
C. moluccensis	0.0	6.7
Alopias superciliosus	1.7	23.9
A. vulpinus	0.1	0.8
Galeocerdo cuvier	0.0	0.8
Scoliodon lacticaudus	2.7	0.2
Rhizoprionodon acutus	15.4	0.9
Stegostoma fasciatum	4.6	0.3
Echinorhinus brucus	1.2	17.2
Neoharriotta pinnata	0.0	1.3
Isurus oxyrinchus	0.0	0.002
Nibrius ferrugineus	0.0	0.2
Rhincodon typus	0.1	0.1
Negaprion acutidens	0.0	0.002
Etmopterus lucifer	0.0	0.001
Annual average landings (t)	**613.5**	**699.8**

Source: Vivekanandan, E. and Sivaraj, P. 2008. Status of Shark Fisheries in the Indian Exclusive Economic Zone. First Regional Consultation on Preparation of Management Plan for Shark Fisheries, BOBP-IGO/RC/SF-1 Working Paper, 16 p.

Image 6: Sharks- Journey from Sea to Markets

3.6 Shark Fishery: Production and Trade

3.6.1 Trends in production

During 1961-2013, the annual shark landings in India has increased from 33,527 tonnes (1961) to 74,943 tonnes (1998) and thereafter declined to 46,471 tonnes (2013) (CMFRI NPOA Shark Guidelines, 2015). The catch was generally high during the years 1992-2000. Medium-sized multiday trawlers (overall length: 15 to 20 meters) were introduced in the early 1980s and became very popular since the early 1990s. These trawlers had higher sea endurance of 7 to 10 days and ventured into waters up to 100m depth and even beyond. This enabled exploitation of new fishing grounds, which were earlier under-exploited leading to increase in overall catch. However, growth in landings of shark is declining in recent times and accordingly, the contribution of sharks to the total all-fish landings along the Indian coast declined from 2.81 percent in 1998 to 1.23 percent in 2013 (***Figure 31***).

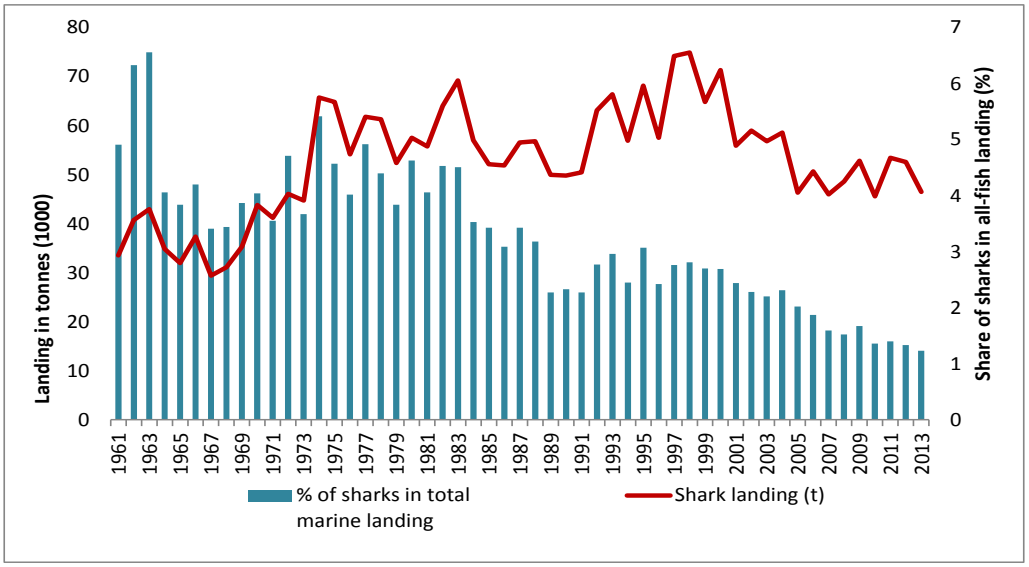


Figure 31: Annual shark landing in India (1961-2013) and their contribution (in %) to total landings

Traditionally, the bulk of the shark landings took place along the northwest coast comprising the maritime states of Gujarat and Maharashtra. However, this trend is changing, and recently Andhra Pradesh has emerged as the major shark producer in the country (***Figure 32***).

About 72 percent of the shark landings along the northwest coast consisted of the small-sized *S. laticaudus* (maximum length: 65 cm). Along the northwest coast of India, the multiday bottom trawlers landed the demersal spadenose shark, *S. laticaudus* in large quantities during 1992-2000 (annual average landings: 19,262 t). During this period, the contribution of shark landings of Gujarat to the all-India shark landings ranged between 41 percent and 56 percent. During 2001-2006 (annual average landings: 9,338 t), the shark landings decreased along the Gujarat coast and reached the earlier level of 1980s, despite continued operation of the multiday trawlers.

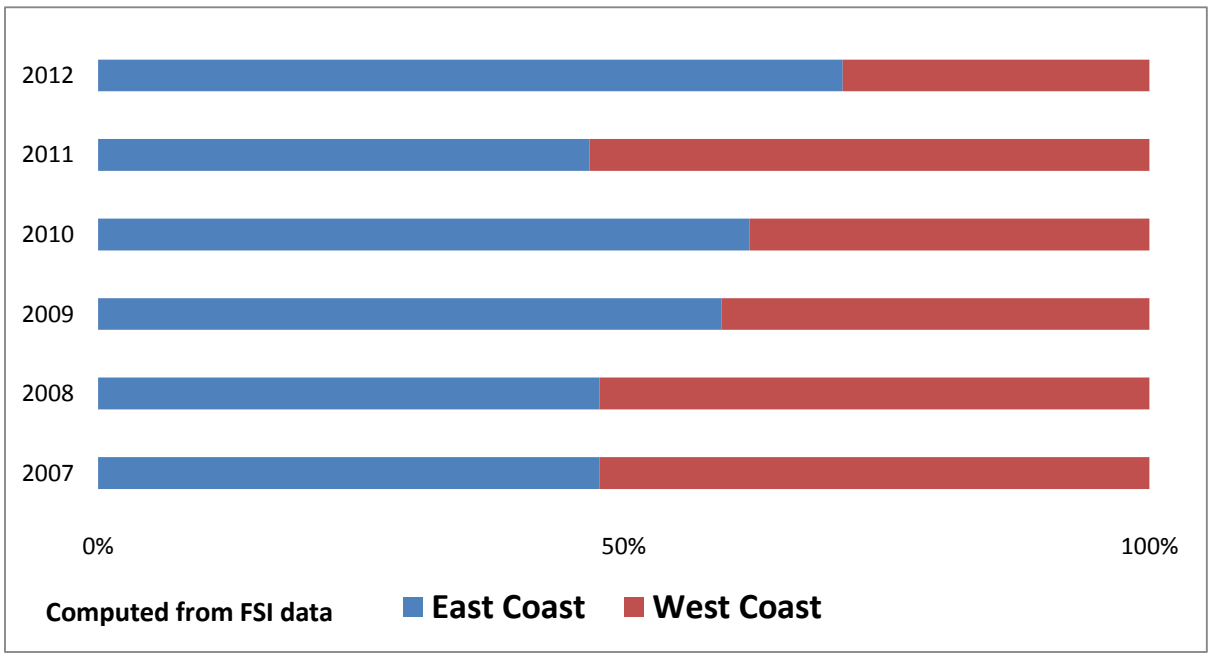


Figure 32: Relative contribution of east and west coast in shark fishery

The other important region for the shark fishery is the southeast coast consisting of Tamil Nadu, Puducherry and Andhra Pradesh. The landings consisted of larger and high-valued carcharinids.

In respect of fishing gear, on all-India basis, trawls, drift gillnets and hooks & line contribute about 95 percent to the shark landings. Whereas the drift gillnets and hooks & line contribute to the landings along the entire coast, the shark landings by the trawlers are mostly along the northwest coast. Almost all the species, which are of common and moderate occurrence, encounter hooks & line, longlines and gillnets (***Table 21***).

Table 21: Percentage contribution of different gears to annual shark landings in coastal States/UTs in India (1985-2013)

State/UT	Trawl net	Gill net	Line gear	Seines	Bag nets	Others
Gujarat & Daman-Diu	47.7	40.8	4.7	0.0	6.8	0.0
Maharashtra	41.8	48.9	0.0	3.1	6.2	0.0
Karnataka & Goa	56.2	39.7	0.0	4.1	0.0	0.0
Kerala	41.0	27.4	11.9	2.5	0.0	17.1*
Tamil Nadu & Puducherry	60.4	36.6	1.1	0.0	0.0	1.9
Andhra Pradesh	52.8	32.4	14.6	0.0	0.0	0.2
Orissa	51.0	6.8	42.2	0.0	0.0	0.0
West Bengal	19.4	51.4	29.2	0.0	0.0	0.0

combination of mechanized gill net and hook & line

Source: Reproduced from CMFRI NPOA Shark Guidelines (2015)

3.6.2 Shark trade

Although India is a major player in exploitation of sharks, it remains a minor player in shark trade (***Figure 33***). However, the export of shark products has increased in value terms from US$ 0.65 million in 1976 to US$8.34 million in 2011. Shark fins are by far the largest contributor to export earnings, often

Image 7: Longlines and hooks used for catching sharks in Thoothoor

contributing the entire value of the export ***(Figure 34***). However, ensuring constant supply of shark fins seems to remain a challenge.

In India, the following four shark species are usually harvested for their fins for the export market:

- *Hammerhead/round headed shark, Sphyrna zygaena*
- *Grey dog shark, Rhizoprionodon acutus*
- *Sharp-nosed/yellow dog shark, Scoliodon laticaudus*
- *Black-finned/black tip shark, Carcharhinus melanopterus*

However, landings of these sharks are on the ebb. In addition, *Sphyrna zygaena* is a listed species in Appendix II of CITES, implying that its fins cannot be exported without first having a comprehensive scientific study to see whether its fishing will be detrimental to the overall population of the species.

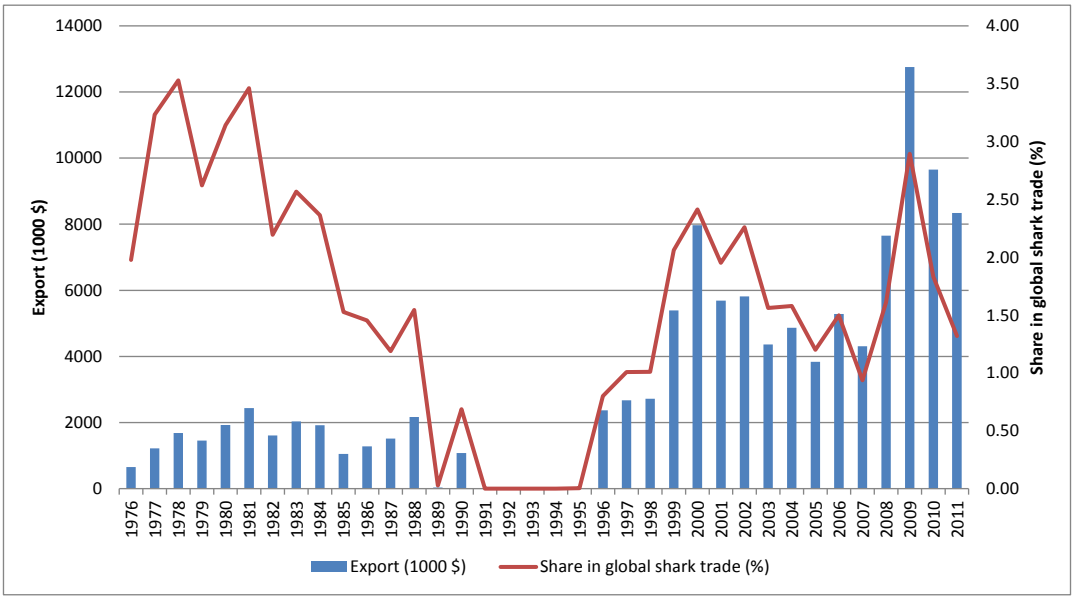


Figure 33: Export of shark products from India and India's share in global shark trade

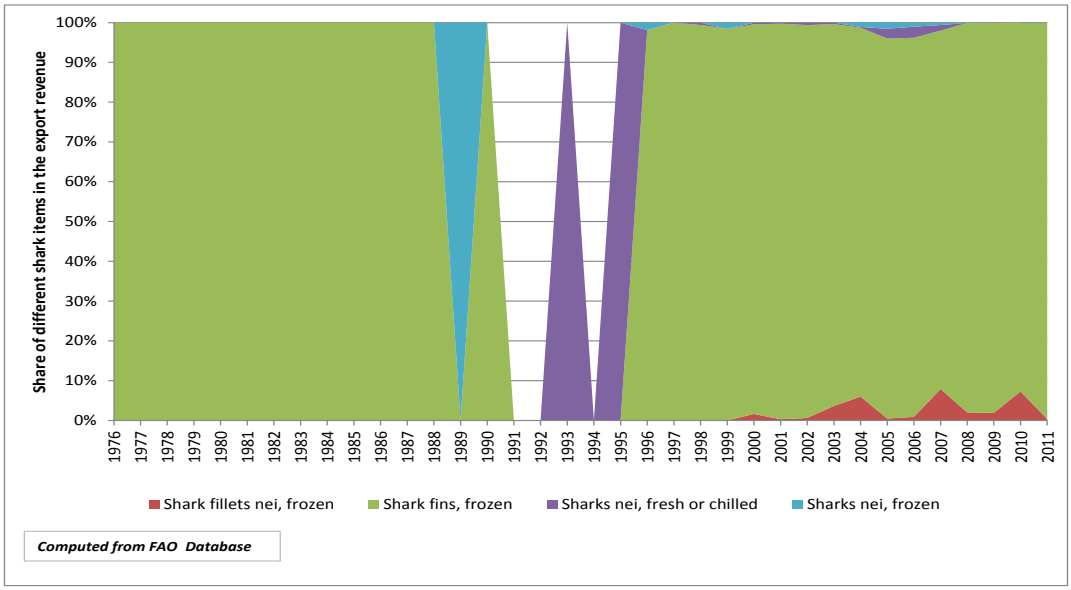


Figure 34: contribution of different shark products in export earnings from shark trade of India

Image 8: Processing of sharks fins

However, sharks are fetching remunerative prices in the domestic market where they are mostly in demand for meat – fresh or dried. CMFRI estimated that the gross value of sharks landed in the Indian maritime states in 2010 stood at Rs 278 crores (***Figure 35***).

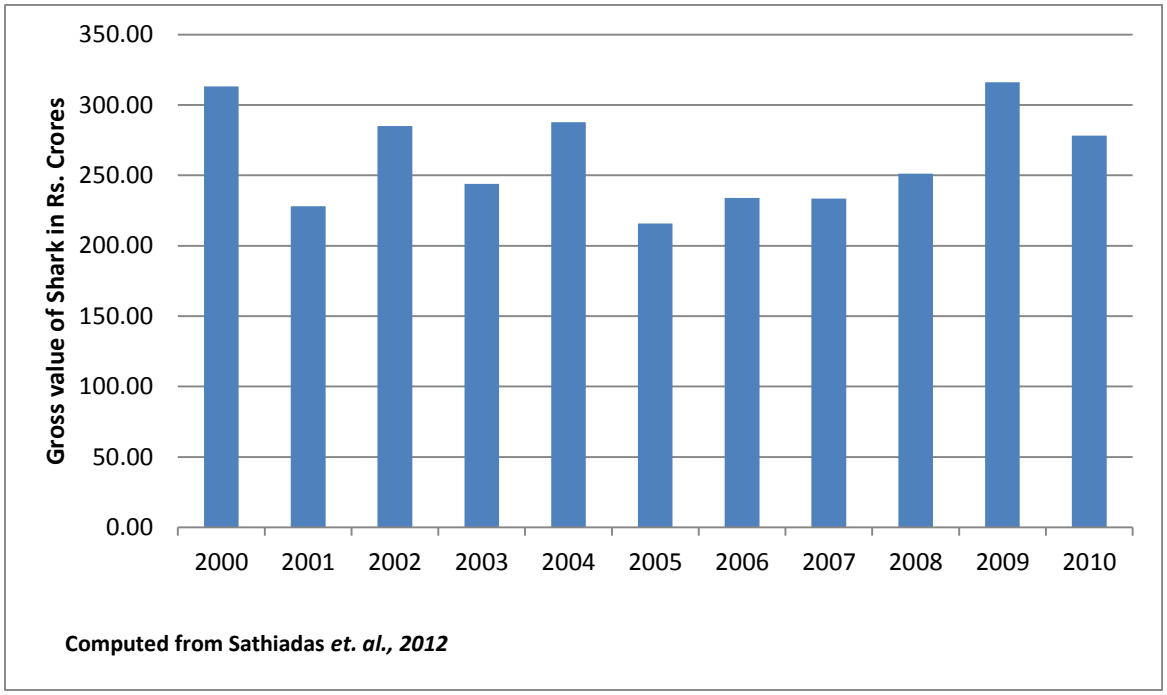


Figure 35: Estimated revenue from sharks landed in coastal states of India

In terms of individual contribution, true sharks contribute about 80 percent of the value followed by rays and skates (***Figure 36***). In terms of value of shark trade for coastal states, Gujarat seems to have the highest revenue from shark fisheries, followed by Maharashtra and Tamil Nadu (***Table 22***)[26]

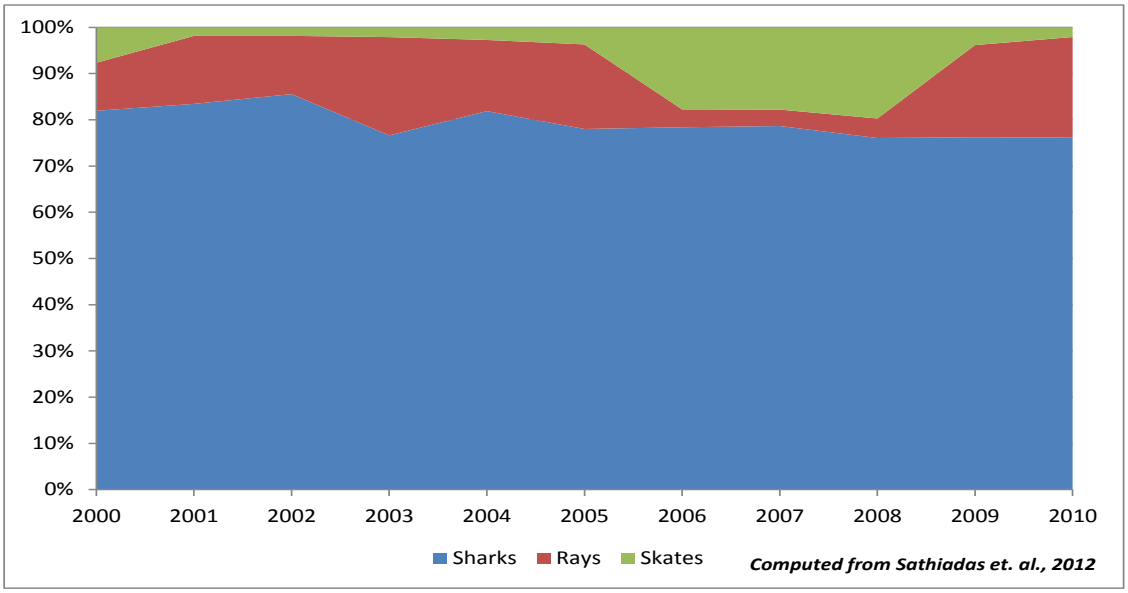


Figure 36: Individual contribution of shark, rays and skates in total value of the sharks

[26] ***Sathiadas, R., Narayanakumar, R. and Aswathy, N. 2012. Marine fish marketing in India. Central Marine, Fisheries Research Institute, 276 p.***

Table 22: State-wise estimated gross value of sharks landed

State/UT	Total value of production during 2000-10 (Rs in lakhs)	Share (%)
West Bengal	15,812.19	5.48
Orissa	9,212.30	3.19
Andhra Pradesh	24,069.52	8.34
Tamil Nadu	59,360.52	20.57
Puducherry	1,067.35	0.37
Kerala	23,915.69	8.29
Karnataka	6,695.93	2.32
Goa	3,067.89	1.06
Maharashtra	63,006.03	21.83
Gujarat	82,416.86	28.56
India	***288,624.28***	***100.00***

Source: Sathiadas, et al. 2012; CMFRI NPOA Shark Guidelines, 2015

3.7 Socio-economic aspects of shark fishing in India

3.7.1 Fishermen groups engaged in shark fishing

In India, fishing is largely practiced as a hereditary activity with population groups identifying themselves as fishermen. Shark fishing, which was developed and practiced as a specialised form of fisheries in certain parts of coastal India, also gave rise to distinct socio-economic identities with many fishermen identifying themselves as 'shark fishermen' – the prominent amongst them are the fishermen from Thoothoor in Kanyakumari district of Tamil Nadu. Vivekanandan (2001) has listed the following fishermen groups who carry out shark fishing in the country:

1) *Traditional catamaran fishers of Kanyakumari who conduct seasonal shark fishing along the east coast.*
2) *Motorised canoe (nava) operating fishers of Kakinada who use bottom set gill nets and hooks & lines.*
3) *Motorised wooden and FRP catamaran fishers of Andhra Pradesh who conduct seasonal shark fishing between Visakhapatnam and Puri.*
4) *Traditional longline fishers of north Kerala.*
5) *Trawl operators who bring in sharks as by-catch.*
6) *Fishermen of Thoothoor in Tamil Nadu who operate a specialised shark fishing mechanised fleet all along the Indian coast.*
7) *Fishermen of Gujarat who employ gill nets, hooks & lines and trawls for shark fishing.*

3.7.2 Dependency on shark fishing

As mentioned earlier, there is a declining dependence on shark fishing owing to several regulations and declining catch. A good example of this is the shark fishermen from Thoothoor who in recent years have been diversifying their fishing operation and moving towards tuna and tuna-like species. However, sharks are unique in the sense that the post-harvest operations of sharks lead to significant value additions. Activities such as fining, drying, shark meat in brine

are largely carried out by fisherwomen and for them it constitutes a major, if not the only source of income.

Apart from production of shark products, over the years, a network of traders and trading in shark products has been developed with Chennai as the base. Traders specialized in trading of dried marine products, mostly shark products, operate through many collection agents along the coastline, who aggregate shark products from different landing centres and send them to Chennai.

According to the shark traders (based on field survey), in recent years targeted shark fishing has declined and no boats are going exclusively for shark fishing. Presently, shark landings are exclusively from trawlers and gill netters (mechanized as well as motorized) whose main purpose is not to catch sharks but a variety of other commercially important species. The trawlers fish for a week towards Andhra Pradesh or Cuddalore area in Tamil Nadu, depending on the season. Gill netters fish for a shorter duration, mostly 1-3 days.

The trawlers land comparatively bigger sharks (>100 kg) sharks, while in case of gill netters, the sizes vary from less than 100 kg to even less than 5 kg of weight. These sharks (<5.0 kg) are locally termed as 'Hand Sharks' and are used for consumption locally. They are sold in open auction either as a 'lot' or on weight basis (price per kg) depending on the market demands for sharks. The price for such varieties ranges from Rs 80 - 110 per kg.

The prominent seasons for shark fishery in Chennai are from December to April and July to August. During June and July, cat eye sharks dominate, while during August, hammer head shark is prominent in the landings. During December to April, a species locally known as Mattai shark dominates the landings. The annual landings of sharks of above 50 kg in Chennai is about 40 tonnes (wet weight) while those below 50 kg is about 30 tonnes (wet weight).

The collection agents wash the fish in running water to remove slime and dirt and then cut and remove the pectoral and pelvic fins. Thereafter the dorsal fin and the shark tails are removed and sun-dried for at least 3 days. The meat, *minus* the fins, is sold in the local market or is transported to Kerala. After drying, the fins are sold to export houses in Chennai. According to local traders, from a 100 kg shark about 5 kg of fins can be obtained, which after drying weigh about 1.2 kg. The local agents earn a 'commission' of Rs 20-30 per kg of wet weight (*e.g. a local agent bought a 100 kg shark for Rs 10 000 @ Rs 100/ Kg. Then he will remove the fins, weighing about 5 kg and sell the balance 95 kg at about Rs 120-130 per kg. From 5 kg of fins (wet weight), priced at Rs 600-650, the agent will get about 1.2 kg of dried fins, which will be sold @ Rs 720-780 per kg).*

3.7.3 Targeted shark fishery in Kanyakumari District[27]

In Kanyakumari district of Tamil Nadu, a targeted shark fishery of about 900 mechanized vessels has been developed. Most of these boats are in the range of 45' to 70' in length. The body is either of wood with FRP coating or of steel. The boats of 50' use an engine of 280-350 HP. The length of fishing trip varies between 15 days (<50' boats) to 30 days for boats of 50' or above in size. These boats mainly fish with hooks and line. Most of the boats are concentrated between Thoothur to Vallavilai (750 boats), followed by a stretch between Colachel to Alikal (120 boats) and Kanyakumari (10 boats) (***Table 23***).

[27] ***Based on field survey***

The fishing area of this targeted shark fishing ranges from Gujarat to India-Maldives maritime boundaries on the west coast and in the east from Wadge Bank to Andaman and Nicobar Islands. The bigger size sharks are used for their fins and tails. After trimming the fins and tails, the flesh is sent to Kerala for consumption, both as fresh and dried. The meat of smaller size black shark is used for extraction of oil.

Presently, Thoothur accounts for about 93 percent of shark landings in Kanyakumari (12,000 tonnes of bigger sharks and 400 tonnes of smaller sharks), followed by Colachel (840 tonnes of bigger sharks and 36 tonnes of smaller sharks) and Kanyakumari (70 tonnes of bigger sharks and 3 tonnes of smaller sharks).

Depending on the location of the catch, the fishers get about 1.2 to 1.6 kg of dried fins from 100 kg of shark (wet weight). For example, from a shark of 1000 kg (wet weight) from Wadge Bank, the fishers would get about 15 - 16 kg of dried fins, while from a shark of the same wet weight from Gujarat, only 12 - 12.5 kg of dried fins can be obtained.

According to the fishers, current price for dried tail fins is about Rs 7,500/kg and the price of dried pectoral, dorsal & pelvic finsis about Rs 5,500/kg. The price for mixed fins is about Rs 6,000/kg (dried) and price for fins of black oil shark is Rs 300/kg (dried). They get about 35 kg of dried meat from 100 kg of wet meat and the price of the meat ranges from Rs 175-180 per kg.

The peak season in Kanyakumari is during August to December and the lean season is during February to May. During May to August, catch mainly comes from the gill netters.

Table 23: Summary statistics of Kanyakumari shark fishery

Stretch	Boats (nos)	Catch (in tonnes)	Catch per boat (in tonnes)
Thoothur to Vallavilai	750	12,400	16.53
Colachel to Alikal	120	876	7.3
Kanyakumari	10	73	7.3

Source: Field survey

3.7.4 People dependent on shark fishing

An approximate estimate indicates that 15,000 to 20,000 fishermen depend almost entirely on shark fishing in India (Vivekanandan, 2001[28]). The total population, including their families and other dependents is around 150,000. However, based on results of the National Marine Fisheries Census, 2011 conducted by CMFRI, it seems that conservatively about 26,576 people from major landing centres depend fully or to a larger extent on shark fishing in the country (***Table 24***). Even after excluding Veraval, where shark fishing has declined to a large extent after serious measures to protect whale sharks were initiated by the Government, about 16,470 people are engaged largely in shark fishery. This is roughly translated to a population of 76,256 given the average family size of 4.63 (from National Marine Fisheries Census, 2011).

[28] ***Vivekanandan, V. 2001. Shark fishing: an ill-thought ban. Samudra, 30: 3-9.***

Image 9: Field Survey with shark fishers

Table 24: Approximation of population depending on shark fishing in India

Centre	No. of people approximately engaged in mechanized fishing sector	No. of people approximately engaged in motorized fishing sector	No. of people approximately engaged in post-harvest (marketing, processing)	Total
Kanyakumari, Tamil Nadu	9000 (900 vessels @ 10 person each)	-	3456	12,456
Kakinada, Andhra Pradesh		594 (99 Motorized vessels @ 6 person each)	3420	4,014
Veraval, Gujarat	7050 (705 vessels @ 10 person each)	1914 (319 Motorized vessels @ 6 person each)	1142	10,106
Total				**26,576**

Based on the above analysis, it can be said that at the national level, over 200 - 225,000 people are engaged in shark fisheries and post-harvest activities (considering a ratio of 1:1.5 of harvesters: processors/ancillary workers).

3.8 National institutional mechanism

3.8.1 Constitutional arrangements

Entry 57 of List 1 of Seventh Schedule of the Constitution of India specifies *Fishing and Fisheries beyond Territorial Waters* as Union Subject, whereas Entry 21 of List II speaks of Fisheries as State Subject. Reading both the entries together, it follows that control and regulation of fishing and fisheries within territorial waters is the exclusive province of the State, whereas beyond the territorial waters, it is the exclusive domain of the Union. The Central Government acts as a facilitator and coordinator responsible for policy formulation, carrying out fishery research and channelling funding support to the States/UTs in line with the national priorities and the commitments made to the State/UT Governments as also in meeting India's obligation to international commitments. The Ministry of Agriculture & Farmers Welfare (Department of Animal Husbandry, Dairying and Fisheries – DAHD&F) within the purview of its allocated business helps the coastal States/UTs in development of fisheries within the territorial waters, besides attending to the requirements of the sector in the EEZ. Therefore, management of fishery exploitation in the EEZ requires close coordination between the Union and the States/UTs.

While at the Central-level, the DAHD&F, Ministry of Agriculture & Farmers Welfare is the focal point, in the State/UTs, it is the Department of Fisheries (DoF). Other Central Ministries/Departments like the Ministry of Commerce and Industry (MoCI), Ministry of Earth Sciences (MoES), Ministry of Food Processing Industries (MoFPI), Ministry of Environment, Forest & Climate Change (MoEF&CC) and the Department of Agricultural Research & Education (DARE) through the Indian Council of Agricultural Research (ICAR) play important roles in various aspects of fisheries resources management. At the national level, the Ministry of Defence (MoD) through the Indian Coast Guard (ICG) is also associated with the management of fisheries in the EEZ. In recent years, the Ministry of Home Affairs (MHA) is also engaged in coastal affairs through the setting up of Coastal Marine Police (CMP). The larger mandate of MHA is

'homeland security' but in the coming years they are likely to play an important role in implementation of fisheries monitoring, control and surveillance.

Role of Central Government: The Fisheries Division in the DAHD&F acts as the focal point for fisheries development and management in the country. It formulates strategies for national development plans for the sector and issues policy guidelines for fisheries development and management. It also provides technical and financial assistance for fisheries development and management to various states/UTs. The financial assistance is over and above the budgetary support provided to the States/UTs directly by the Planning Commission (now known as 'Niti Ayog').

To promote export of fish and fish products, the Government of India established the Marine Products Export Development Authority (MPEDA) under the MoCI in 1972. While the processing aspects fall under the MoFPI, the control of marine biodiversity and marine pollution falls under the jurisdiction of MoEF&CC and the MoES. ***Table 25*** gives a brief overview of the institutional structure for marine fisheries management in India.

Table 25: Institutional setting for marine fisheries development in India

Item	Agency/ Ministry/ Department
· Deep sea fishing (List I) · Survey & assessment of fisheries resources · Research · Training & extension . Fisheries development	Ministry of Agriculture /DAHDF, Indian Council of Agricultural Research Fisheries Survey of India, National Fisheries Development Board Ministry of Earth Sciences (MoES)
· Monitoring of fishing by foreign vessels (List I) · Prevention of marine pollution by ships · Protection of endangered species (Wildlife Protection Act, 1972)	Ministry of Defence/ Coast Guard
· Fish processing · Processing units . Exports	Ministry of Food Processing Industries/ Ministry of Commerce & Industry (MoCI) - MPEDA
· Seafood exports (List I) · Quality control	MoCI - MPEDA Export Inspection Council
· Law of the Sea negotiations (List I)	Ministry of External Affairs
· Potential fishing zones · Monitoring ocean pollution	MoES
· Fishing vessel industry (List I) · Major fishing ports (List I) · Minor fishing ports (List II)	Ministry of Shipping, Road Transport and Highways/, Ministry of Agriculture, State Governments
· Fisheries in territorial waters (List II)	State Governments /
· Protection of marine biodiversity (List III)[29] · Protection of coastal habitats (List III) · Focal point for Ramsar, CITES, CMS & CBD Conventions (List III)	Ministry of Environment and Forests (MoEF) MoES
Infrastructure	Ministry of Agriculture/ MoCI, MPEDA
Homeland Security (Lists I & II)	Ministry of Home Affairs

Role of the State/UT Governments: The State/UT Governments are the principle custodians of fisheries in their respective jurisdictions (land as well as the territorial waters). In the marine sector, they are responsible for fisheries development and management with the main objectives of planning and development of infrastructure facilities for landing and berthing of fishing craft,

[29] ***Concurrent List- Subjects for which both the Union and the States are responsible.***

creating suitable marketing facilities, implementation of various fisheries development programmes *viz*., channelizing financial assistance for purchase of fishing implements, implementation of socio-economic programmes and interactions with the Government of India and other agencies for technical and financial assistance. Each State/UT has a DoF, which functions as its main implementation agency for fisheries and aquaculture development programmes.

3.8.2 The policy framework

In Indian, the scope of fisheries management can be traced through the Five-Year Plans. On perusal of the Plans, it is seen that until the Seventh Five-Year Plan (1985–1990), the Government was mainly concerned with increasing fish production and promoting capitalization of the fishing fleet. Fisheries management *per se* was not elucidated in the earlier Plans. It was only during the Eighth Five-Year Plan (1992–1997) that fisheries management figured in the scope of Plan budget, which was then carried on to the subsequent Plans also.

The other major policy initiatives taken by the Government of India in relation to marine fisheries development in India are the formulation of the Comprehensive Marine Fishing Policy (CMFP) in 2004 and the 1996 Recommendations of the Committee set up on Deep-Sea Fishing Policy (Murari Committee). The following paragraphs provide a glimpse of the directions set by the policy initiatives, in particularly the 2004 CMFP on marine fisheries development in India.

Comprehensive Marine Fishing Policy (CMFP), 2004[30]: The Central Government formulated the CMFP in 2004 to ensure that marine fisheries in India were sustainable and globally competitive so that Indian producers stood to gain in the international market. The Government also considered the fact that after declaration of the EEZ in 1976, immense opportunities were available for exploration, exploitation and utilization of marine living resources in the 2.02 million sq. km area. The Government further realized that most of the deep sea fishery resources were available beyond the conventional fishing limits and fishing capability of the indigenous craft and such resources could be gainfully exploited only if the upgraded and sophisticated vessels of adequate size and capabilities were inducted into the fishery.

The CMFP, 2004 also considered bringing the traditional and coastal fishermen into focus along with stakeholders in the deep-sea sector so as to create a level-playing field and achieve harmonized development of marine fishery both in the territorial and extra territorial waters of the country. Thus the Policy was framed with the objectives of (1) augmenting marine fish production of the country up to the sustainable level in a responsible manner so as to boost export of sea food from the country and also to increase per capita fish protein intake of the masses; (2) ensuring socio-economic security of the artisanal fishermen whose livelihood solely depends on this vocation; and (3) ensuring sustainable development of marine fisheries with due concern for ecological integrity and biodiversity.

The Policy also underscored the need for a departure from the open access concept in the territorial waters, putting in place stringent management regimes and promoting exploitation in the deep sea and oceanic waters for reducing fishing pressure in the traditional fishing areas. The other salient features of the CMFP are as follows:

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[30] The Government of India has recently set up a National-level Committee to review the 2004 CMFP and propose a new policy taking into consideration the contemporary developments in the fisheries sector in India and elsewhere.

- ***Harvesting of marine fish resources:*** *As the bulk of incremental catch to augment annual marine fish production has to come from the deep-sea sector and beyond EEZ limit, the Government would encourage introduction of more resource specific vessels of above 20 meter length overall length (OAL). Proposals for import of resource-specific fishing vessels by wholly Indian owned enterprises would be screened and approval accorded for such imports by a designated authority in accordance with well laid out norms. These additional fishing units in the deep-sea sector would be for tuna fishing and squid jigging. Special incentives would be provided for wholly Indian owned vessels for venturing into international waters and for concluding fishing arrangements with other nations under license, etc. The principles of Code of Conduct for Responsible Fisheries would be incorporated into every component activity.*

- ***Post-harvest operations:*** *Efforts would be made to fully comply with international requirements in post-harvest care of catch so as to achieve highest standards in food safety. It would be also the concern of the Government to ensure that the post-harvest losses are minimised. Implementation of international quality regimes for ensuring food safety in fish and fishery products would be carried out through the nodal agency. A regulatory body would ensure monitoring and verification of compliance. Hygiene in fishing harbour/pre-processing and processing centres would be streamlined through legislation.*

- ***Resource management:*** *Exploitation of living resources within 50 metres depth zone is showing symptoms of depletion and in certain belts in the inshore waters it tends to cross optimum sustainable levels. The policy therefore advocates a stringent fishery management system to be in place. Though the Marine Fishing Regulation Acts of coastal States and UTs have adequate provisions for management of resources and fishing operations, it is often found falling short of effective implementation. This calls for a review of the situation and prescribing a fresh model bill on coastal fisheries development and management with a re-orientation on limited access in coastal marine sector through policy initiative, sound legislation and awareness creation.*

- ***Controlling effort****: Construction and introduction of new fishing units cannot go unchecked any more. All existing boat-building yards shall be registered and construction of any new fishing unit will be after obtaining a license. Standards for fishing vessel construction, especially for those below 20 m OAL need to be developed and control would be exercised through new legislation. Provisions would be made to comply with requirements of registration of vessels and Standards of Training, Certifications and Watch keeping of Fishing Vessel Personnel. There will be closed season on both the coasts, the duration of which would be decided by a designated authority. Such closed seasons shall be uniform for neighbouring states unless the geographic or climatic conditions warrant deviations. There would be strict ban on all types of destructive methods of fishing. The designated authority would be competent to declare any method as destructive after it is convinced so based on facts and data pertaining thereto. Mesh sizes in fishing gear would be regulated. Penalties would be fixed for violations of mesh regulations. The designated authority would, if found required doing so, decide the quota for different classes of fishing vessels in any region. Catching of juveniles and non-targeted species and discarding less preferred species once they are caught would be strictly prohibited through legislation. Posting of observers on commercial fishing vessels and enforcing monitoring control and surveillance system would be ensured.*

- ***Resource enhancement:*** *A resource enhancement programme will be taken up on priority. Designating certain areas as marine sanctuaries and regulating capture of brood stock from these locations would be implemented. Open sea cage culture would be promoted to rear or fatten commercially important species of fishes. Fish aggregating devices would be promoted as a community based activity.*
- ***Safety at sea:*** *The sea safety issue also would be incorporated in to MFRAs for prompt enforcement.*
- ***Reducing impact of pollution:*** *The effect of environmental factors on the health of living resources needs increased attention in tune with the international awareness on the issue. Health hazards due to consumption of fish harvested from contaminated waters is also becoming a matter of great concern in many parts of the world. The agencies responsible for legislation relating to environmental pollution will be urged to implement them more stringently so that the impact of pollution on fisheries can be minimized.*

Other policies for sustainable development of marine fisheries sector*:*
Besides above, the Central Government has undertaken several other measures in the past to promote sustainable development of marine fisheries in the country. These policy initiatives relate to (i) optimisation of marine fishing fleet in the country; (ii) uniform application of closed season on the east and west coasts and (iii) revalidation of the harvestable potential of marine fisheries resources in the EEZ. To optimize and rationalize the fishing fleet, a National Level Review Committee was constituted by the then Ministry of Agriculture in September 1996 to assess the area-wise requirements of different categories of fishing vessels below 20 m OAL and conservation of fishery resources, etc. The committee submitted its report to the Government in 1997 for its consideration and further action in the matter. In the year 1999, a committee was also set up to revalidate the harvestable potential of marine fisheries resources in the Indian EEZ. The committee submitted its report in the year 2000. The resource estimation was re-visited by another committee set up in 2010, which has marginally revised the earlier estimated harvestable potential of marine fisheries[31].

Based on the decisions of another committee set up in 1997, the east and west coast States/UTs were implementing closed season for specified periods to allow the fish stocks to rejuvenate. As the positive results of the closed season were acknowledged by larger sections of the fishing community, recommendations of a committee set up in 2014 suggested extension of the closed season period from 45 days to 60 days. This recommendation of the committee were accepted by the Government and from 2015 onwards closed season period was extended to 60 days in most of the coastal States/UTs. The States where this extended period (Tamil Nadu and Kerala) could not be implemented have been given five years to move from the 45 days closed season to 60 days.

3.8.3 The legal framework

The need for fisheries legislation was emphasized as back as in 1873 when the attention of the then British India Government was drawn towards widespread slaughter of fish, fry and fingerlings and was convinced of the urgency to adopt legislative measures to conserve the fisheries resources. As a result the Indian Fisheries Act came into being in 1897 with the following highlights:

[31] ***The latest estimate of the harvestable marine fisheries potential is discussed in Chapter 2.0 of this document.***

- *Prohibition of destructive methods of fishing such as dynamiting or use of fish poisons in inland and coastal waters (up to 3 nautical miles from the coast).*
- *Empowerment of Provincial governments to frame rules for protection of fish in selected water bodies, restricting the creation and use of fixed engines (dams, weirs, etc.) for catching fish; to put a limit on mesh size, size of fish and catch, and to ban the fishing in certain seasons and certain sensitive fish habitats such as nursery/spawning grounds.*

Early fishery laws in India, starting with the Indian Fisheries Act, were enacted with two main objectives: conservation of resources and collection of revenue, in particular from shell fisheries, pearl fisheries, etc. As the demand of food fish was of very low order, harvesting of resources was also of subsistence nature.

After independence, the Indian Parliament enacted the Territorial Sea, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Acts in 1976, which paved the way for establishment of a 200 nautical mile (nm) EEZ effective from January 15, 1977. Since then, India has also enacted a number of other laws and regulations which have bearing on the sustainable exploitation of the marine fisheries resources in the Indian EEZ, including the Indian Coast Guard Act, 1978; the Maritime Zones of India (Regulation of Fishing by Foreign Vessels), Act, 1981 and the related Rules of August, 1982; the Environment Protection Act, 1986; etc. The other Central legislations, which have important bearing on the fisheries sector, include the Merchant Shipping Act, 1958, the Marine Products Export Development Authority Act, 1972; the Wildlife (Protection) Act, 1972 and the Biological Diversity Act, 2002. However, there is still no law to regulate the Indian-owned fishing vessels operating in the EEZ.

The Marine Fishing Regulation Act (MFRA) enacted by all the coastal States/UTs came as a response to the growing conflicts in the coastal waters. Realizing the problem, the Central Government prepared a model Bill, which was circulated to the coastal States/UTs in 1979, paving the way for enactment of the MFRAs. The MFRAs of the maritime States/UT Governments and the deep sea fishing schemes as provided under the Maritime Zone of India (Regulation of Foreign Fishing Vessels) Act, 1981 of the Government of India provide for prohibition of fishing by mechanized fishing vessels in the areas earmarked for traditional and small-motorized crafts. Presently, the only control exercised by the Central Government with relation to fishing in the EEZ is the closure of fishing for a certain period. This closure coincides with the closure enforced by the coastal State/UTs for fishing in their territorial waters and is done through an 'Executive Orders'.

The provisions under the Wildlife (Protection) Act, 1972 have been used to set up marine parks/sanctuaries along the coastline in India. While the larger objectives have been towards protection/conservation of fauna and flora, in some cases these reserves have also infringed on the livelihoods of the traditional fishers. The scope and extent of the laws that directly or indirectly have bearing on the marine fisheries sector (including shark fisheries) is discussed in detail in ***Annexure 7***.

3.9 Review of management of shark fisheries in India

The Indian marine fisheries is characteristically open access with common property rights. The multispecies fishery comprises more than 200 species of commercially important finfish and shellfish species, exploited by a variety of craft and gear combinations. The MFRA enacted by all the maritime States/UTs contains provisions to regulate or prohibit fishing activities within specified areas, licensing of vessels, cancellation/suspension of licenses etc. The MFRAs

also have provisions for allotting fishing areas for traditional and mechanized sectors. The mechanized vessels are banned from operating in inshore areas, which have been assigned exclusively to the traditional craft. The Gulf of Mannar and the Gulf of Kachchh have been declared as marine protected areas (MPAs). The MFRAs have provisions for regulation of mesh size of especially the cod end mesh of trawls. However, compliance levels are very poor and in the absence of a strong MCS regime, violations are common. A snapshot of the provisions contained in the MFRAs is given in ***Table 26***.

Restriction of the number of days of fishing during monsoon and fish spawning seasons is the most common conservation method followed so far in India. The maritime States/UTs along the west coast follow closed fishing for mechanized vessels for 45 to 60 days during the southwest monsoon months of June to August, and the maritime States/UTs along the east coast also follow 45 - 60 days of closure during April – May.

In July 2001, the then Ministry of Environment & Forest placed all species of sharks under Schedule I of Wildlife (Protection) Act, 1972. Following widespread protests from the stakeholders, the Ministry revised the list and placed the following species under the Act: the Pondicherry shark *Carcharinus hemiodon,* the Ganges sharks *Glyphis gangeticus* and *G. glyphis*, and the whale shark *Rhincodon typus*. In addition, few other elasmobranchs namely, the sawfishes *Anoxypristis cuspidatus, Pristis microdon* and *P. zijsron*, the rays *Himantura fluviatilis* and *Urogymnus asperinus*, and the skate *Rhyncobatus djiddensis* are also protected under the said Act. These four species of sharks and six species of other elasmobranchs should not be caught, harvested or traded. Killing or unauthorized possession of the prohibited species is a non-bailable offence, attracting imprisonment for a period ranging from three to five years, and a penality of Rs 25,000 (US$ 625). All the listed species with the exception of the skate, *R. djiddensis* are very rare in the fishery. However, as no device is available to exclude these species selectively from the catch, especially from gillnet and hooks & line catch, they are occasionally caught in the fishing gear.

In the recent period, the MOEF&CC has also issued a policy guideline on shark finning. On 21 August 2013, the MOEF&CC issued a Policy Circular (F. No. 4-36/2013 WL) under the Wildlife (Protection) Act, 1972 prohibiting on-board finning of sharks. The Circular states that "any possession of shark fins that is not naturally attached to the body of a shark would amount to hunting of a Schedule I species". The burden of proof lies on the accused and failing so the accused will attract penalty as per the Act. Copy of the said policy circular is placed as ***Annexure 2*** under Chapter 1.0.

Subsequent to the listing of certain species of sharks in CITES, the Ministry of Commerce and Industry issued two notification (Notification No 110 (RE – 2013)/2009-2014 Dated: 6 February, 2015) on "Prohibition on export of Shark fins of all species of Shark" and Notification of even number and date on "Prohibition on import of Shark fins of all species of Shark" with immediate effect. Copies of the said notifications are placed as ***Annexures 3 & 4*** under Chapter 1.0. However, for sustaining and effective management of shark populations, a comprehensive plan needs to be developed taking into consideration the livelihoods of the dependent fishermen.

Table 26: Major MCS Measures and their Provisions in the Marine Fishing Regulation Act & Rules of the Coastal States/Union Territories

Sl. No	MCS Measures	GU	MH	GO	KA	KE	TN	PU	AP	OR	WB	ANI	LAK
1	**Mesh size**	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2	**Area closures**	Y	Y	-	-	-	Y	-	Y	Y	Y	-	-
3	**Zonation**	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4	**Minimum and maximum fish sizes**	Y	-	-	-	-	-	-	Y	-	Y	-	-
5	**Vessel movement controls**	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
6	**Vessel inspections**	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
7	**Registration & License**	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
8	**Display**	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
9	**Colour coding**	Y	-	-	-	-	Y	-	-	-	-	-	-
10	**Classification of boats**	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
11	**Fishing Regulations**	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
12	**Catch & Quota Control**	-	-	-	-	-	-	-	-	-	-	-	-
13	**Effort Control**												
	a) Trip limits	-	-	-	-	-	-	-	-	-	-	-	-
	b) Timing	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	c) Restrictions on number of boats	-	-	-	-	-	-	-	-	Y	-	-	-
	d) Seasonal closure	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
14	**Observer**	-	-	-	-	-	-	-	-	-	-	-	-
15	**Vessel Monitoring**	-	-	-	-	-	-	-	-	-	-	-	-
16	**Participatory Management**	-	-	-	-	-	-	-	-	-	-	-	-

Y = Provision Available; - not available

GU- Gujarat; MH- Maharashtra; GO- Goa; KA- Karnataka; KE- Kerala; TN- Tamil Nadu; PU- Pondicherry; AP- Andhra Pradesh; OR- Orissa; WB- West Bengal; ANI- Andaman & Nicobar Islands; LAK- Lakshadweep.

3.10 Views of the fishermen and traders

A series of stakeholder consultations were carried out throughout the preparation of NPOA-Sharks with the fishermen and traders across India. The final series of stakeholder consultations were organized through community driven initiative under the 'National Mission on Conservation of Sharks in India' spearheaded by the Association of Deep Sea Going Artisanal Fishermen (ADSGAF) of Thoothoor, Kanyakumari – one of the prominent shark fishing groups and supported by the BOBP-IGO. So far eight consultations have been held, one in each of the coastal States. The last consultation is due to be held in Goa. Apart from representatives of fisher community, these consultations were also attended by research organizations including CMFRI, FSI, Central Institute of Fisheries Education (CIFE), Colleges of Fisheries, Trade Unions and Associations, NGOs and CBOs.

Of the many suggestions emanating from these consultations, the fishers and traders are of the firm opinion that a rational and participatory livelihood-centric plan of action is required to conserve shark resources in the Indian seas. While, both the groups have strongly emphasized on the need for conservation of sharks, they have viewed existing conservation measures as arbitrary and not in accordance with their experiences at sea and also adversely impacting their livelihoods.

The fishers and traders disagree with the measures in vogue to prohibit shark fishing and imposing ban on export of fins. They are of the view that while every part of shark is useful, fins extract the highest revenue for the fishers and the processors. In view of the ban on export of fins, prices of sharks have gone down and this could be counter-productive as fishermen will increase their effort to compensate for the loss. Traders, on the other hand, are of the view that owing to the ban they cannot dispose the products they have stocked earlier and this is draining their resources. Both fishers and traders are also of the view that IPOA-Sharks calls for full utilization of sharks and wastage of expensive shark product such as fins is contrary to the spirit of the IPOA-Shark.

Fishermen, on their part, have also sought attention on the followings aspects:

- *Participatory research and monitoring;*
- *Broad policy on sharks through consultations;*
- *Improving capacity of the fishermen and as well as officials from MoEF&CC and Indian Coast Guard to identify different species of shark;*
- *Data and research driven conservation measures;*
- *Promotion of eco-friendly fishing gear; and*
- *Improving coordination amongst all stakeholders.*

The summary of outcomes from various stakeholder consultations is given in ***Annexure 8.***

Image 10: Stakeholder Consultations on NPOA-Sharks

3.11 Review of scientific work

A web-based exercise was undertaken to list shark-related publications including media reports until 2014 to understand the concentration of scientific and media coverage on sharks and also to see the research focus on this important constituent of the marine ecosystem. Under the exercise, 578 publications were listed (***Table 27***). The detailed bibliography is annexed to the report (***Annexure 9***). The analysis shows that bulk of the publications is centered on trends in landings of sharks (31.4%), followed by studies on biological aspects (11.07%) and taxonomy (10.90%). Publications on fisheries and distribution of the resources together constitute another 14.53%. However, most of the other aspects such as socio-economics, management and policy aspects remains under represented. The exercise shows that while more research is needed on biological aspects, there is also a need to increase research focus on socio-economics and management aspects. Issue of awareness creation and data-driven decision making has been reflected across the stakeholder consultations and future research agenda needs to bridge this gap.

Table 27: Dimensions of shark related publications

Sl. No	Domain	Count	Share (%)
1	Distribution in the Indian EEZ	33	5.71
2	Landings – Quantitative trend	182	31.49
3	Fisheries	51	8.82
4	Population dynamics	7	1.21
5	Taxonomy	63	10.90
6	Biological studies	64	11.07
7	Growth aspects	5	0.87
8	Catch composition	9	1.56
9	Fishing technology	23	3.98
10	Genetics	4	0.69
11	Impacts on shark population	3	0.52
12	Utilization	19	3.29
13	Gender	2	0.35
14	Shark trade	10	1.73
15	Socio-economics	9	1.56
16	Conservation of shark species	17	2.94
17	Policies on shark fisheries	5	0.87
18	Management aspects	40	6.92
19	Others	32	5.54
20	**Total**	**578**	**100.00**

Further, analysis of the typology of publications shows that most of the publication appeared in information bulletin and extension services (41.3%) published by CMFRI. However, coverage of shark-related matters in public media remained low (8%). The media coverage was largely related to events such as fishermen movement against shark fishing ban or recent ban on export of shark fins. Educational and awareness building media reports are rare. With more proactive role suggested for media during the stakeholder consultations; the data does show that media can play a larger role in opinion-making. Number of publications on sharks appeared in peer-reviewed journal also remain

comparatively less (24.4%) (***Figure 37***). However, there is an increase in publications in peer-reviewed journals in recent years. This is also one area which needs to be addressed in the future to ensure quality of research and scientists broadly agreeing on particular research findings and conclusions, which cannot be achieved through non-peer-reviewed publications.

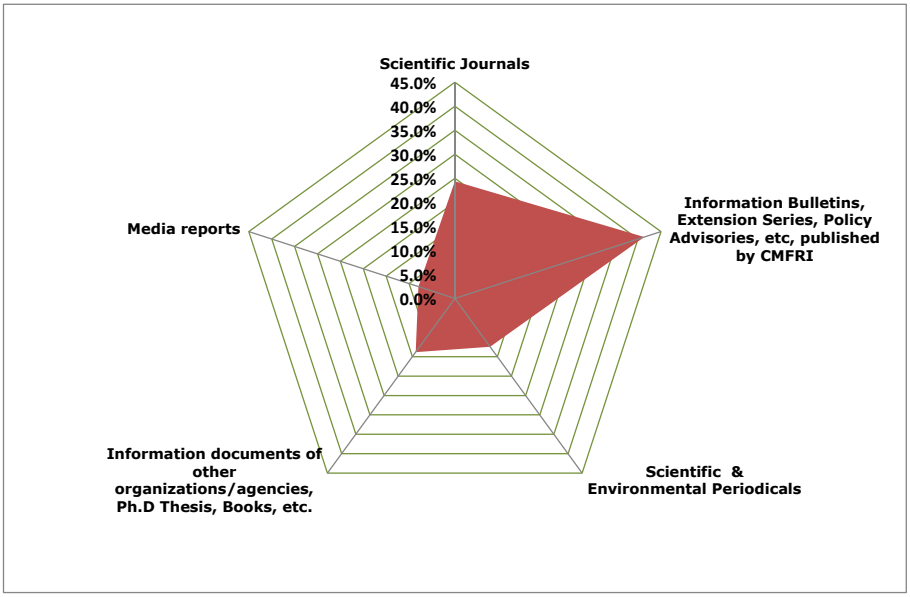

Figure 37: Typology of publication on sharks

Analysis of year-wise data shows that there was a peak of interest in research/writings on shark during mid-1980s which continued till the early 1990s (***Table 28***). In 1990s, the level of interest seemed to plateau, until it started picking up again during 2000. The 2000s were a period of beginning of intense debate on sharks. At the national level, ban on whale shark generated considerable interest. This was clubbed with large-scale successful protest by fisher groups on inclusion of all shark species under the Wild Life (Protection) Act, 1972 leading to subsequent removal of most but vulnerable sharks from listing under the said Act.

In recent time, with increasing global interest on sharks, number of shark related publications also seem to be increasing. At the same time, the publications are more diversified now. Initially, most of the publications were related to biology and distribution of sharks. However, now publications are emerging in the field of socio-economics, trade; policy; conservation measures; genetics along with the traditional areas of research.

Table 28: Decade-wise pattern of publication on sharks

Period	Total number of publications	Average number of publications
< 1950	20	1.43
1951-60	7	0.70
1961-70	12	1.20
1971-80	34	3.40
1981-90	93	9.30
1991-2000	130	13.00
2001-10	174	17.40
2011-14	106	26.50

***

4.0 National Plan of Action on Sharks-India

This section contains the measures to be taken for conservation and management of sharks and the implementation plan with timelines. As India is beginning its journey towards scientific conservation measures for shark fisheries, emphasis is given on setting up of the basics. These include improving fisheries MCS; development of research plans and bringing all stakeholders on board towards this positive effort. Much of the success of implementing NPOA-Sharks will also depend on having skilled human resources at different levels within the Government; research organizations as well as the fisher community. While the role of media and NGOs is not separately mentioned, as they are not accountable to the Government, it is expected that media and NGOs will play a proactive role in community mobilization, dissemination of knowledge and in monitoring of implementation.

4.0 Purpose and scope of NPOA-Shark

1. The purpose of the NPOA-Sharks for India is to ensure conservation and management of sharks and their long-term sustainable use.

2. In the context of the NPOA-Sharks, 'sharks' are defined as all species in the class *Chondrichthyes* and include sharks, skates, rays and chimaeras.

3. The NPOA-Sharks applies to species that are found within India's Exclusive Economic Zone (EEZ) and Territorial Sea, migratory species that frequent India's EEZ and Territorial Sea, and species taken by India-flagged vessels fishing on the High Seas.

4. The NPOA-Sharks is an operational plan. It does not seek to revise the institutional mechanism, unless necessary, rather aim to contribute to it to enhance conservation and management of sharks in India.

5. The primary focus of NPOA-Sharks, at this stage, is to (i) bridge the research and information gaps on status of sharks at species level; (ii) understand socio-economic implications of conservation and management of sharks to design sustainable exploitation policies; and (iii) manage the negative impacts of fishing as it is assumed to be the biggest factor affecting sharks. Impacts from other anthropogenic activities and climate change are not dealt with in the present NPOA. If necessary, these issues could be dealt in the future revision of the NPOA with enough information.

6. The NPOA-Sharks is stakeholder-centric and takes into account their concerns while also ensuring due concerns for the maintenance of ecosystem integrity.

7. The NPOA-Sharks will be reviewed and revised periodically (at least once in five years) to ensure on-going effectiveness of national efforts to address the conservation and management of shark species.

4.1 Issues

The NPOA-Shark seeks to address the following issues:

Arresting decline in shark biomass and species diversity;

Improving monitoring, control and surveillance, including gaps in data collection and identification of species;

Setting the stage for agreed conservation measures;

Identifying research needs; and

Suggesting a holistic framework to address the above issues.

4.2 Management principles

The NPOA-Sharks is based on Ecosystem Approach to Fisheries (EAF)[32]. The FAO Technical Guidelines on the Ecosystem Approach to Fisheries (FAO 2003) define EAF as follows:

"An ecosystem approach to fisheries strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries."

Considering the data limitation and limited knowledge on status of different shark species, the NPOA-Sharks also adopts a 'Precautionary Approach' to manage sharks in the Indian EEZ.

4.3 Summary of actions suggested to address the issues experienced in shark fisheries within the principles of EAF and precautionary approach and their relation to IPOA-Sharks

IPOA-Sharks	Action suggested in NPOA-Sharks
Ensure that shark catches from directed and non-directed fisheries are sustainable.	Any new policy on increasing fisheries production within or outside 12 nautical miles (that is policies of coastal States and policies of Union Government) should not promote direct catch of sharks untill sufficient scientific evidence is available to increase exploitation. Initiate implementation of comprehensive fisheries MCS Plan at the earliest.
Assess threats to shark populations, determine and protect critical habitats and implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use.	Scientists and fishermen should work together to identify and ascertain shark breeding grounds and shark breeding period and agree on conservation measures, such as seasonal ban or area closer. Use of 'O' hooks should be promoted as precautionary measures as some studies suggest that they reduce non-targeted shark catch (even if the evidences are inconclusive). Mesh size and opening of trawl nets, if suggested in corresponding MFRA, should be strictly followed. In case such measures are not clarified in certain MFRAs, the same should be amended to include these measures.
Identify and provide special attention, in particular to vulnerable or threatened shark species/stocks.	Initiate research to catalogue sharks in Indian waters through genetic coding. Develop species-specific indicators using fisheries and exploratory survey data, wherever feasible.
Improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States.	Initiate awareness drive among different stakeholders including fishermen; share research findings with fishermen and encourage fishermen associations/cooperatives to monitor and report shark catch. Implement MCS Plan for fisheries at the earliest.
Minimize unutilized incidental catches of sharks.	Initiate research on value addition for sharks and share the findings with the community.
Contribute to the protection of biodiversity and ecosystem	Ensure effective implementation of fisheries MCS Plan; encourage ecotourism and reef shark diving.

[32] ***Garcia, S. M.; Zerbi, A.; Aliaume, C.; Do Chi, T.; Lasserre, G. The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. No. 443. Rome, FAO. 2003. 71 p.***

structure and function.	
Minimize waste and discards from shark catches in accordance with article 7.2.2(g) of the Code of Conduct for Responsible Fisheries (for example, requiring the retention of sharks from which fins are removed).	Ensure effective implementation of the fin-attached policy of the Government and initiate research on value addition for sharks and share the findings with the community.
Encourage full use of dead sharks.	Review shark export policy, encourage value addition.
Facilitate improved species-specific catch and landings data and monitoring of shark catches.	Introduce logbook system; develop national shark identification kit; build awareness; mobilize fishermen association and build research skills in taxonomy as well as data collection skills of enumerators from agencies involved in data collection.
Facilitate the identification and reporting of species-specific biological and trade data.	Introduce logbook system and voluntary reporting by fishermen; review policy on reporting of catch of prohibited species or species protected under Wild Life (Protection) Act, 1972; encourage regional integration.

4.4 Legal, institutional and management framework requirements

- An effective MCS framework needs to be set up. In 2010, a National Plan of Action on MCS was adopted through a National Consultation. The NPOA-MCS is given in ***Annexure 10.*** The NPOA-MCS provides the basic framework for regulation of fisheries, and can be key stepping stone towards implementation of NPOA-Sharks in the country.

- Presently, there is a legal void to regulate wholly Indian-owned Indian fishing vessels in areas beyond 12 nautical miles in the EEZ. There is a need for enactment of the law for waters between 12 – 200 nautical miles in consultation with the stakeholders.

- The MFRAs of the coastal States/UTs may be reviewed in terms of 'lessons learned' and the contemporary challenges faced by the marine fisheries sector. The MFRAs in their present form do not address many such requirements. A fresh model Bill may assist the coastal States/UTs in re-visiting their MFRAs and bringing in the necessary changes.

- A joint policy paper on sharks from DAHD&F and MoEF&CC may be issued highlighting the dual requirements of balancing conservation and sustainable harvesting. Such a policy paper should weigh international rules and regulations on one hand and the livelihood issues on the other, to arrive at socially and ecologically acceptable trade-offs. The policy paper should also address guiding rules for increasing fisheries production, which is one of the major objectives of fisheries policies of coastal states, with a particular reference to adopting a 'precautionary approach' to discourage direct fishing of sharks and consider impact on shark stocks as by-catch from efforts to boost fisheries production.

- A Coordinating Committee may be set up comprising the four concerned Ministries of the Union Government: Ministry of Agriculture and Farmers Welfare; Ministry of Environment, Forest and Climate Change; Ministry of Commerce and Industry and Ministry of Defence; Department of Fisheries of the coastal States/UTs; fisheries research organisations and representatives from fishermen associations to monitor the efforts of different states, suggesting harmonization of activities as well as reporting on progress of implementation of NPOA-Sharks.

- While stakeholder participation is being increasingly practiced in policy making, there is yet to be a formal mechanism to ensure stakeholder engagement,

especially the marginal groups. Government needs to consider this to ensure stakeholder participation, with due representation form various sections, including women.

- There is a need to review shark trade policies in view of the requirements stipulated under international agreements such as CITES and the livelihood needs of fishers.

4.5 Human resources and capacity development requirements

To ensure effective implementation of the NPOA-Sharks, human resource development and capacity building need to be carried out at the following levels:

Activity level	Description of activity	Expected Outcome	Responsible Agency
Low	Preparation of shark cards in waterproof material (plastic) with vernacular names and importance.	The cards will be initially distributed amongst major shark fishing groups to build their awareness and collect information subsequently.	CMFRI/FSI
High	Building better taxonomic skills of field investigators; scientists.	Improved database on sharks.	FAO (training of trainers); FSI/CMFRI for subsequent trainings.
High	Building skills on data collection techniques for field investigators.	Improved database on sharks	CMFRI
Medium	Awareness building of fishermen and leadership building for monitoring fisheries activities.	Improved scope of community participation. This needs to be done with sustained efforts. Few fishermen groups are more progressive than others; such fishermen groups could be tapped to reach to other fishermen groups. Ultimately, the exercise will be fisher-to-fisher with backstopping by research institutes.	To be identified. However, NGOS or CBOs could be effective in this exercise.
High	Improved research activity and skills.	Better knowledge products on sharks. The target of this activity will be the premier research institutes of the country to improve their skills further and acquiring cutting- edge technology. It is expected that subsequently these institutions will spread the skills at the state-level.	FAO
High	Improving skills on MCS	Better fisheries MCS. This activity will primarily target Government officials engaged in MCS and related management functions. A detailed plan is given in ***Annexure 10***.	BOBP-IGO
Medium	Training programme on the Code of Conduct for Responsible Fisheries and Ecosystem Approach to Fisheries for fisheries officials and other stakeholders.	Improve the understanding of sustainable fishing practices and global instruments; appreciating need for better management measures for fisheries; develop skills for extension to fishermen.	BOBP-IGO/ CMFRI/ FSI/ DoF
High	Improving understanding of international agreements/arrangements.	Better informed on the duties and responsibilities under such agreements/arrangements. This activity will primarily target Government officials and other concerned stakeholders.	BOBP-IGO

4.6 Data collection and management requirement

A coordinated approach is required to bring the major sources of fisheries data in the country: CMFRI, FSI and DoF together. It is necessary that the sampling methodology for collecting data from landing centres is revisited both from design as well as implementation perspectives. Wide variations in reported data between CMFRI and DoF in several cases are a matter of concern. As data will be used for monitoring and reporting; such variations will lead to an inconclusive scenario. It is suggested that an independent agency can review the implementation practices and suggest a coordinated Plan for better implementation of the sampling methodology.

The other measures required are as follows:

- Identify gaps in existing monitoring and data collection programmes for commercial fisheries and exploratory surveys.
- Evolve mechanisms of reporting the catches by fishermen involved in directed and non-directed fisheries, especially through logbooks.
- Ensure collection of data necessary for risk assessment of shark species, such as availability, catchability, productivity and distribution.
- Ensure sound management norms for data bases for easy retrieval and analysis, and are subjected to internal verification and validation checks.
- Develop protocols whereby data can be shared between relevant agencies, yet remain secure.
- Ensure that appropriate data on fishing mortality are collected as inputs for stock assessment and risk assessment.
- Ensure that where a species is taken in two or more fisheries within a jurisdiction or in two or more jurisdictions: (a) processes are in place to collect/report data from all fisheries and jurisdictions involved in the management of that species uniformly, and, (b) are included, when data became available, in subsequent stock assessments or risk assessments conducted for that species.
- Develop DNA sequences of all species and establish DNA referral library. This would assist in resolving issues related to taxonomic ambiguities.
- Evaluate the methodologies for risk assessment and adopt a single national risk assessment framework, consistent across species and fisheries.
- Revalidate species listing under different vulnerability categories; and revise the status, if necessary.
- Increase opportunities for better utilization and value addition of shark products from currently harvested species and encourage commercial fisheries to use these opportunities subject to the long-term ecologically sustainable harvest of shark species.
- Initiate an evaluation of the methodology, and where possible, apply the methodology to assess the impact of shark management and conservation measures on ecosystem structure and function.
- Initiate a process to collect data on the impact of natural and anthropogenic impact (pollution and climate change) on the stocks, their migration and abundance.
- Document indigenous shark fishing practices, highlighting the traditional, cultural and spiritual significance of sharks to local people so as to

accommodate these issues in the development of management arrangements.

- Strengthen research on shark biology and develop appropriate methods for modelling the population dynamics of sharks in the ecosystem and develop a basis for distinguishing between natural variation and trends in the system so as to assist in understanding population status, rates of recovery, population structure and distribution.
- Develop a quantitative framework to assess the recovery of listed threatened species.
- Prepare a review of shark handling practices to identify areas of concern and possible solutions for the conservation and management of sharks.

4.7 Scientific research

- Research should pave the way for (1) bridging taxonomic gaps; (2) better understanding shark socio-economics; (3) developing SMART indicators; (4) stock assessment; and (5) moving towards ecosystem approach to fisheries.
- More than the volume of research, it is necessary that the quality of research and dissemination of research findings are ensured.
- Properly planned research needed in fishing gear technology to develop effective by-catch reduction devices, especially in the longline fisheries.
- Identification of shark hotspots and congression zones is necessary to design strategies to effectively safe guard these zones with minimum impact on fishing.
- Trade off analysis and dissemination of finding to create awareness on effective management of sharks.
- Submit periodic report to international agencies such as FAO and IOTC on progress of NPOA-Shark.

4.8 Options of regulating fishing

- Encourage fishermen to follow gear regulation and effort control through awareness building.
- Ensure effective implementation of MCS measures. Create scope for community participation in MCS, which will make implementation cost-effective.
- Identify, in consultation with the fishermen and the FSI, shark breeding grounds and season(s) and encourage them to avoid these places through awareness building or through seasonal and area closure.
- Introduce logbook system starting with mechanized fishing vessels and ensure regular inspection of logbook by DoF officials.
- Develop effective shark bycatch reduction measures, such as having standard trawl opening and mesh size, and encourage adoption of those measures.
- Ensure that management arrangements for target shark species include precautionary management.
- Develop mechanism for certification of products to avoid illegal trade on protected species as well as to facilitate genuine trade in domestic and export markets.

- Address fear of the community in reporting catching of protected species accidentally.
- Introduce a community education strategy aimed at the general public, commercial, and indigenous fishermen and raise national awareness of the vulnerability of sharks and in particular their role in the marine ecosystem, current threats and status.
- Educate resource users about the rationale for and use of recorded shark catch data.
- Develop awareness amongst all resource users of the protected and threatened species provisions, reporting requirements and penalties.
- Encourage use of techniques to improve shark species identification (for example, use of photos, retention of rare species for confirmation of species identification), by user groups.
- Engage print media effectively and make full use of the electronic and social media to create awareness.

4.9 Encouragement of full utilization of dead sharks

Sharks are usually fully utilized in India, as shark meat is popular in many parts of the coastal India in both fresh and dried forms. Dried shark meat also finds market in hinterland areas of the country, especially in the north-Eastern States. However, the following action may be considered:

- Livelihoods of people dependent on sharks should be taken into consideration while implementing NPOA-Shark.
- To measure the full extent of dependency on sharks, an additional set of questionnaires in the National Marine Fisheries Census proposed to be held during December 2015 to January 2016 should be added. The questionnaire should cover gear and vessel use for shark fishery; role in shark fishery; proportion of time spent in shark fishing and proportion of income received from shark fishing.
- Posters of species which can be finned and exported without any detrimental impact should be placed in the fishing harbours and Fish Landing Centres of major shark landing areas.
- Given the difficulties in species identification, trained staff from the DoF/MPEDA should be deputed to certify shark catches fit for finning.
- Encourage value addition in shark products.

4.10 Biodiversity and ecological considerations

- Fisheries policies at Union and State level should adopt EAF for designing fisheries policies.
- Improve monitoring of anthropogenic impact on fisheries resources and habitats.
- Improve monitoring of reefs and reef-based fisheries resources and discourages uses of reef for dumping.
- Encourage eco-tourism; shark dives with the active participation and building of entrepreneurial skill among marginalised local communities including fishermen.
- Consider development and regular updating of ecosystem health indicators.

- Encourage research on impact of climate change and pollution on ecosystem.

4.11 Regional cooperation

- Regional cooperation is a must for ensuring optimal results from national efforts as many shark species are shared and straddling stocks.
- Consider contributing to development of a Regional Plan of Action for Management of Sharks (RPOA-Sharks) through information exchange; policy dialogues; multilateral and bilateral forums and collaborative research.
- Create national agreement on scope of regional cooperation and develop protocols for regional cooperation and share the same in international and regional forum to reach regional agreement.
- Along with fisheries; create regional drive on environmental issues, especially on the health of oceanic ecosystem.
- Raise the issue of need of regional cooperation in management of sharks in political and development forums such as the South Asian Association for Regional Cooperation (SAARC); Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) and Indian Ocean Rim Association (IORA).
- Actively participate in international and regional fisheries and environmental forums such as FAO, IOTC, Asia-Pacific Fishery Commission (APFIC), South Asia Cooperative Environment Programme (SACEP), Southeast Asian Fisheries Development Centre (SEAFDEC), BOBP-IGO, and IUCN and share policy initiative and scientific findings.
- Encourage discussion of fisheries issue as a part of Governmental initiative towards South-South Cooperation.

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4.12 Implementation Framework for National Plan of Action for Conservation and Management of Sharks (Years 1-3)

#	Activity	Description of Activity	Responsible Agency/Person (Proposed)	Indicator(s) of Progress	Associated Actions/Issues/Risks	Approximate Cost (Rs.)
1. Preparatory Activities (01 – 06 Months)						
1.	***Acceptance and notification on Implementation of the National Plan of Action for Conservation and Management of Sharks (NPOA-Sharks).***	The first and foremost requirement is to ensure the acceptance (ownership) of the NPOA-Sharks. In line with the Allocation of Business Rule of the Government of India, the Ministry of Agriculture and Farmers Welfare (MAFW) through Fisheries Division of Department of Animal Husbandry, Dairying and Fisheries (DAHD&F) will be the lead Government agency and assume the responsibility of implementing the NPOA-Sharks.	Joint Secretary (Fisheries), DAHD&F.	• Notification of NPOA-Sharks, including its Implementation Plan. • Nomination of Focal Point in DAHD&F and a core team for day-to-day implementation work. • Setting up of coordination mechanism with relevant Government and Non-government Organizations/ Agencies.	Involvement of multiple Ministries/Departments that deal with aspects such as conservation (the Ministry of Environment, Forest & Climate Change– MoEF&CC; the Ministry of Commerce and Industry– MoCI; Ministry of Defense through the Indian Coast Guard- ICG; Ministry of Home Affairs for involvement of Coastal Marine Police- CMP; Department of Fisheries-DoF of the coastal States/Union Territories(UTs); concerned Non-Governmental Organizations (NGOs) and Community-Based Organizations (CBOs); and Representatives of Fisher Associations/Cooperatives.	5,00,000.00
2.	***Setting up of an Inter-Ministerial Coordination Committee.***	This activity should be carried out simultaneously with Activity #1. The purpose of this activity is to mitigate the risk of working in a multi-agency environment. In addition, this activity will ensure oversight of the implementation process.	Secretary (DAHD&F); Joint Secretary (Fisheries, DAHD&F); Secretary (MoEF&CC); Chairperson, MPEDA; Director General, ICAR; Joint Secretary (Borders), MHA; Inspector General of Forests (WL); Secretary/Director of Fisheries of all coastal States/ UTs; The Chief Wildlife Warden of all Coastal States.	• Order issued on setting up of the Committee along with the Terms of Reference. • Minutes of the Meetings.	Relative importance of sharks in overall scope of work of the Ministries/Departments is low.	0.00

3.	***Publication of National Shark Identification kit or Guide.***	Preparation of the National Shark identification Kit or Guidelines. The document *inter alia* contains relevant details of the species and their local names. From the user perspective, the document should comprise two parts: species allowed to catch and species prohibited for catching. Currently, CMFRI recorded 160 species of sharks. If it is not possible to collect information on all of them, species not allowed to catch should be prioritized.	Central Marine Fisheries Research Institute-CMFRI; Fishery Survey of India- FSI; DoFs; Fisher Associations/ Cooperatives CMFRI, FSI and DoF to collaborate to prepare the guide and to collect information on local names.	• Publication of the Guide. • Distribution of copies of the guide to all users.	Mislabeling; lack of coordination amongst different agencies; lack of information to generate details. Low priority by the R&D Institutions.	15,00,000.00
1. Preparatory Activities						***20,00,000.00***
2. Setting up of MCS Frameworks (01 – 36 Months)						
4.	***Notification on Implementation of the National Plan of Action on Monitoring, Control and Surveillance (NPOA-MCS).***	The NPOA-MCS was finalized and agreed through a National-level Workshop held in Chennai in December 2010. Many aspects of implementation of NPOA-Sharks, such as gear regulation, data collection, protected areas, etc. will depend on the implementation of the provisions under the NPOA-MCS.	Secretary (DAHD&F); Joint Secretary (Fisheries, DAHD&F); Indian Coast Guard; Ministry of Home Affairs; DoF; Coastal Police; Fisher associations/ Cooperatives.	• Notification of the NPOA-MCS, including its Implementation Plan. • Setting up of an empowered committee to oversee the implementation of the NPOA-MCS. • Setting up of a MCS Cell in DAHD&F for day-to-day implementation work. • Setting up of coordination mechanism with relevant Government and Non-government	Involvement of multiple Ministries/Departments that would be dealing with different aspects of MCS, such as Ministry of Defense through the ICG; Ministry of Home Affairs for involvement of Coastal Marine Police- CMP; DoF of the coastal States/UTs; concerned NGOs/CBOs; and Representatives of Fisher Associations/Cooperatives. Multi-agency coordination and networking.	5,00,000.00

				Organizations/ Agencies.		
5.	***Setting up of MCS Division at the Central level (MoA&FW) and in each coastal State and UT for effective implementation of the scheme.***	Attachment 1 provides the details.	-Do-	• Notification/Order. • Placement of staff.	Coordination and networking to ensure smooth functioning in a multi-agency environment. Sanction of additional posts, if required.	20,00,00,000.00
6.	***Establishment and maintenance of systems for acquisition, storage and dissemination of MCS data.***	Part of standard MCS measures.	-Do-	• Notification. • Implementation of log books.	--	0.00
7.	***Promotion of industry knowledge and understanding of the need for, and their cooperative participation in, MCS activities to prevent, deter and eliminate IUU fishing.***	Building awareness amongst stakeholder on the importance of MCS and how it will help fisheries business, especially the small-scale fishermen.	-Do-	• Annual MCS Reports. • Number of consultations and awareness programmes held.	--	0.00
8.	***Planning and provision of funds for MCS operations.***	A dedicated funding mechanism is needed as MCS is a continual process. It is suggested that an appropriate scheme is designed to implement MCS system.	DAHD&F;ICG; DoF	• Budget Plan/ Scheme	Approval of the Niti Aayog and Ministry of Finance.	Budget to be identified based on the scope and extent of the scheme.
9.	***Provision of training and education to all persons involved in MCS operations.***	To build human resources	DAHD&F; DoF; ICG; MPEDA; Bay of Bengal Programme Inter-Governmental Organization (BOBP-IGO).	• Training programmes conducted (nos). • Persons trained (nos).	--	-Do-
10.	***Implementation of Vessel Monitoring System (VMS).***	To ensure fishing is carried out in accordance with the license.	DAHD&F; MHA; DoF; ICG.	• Annual MCS Reports.	Availability of dedicated satellite for the purpose.	-Do-
11.	***Implementation of log book system.***	To encourage recording of catch and self-reporting by	DAHD&F; DoF; ICG; CMFRI/FSI (for	• Preparation log books and their	Cooperation of DoF; Fisher Associations/Cooperatives in	-Do-

		the fishermen. This is especially essential for mechanized fishing vessels.	designing of logbook and data processing).	translation in vernacular. • Annual MCS Reports.	recording of catch information through use of log books.	
12.	***Maintenance of records of all boat building yards and their operation and construction of boats.***	This would help is ensuring the quality and safety of fishing vessels as well as a tools for verification of new fishing vessels being constructed. In the long-run also an effective mechanism for input control.	DAHD&F; DoF.	• Notification. • Coverage of boatyards in the registration scheme. • Annual MCS Reports.	-Do-	-Do-
13.	***Record of fishing vessels.***	Maintenance of records of all vessels (through appropriate registration and licensing) and their current owners and operators authorized to undertake fishing subject to their jurisdiction	DAHD&F; DoF.	• Coverage of boatyards in the registration scheme. • Annual MCS Reports.	-Do-	-Do-
14.	***Review of policies and Acts and preparation of a Joint Policy Paper.***	The review needs to be done from two perspectives: (1) whether existing policies and Acts including Marine Fishing Regulation Acts and Wildlife (Protection) Act, 1972 are sufficient to cover for international institutional requirements that India is party to; and (2) whether existing policies and Acts are creating hurdles for livelihood development of fishermen and fisheries sector.	Concerned Ministries may set up Committee comprising experts and stakeholders to deliberate over the issues.	• Notification. • Harmonized national policies and laws with international instruments/ arrangements. • Review Reports.	Revision/formulation of new policies and or laws are usually time-consuming and multi-stakeholder exercises. Building consensus in such an environment can be hurdle.	10,00,000.00
2. Setting up of MCS Frameworks						***20,15,00,000.00***
3. Human resources and capacity building requirements (06 – 12 Months)						
15.	***Building better taxonomic skills of field investigators; scientists.***	Sharks are one of the little known species in terms of taxonomy. India has poor species-wise data collection system and objective of this activity is to improve the scenario.	DAHD&F/CMFRI/FSI/ FAO/ Universities/National Bureau of Fish Genetic Resources (NBFGR)	• Training Plans. • Reports	--	50,00,000.00
16.	***Building skill on data collection techniques for***	This is a training programme on sampling and data collection. Different agencies	DAHD&F/CMFRI/FSI/ DoF.	• Agreement between different agencies.	--	50,00,000.00

	field investigators.	collecting primary data report considerably different estimates. The objectives is to develop the skill to standardize data collection system.		• Reports.		
17.	***Awareness building of fishermen and leadership building for monitoring fisheries activities.***	Fishermen are often not clear of the ecological importance of sharks and questions need for conserving shark specifically. In addition, to effectively integrate them with the monitoring system, training should be provided to build leadership skills and participatory skills	BOBP-IGO/ CMFRI/FSI/DoF/NGO/ CBO.	• Agreement between different agencies. • Reports	--	80,00,000.00
18.	***Training programme on Code on Conduct for Responsible Fisheries and EAF***	The objective of this programme is to improve the understanding of sustainable fishing practices and global instruments; appreciating need for better management measures for fisheries; develop skills for extension to fishermen.	BOBP-IGO/ CMFRI/FSI/DoF	• Report of Training programmes; • Pre and post training evaluations		30,00,000.00
3. Human resources and capacity building requirements						***2,10,00,000.00***
4. Management, research, ecological and biodiversity related requirements (04 – 36 Months)						
19.	***Developing methodology and indicators for rapid assessment of status of different shark species.***	Suitable methodology, based on available data and flow of data from ongoing research activities is needed to be developed. At the same time SMART indicators should be a part of this methodology. The indicators should be interpretable by lay person.	CMFRI/FSI/FAO/Universities/NBFGR.	• Reports. • Peer-reviewed papers.	Balancing scientific rigor with available resources.	10,00,000.00
20.	***Identification of shark hotspots and congression zones.***	Identification of shark hotspots and congression zones is necessary to design strategies to effectively safe guard these zones with minimum impact on fishing	CMFRI/FSI/ Universities	• Reports. • Peer-reviewed papers.	On-going activity of CMFRI.	0.00

21.	***Developing DNA sequences of all species and establish DNA referral library.***	To resolve taxonomic ambiguities	CMFRI/FSI/FAO/ Universities/NBFGR	• Reports. • Peer-reviewed papers.	On-going activity of NBFGR.	50,00,000.00
22.	***Evaluating methodologies for risk assessment and adopting a single national risk assessment framework, consistent across species and fisheries.***	This activity will ensure consistent reporting.	CMFRI/FSI/FAO/ Universities	• Reports	--	5,00,000.00
23.	***Revalidating species listing under different vulnerability categories; and revise the status, if necessary***	There is a long standing demand from fishermen to revalidate the status of different species. In addition, this activity is necessary to meet CITES trade requirements; if in future India likes to review its trade policies. This activity will also include setting benchmarks at species-level against which the status will be compared. CMFRI has in the past carried out a similar exercise.	CMFRI/FSI/ Universities/DAHD&F/ MPEDA/Fishermen Associations	• Reports. • Peer-reviewed papers.	--	10,00,000.00
24.	***Developing effective shark by-catch reduction measures.***	Since majority of sharks land as by-catch, without a viable strategy controlling shark catch will be difficult. Part of the problem will be addressed if and only if there is a better MCS system. However, at the same time options should be explored to design better gear – eco-friendly but with comparable catching efficiency of existing gear. In longline, more studies are needed on use of 'J' hooks versus 'O' hooks	CMFRI/FSI/ Universities/DAHD&F/ MPEDA/Fishermen Associations	• Reports. • Peer-reviewed papers.	Acceptance by fishermen	5,00,000.00

25.	***Review of shark trade policies.***	Although shark fin trade is a small percentage of the total revenue from fish trade; the uniqueness of shark in creating multiple times revenue in post-harvest should be noted. This is also an important activity for women. It also needs to ascertain that whether such policies will be actually benefitting the stocks as most sharks are landed as a by-catch.	CMFRI/FSI/ Universities/DAHD&F/ MPEDA/Fishermen Associations /Merchants/ BOBP-IGO	• Reports. • Peer-reviewed papers.	--	5,00,000.00
26.	***Research on value addition from sharks.***	The IPOA-Shark emphasis on full-utilization of sharks.	NIFPHTT/Universities	• Reports • Field trials	--	3,00,000.00
27.	***Creation of awareness material.***	Creation of awareness material for fishermen and policy makers	CMFRI/FSI/ Universities/DAHD&F/ MPEDA/Fishermen Associations/ BOBP-IGO	• Distribution of Material	--	20,00,000.00
28.	***Assessment of NPOA-Shark.***	This is the final activity to review the progress under NPOA-Shark and revise the Plan accordingly	FAO/IOTC/BOBP-IGO	• Report	--	0.00
4. Management, research, ecological and biodiversity related requirements						***1,08,00,000.00***
5. Building regional cooperation (6 – 36 Months)						
29.	***Contribution towards development of RPOA-Sharks.***	Many shark species, especially the large pelagic sharks are straddling and shared stocks. Therefore, it is beyond the scope of a country to manage them successfully without regional cooperation. IOTC is the concerned fisheries management agency with the power to implement a regional management plan. In addition, IOTC also covers areas, which are most important for management of sharks in the region. Apart from IOTC, other regional fisheries and environmental agencies will	DAHD&F; MPEDA; MOEF&CC; FAO/ APFIC; BOBP-IGO; IOTC; IUCN; WWF; SACEP; Conservation International (CI)	• Meeting Reports. • RPOA-Shark in place.	Will require multi-country and multi-agency cooperation.	5,00,000.00

		also play an important role in policy harmonization, capacity building and development of information base. These agencies are BOBP-IGO; SEAFDEC; APFIC and SACEP. The activity includes participation in regional consultation; working towards policy harmonization and sharing of information. RPOA-shark is also highlighted as important by fishermen community				
30.	***Development of regional collaborative research and information exchange protocols.***	The aim of this activity is to promote south-south cooperation in information exchange and research. However, since most of the research and information generated for research or through research are proprietary assets; agencies are not often agreeable to share them. In case of collaborative research; funding is a major issue. It is proposed that DAHD&F will carry out first an internal discussion with national agencies and develop a strategy for regional cooperation. This strategy then can be presented for larger consideration through different regional forums including BOBP-IGO; APFIC and IOTC towards development of an agreed regional protocol.	DAHD&F; ICAR; MPEDA; MOEF&CC; APFIC; BOBP-IGO; IOTC; IUCN; WWF; SACEP; CI.	• Agreement on Regional Research and Information Exchange Protocol adopted. • Interim: MoU between regional research institutes.	While there are many examples of North-South Cooperation and South-South Cooperation through external funding; prior example of South-South Cooperation with self-funding/national funding are scanty. Cost for this activity is towards arrangement of meetings at national and regional level.	10,00,000.00
31.	***Reporting to IOTC/FAO/CITES on the progress of NPOA-Sharks.***	The objective of this activity is to inform the international community on India's efforts, which is necessary (i) to demonstrate India's	DAHD&F; FSI; CMFRI; MPEDA; MOEF&CC; BOBP-IGO.	• Participation in international events and presentation of reports in	--	5,00,000.00

		commitment towards global sustainability initiatives; (ii) informing global community about the challenges being faced and efforts to overcome them; and (iii) receiving feedback from international community to improve implementation.		appropriate forums.		
32.	***Building required political environment in support of regional action through regional forums***	Apart from regional fisheries and environmental organizations; regional political and development organizations may also be considered for involvement to create the necessary political and developmental mandate to support RPOA-Shark. Such political and development agencies are South Asian Association for Regional Cooperation (SAARC); Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC); Indian Ocean Rim Association (IORA)	Ministry of External Affairs; DAHD&F; BOBP-IGO (Advocacy); IUCN (Advocacy); WWF (Advocacy).	• Adoption of regional resolutions.	--	
5. Building regional cooperation						***20,00,000.00***
Total (1 – 5)						**23,73,00,000.00**
In US$						**3,650,769.23**

4.13 Time-Plan for Implementation of NPOA-Sharks

#	Activity	Months																																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
1.	***Notifying ownership of the Plan***																																				
2.	***Setting up of an Inter-Ministerial Coordination Committee***																																				
3.	***Publication of National shark Identification kit***																																				
4.	***Policy decision on setting up of an effective MCS framework***																																				
5.	***Setting up of MCS Division***																																				
6.	***Establishment and maintenance of systems for acquisition, storage and dissemination of MCS data***																																				
7.	***Promotion of industry knowledge and understanding on MCS activities***																																				
8.	***Planning and funding MCS operations***																																				
9.	***Provision of training and education to all persons involved in MCS operations***																																				
10.	***Implementation of Vessel Monitoring System (VMS)***																																				
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12.	***Maintenance of records of all boat building yards***																																				
13.	***Record of fishing vessels***																																				
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30.	***Reporting to IOTC/FAO/CITES on the progress of NPOA-Sharks***																																				
31.	***Building required political environment in support of regional action through regional forums***																																				

4.14 Establishment of an MCS Division at the Ministry of Agriculture and Farmers Welfare (Department of Animal Husbandry, Dairying and Fisheries - DAHDF) and at the Coastal States/Union Territories Level

An MCS Division should be set up at all levels. The MCS Division will be headed by an officer in the rank of Joint Commissioner. Under him/her there will be one (01) Deputy Commissioner (Fisheries Management) and one (01) Assistant Commissioner (Fisheries Management). The Division will be assisted by two Fisheries Research & Investigation Officers (FRIO), one for fisheries information system and one for fisheries management. In addition, there will be four (04) Senior Technical Assistants and one (01) Legal Officer.

The MCS Division will be responsible for maintaining a record of legal provisions on marine fisheries across the coastal states; facilitating registration and licensing of fishing vessels operating in the Territorial Waters or the EEZ; collection of information on landings and developing and maintaining a centralized database as per the international requirement; and maintaining a database of all registered fishing vessels in the country.

The MCS Division will also be responsible for coordinating the MCS Divisions in the Coastal States and Union Territories (UTs).

Establishment of an MCS Division at the Department of Fisheries (DoF) in the coastal States/UTs

In the coastal States and UTs a MCS Division will be established as per the following structure:

Joint Director	-	01
Deputy Director	-	01
Assistant Director	-	02
Inspector of Fisheries	-	04
Total	**-**	**08**

Establishment of an MCS Division at the DoF in the coastal States at the District Level

In the coastal States and UTs a MCS Division will be established under the scheme at the district level, with the following structure:

Assistant Director	-	01
Inspector of Fisheries	-	02
Total	**-**	03

Establishment of an MCS Division at the Fishing Harbour/FLCs

Each Fishing harbor/FLC will also have a MCS Unit under the scheme with the following composition:

Inspector of Fisheries	-	01
Inspector of Fisheries	-	02
Field men	-	04
Total	**-**	**07**

Note: However, the number of positions would vary depending on the size of the facility and the volume of landings.

Activities to be carried out by the MCS Division at various levels

Level	Activities	Support from the Scheme
Central	• Inter-Ministry Coordination (*e.g.* with the Ministry of Shipping, Ministry of Home Affairs, Ministry of Defense, etc); • Inter-State coordination; • Assistance in MCS activities to the coastal States and UTs (*e.g.* registration, licensing, zonation, colour coding, etc.). If required updating the Marine Fishing Regulation Act through a fresh Model Bill. • Formulation of a Central Act to regulate fishing in the EEZ; • Overseeing MCS activities within the States and UTs; • Developing and maintenance of a centralized record system for registered fishing vessels ; • Developing and maintenance of a centralized database on landings, discards, etc.; • Development and maintenance of a national record of boat building yards; gear manufacturer and fuel distributors; • Coordination with relevant authorities to implement a satellite-based VMS for fishing vessels engaged in the EEZ (> 20 meter Length Overall). • Assistance in implementation of Automatic Identification System of Fishing Vessels as designed by the Ministry of Shipping; • Implementation of the Fishermen Identity Card scheme; • Development and maintenance of a National Register of Fishermen; • Estimation of fishing capacity, maximum sustainable yield and maximum economic yield. • Carrying out training and extension activities and other capacity building activities; • Implementation of at-sea observer monitoring programme; • Development of norms for fisheries data collection; and • Legal advice.	Fully supported except the salary component.
State	• Inter-Departmental coordination (*e.g.* Coastal Marine Police) • Compilation of information collected at district-level and communicating it to the MCS Division at the Central level; • Registration of fishing vessels, boat yards, gear manufacturer and service providers (*e.g.* ice factories, cold storage, etc.) and communicating it to the MCS Division at the Central level;. • Implementation of on-shore monitoring and at-sea monitoring through observer programme; and • Development and maintenance of a State-level	• Capacity-building; • Funding for development and maintenance of database.

	database on fishermen, fishing craft, fishing gear and fisheries infrastructure and service providers.	
District	• Registration and licensing of fishing vessels; • Inventorization and registration of boat building yards, ice plants; cold storage, etc; • Coordination with Coast Guard, Coastal Marine Police on Search and Rescue Operations; • On-shore monitoring of landings (through log books) and at-sea monitoring through observer programme; • On-shore surveillance and random checks for registration, licensing; gear regulation; closed season and closed area; use of fuel; etc. • Collection of information, compilation and communicating the same to the state level; and • Dissemination of weather warnings and catch-related information.	• Capacity building; • Funding for development of data collection mechanism.
Fishing Harbours/ FLCs	• Coordination with Coast Guard, Coastal Marine Police on Search and Rescue Operations; • Registration and licensing of fishing vessels; • On-shore monitoring of landings and through log books; • On-shore surveillance and random checks for registration, licensing; gear regulation; closed season and closed area; use of fuel, etc; • Collection of information, compilation and communicating the same to the district level; and • Dissemination of weather warnings and catch-related information.	• Capacity building; • Funds for development data collection mechanism. • Development of infrastructure at Fishing Harbours and FLCs for setting up of office.

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5.0 Annexures

Annexure 1: Terms of Reference for the collaborative work between the Bay of Bengal Large Marine Ecosystem Project and the Bay of Bengal Programme Inter-governmental Organisation

Major outputs:

Socio-economic assessment of shark targeting fisheries in Kanyakumari District, Tamil Nadu and Veraval in Gujarat: It will cover aspects such as number of fishers and others involved in auxiliary activities, ownership of boats and gear and other assets, alternative livelihood opportunities, migration and its implications, fishing (areas, boats, gears, shark landings targeted and by catch, landings (species, quantities, values), fish utilization (preservations, processing, marketing channels and destinations, etc). The study will also highlight fishers' perceptions on important issues to be considered in managing the shark fisheries.

A draft National Plan of Action (NPOA) for shark conservation and management as the basis for a future agreed official NPOA-sharks: The extent to which this is successfully completed will be measured against the contents of FAO's international plan, other national plans from the region and the degree of endorsement from different stakeholder groups.

Main activities:

- Compilation of references and information on shark fisheries in India including fishing methods, fishing areas, fishing groups, catch, stock/resource assessments, post- harvest and marketing details from available sources and preparing a review report.
- Field visits and detailed consultations with two shark fishing groups: one in Thoothoor, Kanniyakumari (Tamil Nadu) and another in Veraval, Gujarat and developing detailed case studies covering targeted fisheries, by catch, broader socio-economic context including livelihoods and shark disposal methods (post-harvest and trade), and migration and its implications. Focus group discussions and other participatory methodologies will be utilised.
- Procuring and distributing copies of CMFRI Shark Manual to BOBLME countries and SEAFDEC.
- One day consultation with shark traders based in Chennai.
- Three days (national level) stakeholder consultation on developing the National Plan of Action for Sharks.
- Developing the draft National Plan of Action on Sharks based on the outcomes of the case studies and consultations.

***

Annexure 2: Policy on prohibition of "finning" of Shark fins in the sea

F.No.4-36/2013 WL
Government of India
Ministry of Environment and Forests
(Wildlife Division)

Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi-110 003

Dated: 24 August 2013

Policy Circular

***

Subject: Policy on prohibition of "finning" of Shark fins in the sea.

The Wild Life (Protection) Act, 1972, has been enacted by the Parliament of the purpose of according protection of wildlife and their habitat in the country. The Act also has six schedules. Various wildlife species are categorized into these Schedules based on their prevailing threat status and providing different degrees of protection to the species therein.

Whereas, India is known to be home to about 40-60 species of sharks, many of them assessed as threatened, ten species of the critically endangered Sharks and Rays are listed under the schedule-I of the Act according them highest degree of protection;

Whereas, Section 9 of the Wild Life (Protection) Act, 1972 prohibits hunting of any wild animal specified in Schedule-I, II, III, IV, except in provisions provided under Section 11 and 12 of the Act;

Whereas, it has been noticed that large number of sharks have been decimated by the act of "finning" on-board the vessel in the mid-sea, and the 'de-finned' sharks are subsequently disposed in the sea.

Noting that the enforcement t of provisions of the Wild Life (Protection) Act, 1972 is extremely difficult as it is often difficult to identify the species of the shark from the fins alone, without the corresponding carcass, from which the fins have been detached;

Also *Noting* that bringing in this policy would enable the enforcement agencies to monitor the illegal hunting/poaching of the species of sharks that are listed in the Schedule-I of the Wild Life (Protection) Act, 1972;

It is expedient for the Ministry of Environment and Forests to prohibit removal of shark fins on board a vessel in the sea.

Any possession of shark fins that are not naturally attached to the body of a shark, would amount to "hunting" of a Schedule-I species and thereby, attracting penal provisions under Section 51 of the Act. Further, in accordance with Section 57 of the Act, the burden of proof for unlawful possession, custody, control of such animal, animal article, meat etc, shall lie on the accused.

All the concerned State Government shall strictly implement this policy initiative through appropriate legislative, enforcement and other measures.

This issues with the approval of competent authority.

(Vivek Saxena)
Deputy Inspector General of Fests (WL)

Distribution

1. The Chief Secretary, all Coastal States
2. The Joint Secretary (Fisheries), Ministry of Agriculture, Krishi Bhawan, New Delhi
3. The Addl. Director, WCCB, New Delhi
4. The Principal Secretary (Fisheries), all Coastal States
5. The Principal Secretary (Forests), all Coastal States
6. The Chief Wildlife Warden, all Coastal States
7. The Director (Fisheries), all Coastal States.

Copy to:

1. PS to Hon'ble Minister of State (Independent Charge) for Environment and Forests.
2. PPS to Secretary (E&F), MoEF
3. PPS to DGF & SS, MoEF
4. PPS to Addl. DGF(WL), MoEF
5. PPS to IGF(WL), MoEF
6. PS to JD(WL)
7. Technical Director, NIC with a request to kindly upload this circular in the MoEF website.

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Annexure 3: Prohibition on export of Shark fins of all species of Shark

(To be published in the Gazette of India Extraordinary Part-II, Section - 3, Sub-Section (ii))

Government of India
Ministry of Commerce & Industry
Department of Commerce
Udyog Bhawan

Notification No 110 (RE – 2013)/2009-2014
New Delhi, Dated: 6 February, 2015

Subject: Prohibition on export of Shark fins of all species of Shark.

S.O.(E) In exercise of the powers conferred by Section 5 of the Foreign Trade (Development & Regulation) Act, 1992 (No.22 of 1992) read with Para 1.3 of the Foreign Trade Policy, 2009-2014 (as amended from time to time), the Central Government, with immediate effect, hereby inserts a new entry at Sl. No. 31 A in Chapter 3 of Schedule 2 of ITC(HS) Classification of Export & Import Items, as under:

Chapter 3

Fish and Crustaceans, Molluscs and other Aquatic Invertebrates

S. No	Tariff Item HS Code	Unit	Item Description	Export Policy	Nature of Restriction
31A	03057100	Kg	Shark fins of all species of shark	Prohibited	Not permitted to be exported

2. Effect of this notification:

Export of Shark fins of all species of Shark has been prohibited.

(Pravir Kumar)
Director General of Foreign Trade
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(Issued from F.No.01/91/171/12/AM05/PC-III/Export Cell)

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Annexure 4: Amendment in import policy conditions of Shark fins

To be published in the Gazette of India Extraordinary Part-II, Section - 3, Sub-Section (ii)

Government of India
Ministry of Commerce & Industry
Department of Commerce
Udyog Bhawan, New Delhi

Notification No 111/(RE – 2013)/2009-2014
Dated the 6th February, 2015

Subject: Amendment in import policy conditions of Shark fins under ITC (HS) 0305 71 00 of Chapter 03 of ITC (HS), 2012 – Schedule – 1 (Import Policy).

S.O.(E): In exercise of powers conferred by Section 3 of FT (D&R) Act, 1992, read with paragraph 1.3 and 2.1 of the Foreign Trade Policy, 2009-2014, the Central Government hereby makes the following amendment to the Import Policy Conditions in Schedule – I of ITC (HS), 2012 EXIM code 0305 71 00, as under:

Exim Code	Item Description	Existing Policy	Revised Policy
0305 71 00	Shark fins	Free	Prohibited

3. Effect of this notification: Import policy of the item 'Shark fins' covered under EXIM Code 0305 71 00 is changed from 'free' to 'prohibited'.

(Pravir Kumar)
Director General of Foreign Trade
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[Issued from File No.01/89/180/118/AM-02/PC-2 (A)]

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Annexure 5: International Instruments (Binding and Non-binding) Concerning Conservation of Management of Shark Fisheries

1.0 United Nations Convention on the Law of the Sea (UNCLOS), 1982

UNCLOS was adopted in 1982 and came into force on 16 November 1996 (www.unclos.com). It provides a framework for the conservation and management of fisheries and other uses of the seas by giving coastal States rights and responsibilities for the management and use of fishery resources within their national jurisdictions. With regard to fisheries, the Convention establishes a regime for the conservation and management of fisheries resources on two bases. First, on the basis of the area they occupy (the internal waters, archipelagic waters, and territorial seas, exclusive economic zones, continental shelf areas and high seas), and, second, on the types of fish stocks (straddling stocks, highly migratory species, shared species (***Figure 1***) that occur in them. States are required to conserve and manage living marine resources in the areas that are within their jurisdiction or the areas over which they exercise sovereign rights. States are also required to cooperate to conserve and manage specific stocks, particularly straddling fish stocks and highly migratory species without prejudice to the rights of the coastal state where such stocks occur within their jurisdiction or in areas where the coastal state exercises sovereign rights. Coastal States are also required to consider the effects of fishing on associated and dependent species (Article 61(4)). The management goal adopted by UNCLOS (Article 61(3)) is that of maximum sustainable yield, qualified by environmental and economic factors. UNCLOS provisions of direct relevance to the conservation and management of sharks include the duty placed on coastal States to ensure that the stocks occurring within waters under their jurisdiction are not endangered by over-exploitation.[33].

Annex I of UNCLOS 1982 has listed several oceanic sharks (***Table 1***). Art. 64 of UNCLOS, reads that "The coastal State and other States whose nationals fish in the region for the highly migratory species listed in Annex I shall cooperate directly or through appropriate international organizations with a view to ensuring conservation and promoting the objective of optimum utilization of such species throughout the region, both within and beyond the exclusive economic zone. In regions for which no appropriate international organization exists, the coastal State and other States whose nationals harvest these species in the region shall cooperate to establish such an organization and participate in its work."

[33] ***Fisheries and Aquaculture topics. The United Nations Convention on the Law of the Sea. Topics Fact Sheets. Text by William Edeson. In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 27 May 2005. [Cited 1 September 2015]. http://www.fao.org/fishery/topic/14839/en***

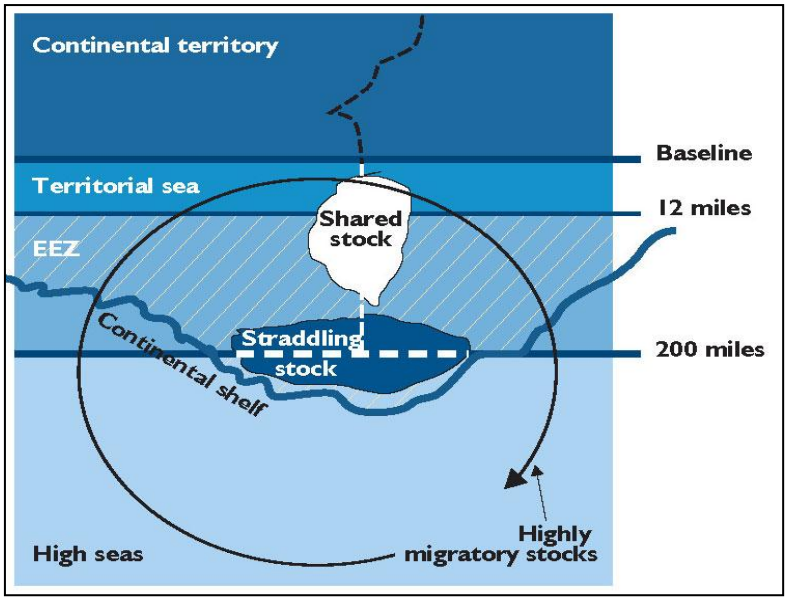

Figure 1: Shared, straddling and highly migratory stocks as defined by UNCLOS

Table 1: Shark species listed in UNCLOS Annex 1, Highly Migratory Species

Migratory / possibly migratory sharks listed in UNCLOS Annex 1, Highly Migratory Species		
Hexanchus griseus	*Carcharhinus isodon*	*Prionace glauca*
Cetorhinus maximus	*Carcharhinus leucas*	*Rhizoprionodon acutus*
Family Alopiidae	*Carcharhinus limbatus*	*Rhizoprionodon terraenovae*
Alopias pelagicus	*Carcharhinus longimanus*	Family Isurida (now Family Lamnidae)
Alopias superciliosus	*Carcharhinus macloti*	
Alopias vulpinus	*Carcharhinus melanopterus*	*Carcharodon carcharias*
Rhincodon typus	*Carcharhinus obscurus*	*Lamna ditropis*
Family Carcharhinidae[5]	*Carcharhinus perezi*	*Lamna nasus*
Carcharhinus acronotus	*Carcharhinus plumbeus*	*Isurus oxyrinchus*
Carcharhinus albimarginatus	*Carcharhinus porosus*	*Isurus paucus*
Carcharhinus altimus	*Carcharhinus sealei*	Family Sphyrnidae
Carcharhinus amblyrhynchoides	*Carcharhinus signatus*	*Eusphyra blochii*
Carcharhinus amblyrhynchos	*Carcharhinus sorrah*	*Sphyrna corona*
Carcharhinus amboinensis	*Galeocerdo cuvier*	*Sphyrna lewini*
Carcharhinus brachyurus	*Isogomphodon oxyrhynchus*	*Sphyrna media*
Carcharhinus brevipinna	*Lamiopsis temmincki*	*Sphyrna mokarran*
Carcharhinus dussumieri	*Nasolamia velox*	*Sphyrna tiburo*
Carcharhinus falciformis	*Negaprion acutidens*	*Sphyrna tudes*
Carcharhinus galapagensis	*Negaprion brevirostris*	*Sphyrna zygaena*

Source: FOWLER, S. (2014). The Conservation Status of Migratory Sharks. UNEP/CMS Secretariat, Bonn, Germany. 30 pages.

Summing up, UNCLOS specifies that it is the responsibility of the state to use its marine resources sustainably. In case of migratory or straddling stocks, the states should cooperate with each other or through appropriate forum for sustainable use of such species.

2.0 FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, 1993 (FAO Compliance Agreement)

The FAO Compliance Agreement calls upon States to take effective action, consistent with international law, to deter reflagging of vessels by their nationals as a means of avoiding compliance with applicable conservation and management rules for fishing activities on the high seas, compliment the basic principles developed in UNCLOS and CITES (mentioned below). The Agreement defines some key terms such as "vessels", "conservation measures", "length", etc. The Agreement also provisionally exempts fishing vessels of less than 24 metres in length entitled to fly its flag from the application of this Agreement. The Agreement also specifies responsibility of flag states, maintenance of records, international cooperation and exchange of information. Such measures are important to ensure traceability and legality of fishing operation and curbing illegal, unreported and unregulated fishing.

Article III of the Agreement has set out the responsibilities of the flag state. It places an obligation on the flag state to take "*such measures as may be necessary to ensure that fishing vessels entitled to fly its flag do not engage in any activity that undermines the effectiveness of international conservation and management measures*" (paragraph 1 a). It continues: "*In particular, no Party shall allow any fishing vessel entitled to fly its flag to be used for fishing on the high seas unless it has been authorized to be so used by the appropriate authority or authorities of that Party. A fishing vessel so authorized shall fish in accordance with the conditions of the authorization.*" (Article III 2).

Further duties are imposed to give content to these basic obligations, including provisions concerning: not granting an authorization unless the flag state is able to exercise effectively its responsibilities in respect of the vessel, non-authorization of a vessel still under suspension, the requirement that vessel be marked so as to be readily identified in accordance with generally accepted standards (such as the FAO vessel marking scheme[34]), supplying information on the operations of a vessel, and the imposition of sufficiently grave sanctions as to be effective in securing compliance with requirements of the Agreement.

Summing up, the FAO Compliance Agreement specifies the measures that should be taken by a flag state to ensure that fishing vessels flying its flag do not contravene the international conservation measures as applicable in concerned high seas. The Agreement in a way set limits on expansion of fishing fleet of a coastal state by stipulating that flag state should not grant an authorization unless the concerned flag state is able to exercise effectively its responsibilities in respect of the vessel. That is the authorization should be limited by the capacity of the monitoring, control and surveillance system of the state.

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[34] The UN Fish Stocks Agreement, in Article 18.3 (d), includes the marking of fishing gear.

3.0 Agreement for the implementation of the provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the conservation and management of straddling fish stocks and highly migratory fish stocks, 1995 (UN Fish Stocks Agreement)

The Fish Stocks Agreement elaborates general principles concerning conservation and management of straddling fish stocks and highly migratory fish stocks by setting out detailed mechanisms for cooperation between coastal and fishing States, including the establishment of regional fisheries arrangements or organisations. Adopted in 1995, it received its 30th ratification in November 2001 and came into force 30 days later in December 2001, thus establishing firm rules and conservation measures for high seas fishery resources. The Agreement provides that coastal States and States fishing on the high seas are required to promote the objective of optimum utilization of straddling fish stocks and highly migratory fish stocks. It is also stipulated that the best scientific evidence available shall guide the adoption by States of conservation and management measures for straddling fish stocks and highly migratory fish stocks.

The Agreement recommends use of precautionary reference points in conservation and management of straddling fish stocks and highly fish stocks. Two types of reference points are specified: (1) conservation or limit reference points and (2) management or target reference points. Limit reference points set boundaries which are intended to constrain harvesting within safe biological limits within which the stocks can produce MSY. Target reference points are intended to meet management objectives, such as long-term sustainability of the target stocks, as well as conservation of associated or dependent species. They point to a state of a fishery or a resource that is considered to be desirable.

The Agreement requires coastal States and States fishing on the high seas to assess the impact of fishing and other human activities, as well as environmental factors on target stocks and on species belonging to the same ecosystem or dependent upon or associated with the target stocks, and to adopt where necessary, conservation and management measures for these species, with a view toward maintaining or restoring their populations above levels at which their reproduction may become seriously threatened.

Summing up, the UN Fish Stock Agreement sets the condition for exploiting straddling fish stocks and highly migratory fish stocks through use of precautionary limits and regional cooperation. The Agreement also set the conditions for maintaining the ecosystem and establishing a mechanism for monitoring it.

4.0 The United Nations Conference on Environment and Development (UNCED): Agenda-21

Agenda 21 is a non-binding and voluntarily implemented action plan of the UN related to sustainable development, adopted during the UNCED in Rio de Janeiro, Brazil, in 1992. Chapter 17 of Agenda 21 deals with the protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and sees the protection, rational use and development of their living resources as central to marine fisheries and aquaculture. It includes provisions for: (i) integrated management and sustainable development of

coastal areas, including EEZs; (ii) marine environmental protection; (iii) sustainable use and conservation of marine living resources of the high seas; (iv) sustainable use and conservation of marine living resources under national jurisdiction; (v) addressing critical uncertainties for the management of the marine environment and climate change; (vi) strengthening international, including regional, cooperation and coordination; and (vii) sustainable development of small islands.

5.0 The 2008 and 2010 United Nations General Assembly (UNGA) Resolutions

In its 2008 Resolution on sustainable fisheries, the UNGA recognized the need for measures to promote the long-term conservation, management and sustainable use of shark populations given their vulnerability and the fact that some are threatened with extinction. It further recognized the relevance of the IPOA Sharks. It noted that basic data are still missing, that few countries have adopted an NPOA and that not all RFMOs have adopted measures for shark conservation and management. It called upon States to adopt measures urgently to implement the IPOA Sharks fully and to report regularly on shark catches. It further called on States to improve implementation of and compliance with the existing measures adopted by RFMOs, particularly the ones prohibiting shark fining. It finally requested FAO to report on the national implementation of the IPOA Sharks. In addition, in the 2010 Resolution on sustainable fisheries, the UNGA called upon RFMOs to strengthen or establish precautionary, science based conservation and management measures for sharks taken in fisheries within their convention areas – this to be done in a manner consistent with the IPOA Sharks.

6.0 The 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

One of the most significant agreements, CITES, was adopted at Washington in 1973. It came into force on 1 July 1975. The Convention protects endangered species by restricting and regulating their international trade through export permit systems. It establishes the international legal framework and procedural mechanism for the prevention of trade in endangered species and for an effective regulation of trade in certain other species. In order to ensure that the General Agreement on Tariffs and Trade (GATT) was not violated, the GATT Secretariat was consulted during the drafting process. CITES is an international agreement to which States (countries) adhere voluntarily. States that have agreed to be bound by the Convention ('joined' CITES) are known as Parties. Although CITES is legally binding on the Parties – in other words they have to implement the Convention. It does not take the place of national laws, but provides a framework to be respected by each Party. The country needs to adopt its own domestic legislation to ensure that CITES is implemented at the national level.

CITES works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-exports and introduction from the sea of species covered by the Convention has to be authorized through a licensing system. Each Party to the Convention must designate one or more Management Authorities in charge of administering that licensing system and one or more Scientific Authorities to advise them on the effects of trade on the status of the

species. The species covered by CITES are listed in three Appendices, according to the degree of protection they need.

Appendix I includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.

Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival.

The CoP, which is the supreme decision-making body of the Convention and comprises all its member States, has agreed in Resolution Conf. 9.24 (Rev. CoP16) on a set of biological and trade criteria to help determine whether a species should be included in Appendices I or II.

Appendix III contains species that are protected in at least one country and this country has requested other CITES Parties, for assistance in controlling the trade to facilitate its effort in protecting the species. Changes to Appendix III follow a distinct procedure from changes to Appendices I and II, as each Party's is entitled to make unilateral amendments to it.

The Convention applies to 'specimen of species' which is listed in the Appendices to the Convention. Under CITES, definition of species includes any species, sub-species, or a geographically separate population. This allows different populations of the same species to be considered independently for listing purposes. This also enables the parties to list a particular species or sub-species either in Appendix I or Appendix II irrespective of the fact that the particular sub-species is endangered in other parts of the world. The 'specimen' as defined under the CITES may be living or dead and includes any 'readily recognizable' part or derivative thereof. This implies that international trade in products such as ivory, skin, horns, etc. which forms the bulk of wildlife trade is covered by the Convention.

Trade regulations

Appendix-I specimens: An import permit issued by the Management Authority of the State of import is required. This may be issued only if the specimen is not to be used for primarily commercial purposes and if the import will be for purposes that are not detrimental to the survival of the species. In the case of a live animal or plant, the Scientific Authority must be satisfied that the proposed recipient is suitably equipped to house and care for it.

A permit for export or certificate for re-export issued by the Management Authority of the State of export or re-export is also required. An export permit may be issued only if the specimen was legally obtained; the trade will not be detrimental to the survival of the species; and an import permit has already been issued. A re-export certificate may be issued only if the specimen was imported in accordance with the provisions of the Convention and, in the case of a live animal or plant, if an import permit has been issued. In the case of a live animal or plant, it must be prepared and shipped to minimize any risk of injury, damage to health or cruel treatment.

Appendix-II specimens**:** A permit for export or certificate for re-export issued by the Management Authority of the State of export or re-export is required. An export permit may be issued only if the specimen was legally obtained and if the

export will not be detrimental to the survival of the species. A re-export certificate may be issued only if the specimen was imported in accordance with the Convention.

In the case of a live animal or plant, it must be prepared and shipped to minimize any risk of injury, damage to health or cruel treatment. No import permit is needed unless required by national law. In the case of specimens introduced from the sea, a certificate has to be issued by the Management Authority of the State into which the specimens are being brought, for species listed in Appendix I or II. For further information, see the text of the Convention, Article III, paragraph 5 and Article IV, paragraph 6.

Appendix-III specimens: In the case of trade from a State that included the species in Appendix III, an export permit issued by the Management Authority of that State is required. This may be issued only if the specimen was legally obtained and, in the case of a live animal or plant, if it will be prepared and shipped to minimize any risk of injury, damage to health or cruel treatment.

In the case of export from any other State, a certificate of origin issued by its Management Authority is required. In the case of re-export, a re-export certificate issued by the State of re-export is required. There are special rules in these cases and a permit or certificate will generally still be required. Anyone planning to import or export/re-export specimens of a CITES species should contact the national CITES Management Authorities of the countries of import and export/re-export for information on the rules that apply.

When a specimen of a CITES-listed species is transferred between a country that is a Party to CITES and a country that is not, the country that is a Party may accept documentation equivalent to the permits and certificates described above.

CITES on Sharks

Sharks were first included in Appendix II of CITES in February 2003, after the Conference of the Parties to CITES decided at its 12th meeting to include the basking shark (*Cetorhinus maximus*) and whale shark (*Rhincodon typus*) in Appendix II, in accordance with Resolution Conf. 9.24 on *Criteria for amendment of Appendices I and II*. As of now, ten species of sharks and all manta rays (which belong to the same subclass Elasmobranchii) are included in Appendix II, and none in Appendix I. However, all species of sawfishes (which also belong to the subclass Elasmobranchii) are in Appendix I of CITES (***Table 2***).

Table 2: Shark species listed in CITES

Species	Appendix	Effective Date
Cetorhinus maximus (Basking shark)	II (previously III since 13/09/00)	13/02/2003
Rhincodon typus (Whale shark)	II	13/02/2003
Carcharodon carcharias (Great white shark)	II (previously III since 13/09/00)	12/01/2005
Pristidae spp. (Sawfishes - 7 species)	I	13/09/2007
Lamna nasus (Porbeagle shark)	II (previously III since 13/09/00)	14/09/2014

Carcharinus longimanus (Oceanic whitetip shark)	II	14/09/2014
Sphyrna lewini (Scalloped hammerhead)	II (previously III since 13/09/00)	14/09/2014
Sphyrna mokarran (Great hammerhead shark)	II	14/09/2014
Sphyrna zygaena (Smooth hammerhead shark)	II	14/09/2014
Manta spp. (Manta rays)	II	14/09/2014

Although the Convention itself does not provide for arbitration or dispute in the case of noncompliance, years of practice within CITES framework has resulted in several strategies to deal with infractions by Parties. The Secretariat, when informed of an infraction by a Party, will notify all other parties. The Secretariat will give the Party time to respond to the allegations and may provide technical assistance to prevent further infractions. Other actions the Convention itself does not provide for but that derive from subsequent COP resolutions may be taken against the offending Party. These include:

- *Mandatory confirmation of all permits by the Secretariat;*
- *Suspension of cooperation from the Secretariat;*
- *A formal warning;*
- *A visit by the Secretariat to verify capacity;*
- *Recommendations to all Parties to suspend CITES related trade with the offending party; and*
- *Dictation of corrective measures to be taken by the offending Party before the Secretariat will resume cooperation or recommend resumption of trade.*

Infractions may include negligence with respect to permit issuing, excessive trade, lax enforcement, and even failing to produce annual reports.

In CITES framework, funding for the activities of the Secretariat and Conference of the Parties (CoP) meetings comes from a Trust Fund derived from Party contributions. Trust Fund money is not available to Parties to improve implementation or compliance. These activities, and all those outside Secretariat activities (training, species specific programmes) must find external funding, mostly from donor countries and regional organizations.

India[35] signed the CITES on 9 July 1974 and ratified it on 20 July 1976. The Ministry of Environment, Forests and Climate Change (MoEF&CC) is the nodal agency for CITES. The Director General of Forest (Wild Life) and Director, Wildlife Preservation, are the Management Authority for CITES in India.

Export-Import (EXIM) Policy is announced periodically by the MoCI under Section 5 of the Foreign Trade (Development and Regulation) Act, 1992 and contains the conditions for compliance with CITES governing import and export of permissible species. The Policy is decided in consultation with the Management Authority for CITES in India as far as matters related to wild fauna and flora are concerned and is enforced through the Customs Act, 1962. Sec. 3 (2) of the Import and Export Control Act, 1947, provides that all items (including wild fauna and flora) covered in the import and export policy will be deemed to

[35] ***This section is based on "Handbook on International Environmental Agreements: Indian Perspective. Ministry of Environment and Forests and Centre for Environmental Law, WWF, New Delhi. 2006.***

be covered under Section 11 of the Customs Act. Consequently, all cases of violation of EXIM Policy in general and CITES in particular, constitute an offence under Customs Act. India has recognized 4 ports for the purpose of import and export. They are Delhi, Mumbai, Kolkata, and Chennai. They also facilitate pre-shipment/release and examination, and quarantine facilities have been made as per the requirements of CITES.

Summing up, CITES aims at ensuring conservation of species through (1) removal of trade-related incentives, and (2) facilitation of an enabling legal framework at the national level. The Agreement is backed by a set of actual trade-related measures which were established through year of practice. Therefore, unlike many environmental treaties CITES is armed with real threat for an offending countries to act on conservation.

7.0 Convention on the Conservation of Migratory Species of Wild Animals *1979 (CMS)*

As an environmental treaty under the aegis of the United Nations Environment Programme, CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range. CMS was adopted on 23 June 1979 and came into force on 1 November 1983. This Agreement is aimed at conserving those species of wild animals that migrate across or outside national boundaries by developing and implementing co-operative agreements, prohibiting taking of endangered species, conserving habitat, and controlling other adverse factors. The Parties should promote, co-operate in and support, research relating to migratory species. Special attention should be paid to those migratory species which has unfavourable conservation status.

In the context of the Agreement, migratory species are defined as "the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries" and "endangered" means that the migratory species is in danger of extinction throughout all or part of the territory of a State. Conservation status of a migratory species is considered favourable when following conditions are met. If any of these conditions is not met the status is considered as unfavourable.

- *Population dynamics data indicate that the migratory species is maintaining itself on a long-term basis as a viable component of its ecosystems;*
- *the range of the migratory species is neither currently being reduced, nor is likely to be reduced, on a long-term basis;*
- *there is, and will be in the foreseeable future, sufficient habitat to maintain the population of the migratory species on a long-term basis; and*
- *the distribution and abundance of the migratory species approach historic coverage and levels to the extent that potentially suitable ecosystems exist and to the extent consistent with wise wild life management.*

The Convention seeks to protect migratory species by dividing them into two parts. One part, i.e. Appendix I will have all those species taking of which in any

form is banned and the other part, *i.e.* Appendix II will list those species which are not endangered but which are the subject of different agreements. Agreements, within the framework of the umbrella Convention, can stipulate precise conservation measures and implementation mechanisms. The Agreement should as far as possible deal with more than one species and cover the whole range of species concerned. Agreement should provide for co-ordinated species conservation and management plans; conservation and restoration of habitats; control of factors impeding migration; co-operative research and monitoring; and exchange of information and public education. CMS also provides for alternative, legally binding international instruments to achieve objectives similar to those of Agreements like a Memorandum of Understanding (MOU). The aim of the MOU is to co-ordinate short-term measures to be taken by the range states at the administrative and scientific levels, in some cases on the basis of already existing commitments.

Migratory species, considered as endangered as per the best scientific evidence available, are listed in Appendix I of CMS. There is a provision for the removal of particular species from Appendix I provided that there is adequate scientific proof that this particular species is no longer considered endangered and is not likely to become endangered again. Parties that are range states are obliged to prohibit the taking, *i.e.* hunting, fishing, capturing, and deliberate killing of animals listed in Appendix I and also endeavour to conserve and restore important habitats of Appendix I species, to counteract factors impeding their migration and to control other factors that might endanger them. However, there are a few exceptions to this prohibition. Migratory species belonging to Appendix I may be allowed to be taken if it is for scientific purposes or for the purpose of enhancing the propagation or survival of the affected species or to accommodate the needs of traditional subsistence users of such species or any other extraordinary circumstances.

Migratory species whose conservation status is unfavourable and which require international agreements for their conservation and management ate listed in Appendix II of CMS***.*** CMS is a framework Convention since it provides for separate internationally and legally blinding instruments between range states of certain migratory species. Parties to such Agreements do not have to be Parties to CMS. Migratory species could be listed in both Appendix I and Appendix II if the circumstances warrant.

In 2010, a Memorandum of Understanding on the Conservation of Migratory Sharks (MoU-Sharks) was founded under the auspices of CMS. The MoU is aimed at facilitating international coordination for the protection, conservation and management of the sharks involved, through multilateral, intergovernmental discussion and scientific research. It is a global non-binding treaty aimed at improving "compliance and enforcement efforts" for states whose waters are inhabited by these sharks and to states whose flagships pass through international waters inhabited by these sharks. Signatories to this treaty intend to expand information sharing. The memorandum states: "The objective of this Memorandum of Understanding is to achieve and maintain a favourable conservation status for migratory sharks based on the best available scientific information, taking into account the socio-economic and other values of these species for the people of the Signatory States." India is a party to CMS but not a party as of yet (September 2014) to MoU-Sharks.

The Appendices of the Convention on the CMS currently include eight species of "sharks." Seven of these are true sharks, which are also listed in Annex I of the MoU-Sharks. The giant manta ray is the last one to be included in Appendix I of CMS; however, it is not included in Annex I to the MoU (***Table 3***).

Table 3: Shark species listed in the CMS Appendices and MOU Annex 1

Family	Species	Common name	Appendix I	Appendix II	MOU Annex I
Rhincodontidae	*Rhincodon typus*	Whale shark	-	1999	✓
Lamnidae	*Carcharodon carcharias*	White shark	2002	2002	✓
Cetorhinidae	*Cetorhinus maximus*	Basking shark	2005	2005	✓
Lamnidae	*Isurus oxyrinchus*	Shortfin mako	-	2008	✓
"	*Isurus paucus*	Longfin mako	-	2008	✓
"	*Lamna nasus*	Porbeagle	-	2008	✓
Squalidae	*Squalus acanthias*	Spiny dogfish *	-	2008	✓
Mobulidae	*Manta birostris*	Giant manta	2011	2011	×

Summing up, CMS is of great significant for conservation of migratory species and the only dedicated international instrument for that. Being a binding agreement, countries are bound to work towards conservation of facilitated conservation of species listed in CMS.

8.0 The Convention on Biological Diversity (CBD)

The CBD came into force in 1993 and promotes the conservation of biological diversity, ensuring the sustainable use of biological components of ecosystems, and the fair and equitable sharing of benefits arising from the use of genetic resources. The objectives of the CBD are addressed through national frameworks and policies, and meetings are convened every two years to monitor implementation. Although similar to CITES in terms of numbers of Parties and hence its international coverage, CBD differs considerably in that implementation is the individual responsibility of each Party and may be taken forward in varying ways in different States and Decisions are passed by consensus. Sharks are a focus group of the CBD, and several recommendations for their sustainable conservation and management have been adopted by the parties, in particular with regard to large pelagic sharks.

Summing up, CBD provides an international impetus to design national strategies for conservation of biodiversity.

9.0 The 1995 FAO Code of Conduct for Responsible Fisheries (CCRF)

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 FAO-CCRF or popularly known as the 'Code' was developed and finally adopted as a blueprint for the management of fisheries on 31 October 1995 at the 28th session of the FAO Conference in Rome.

The Code is today the most significant of the non-binding agreements in the global fisheries sector. It is global in scope and 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 voluntary, but certain parts of the Code reflect and include major articles and provisions from a number of global UN conventions and agreements, as mentioned earlier. The Code sets forth principles and standards applicable to the conservation, management and development of all fisheries. It also covers the capture, processing and trade of fish and fishery products, fishing operations, aquaculture, fisheries research and the integration of fisheries into coastal area management.

The Code of Conduct addresses six key themes: Fisheries management, fishing operations, aquaculture development, integration of fisheries into coastal area management, post-harvest practices and trade, and fisheries research. In total, there are 19 general principles and 210 standards in the Code. While a precautionary approach is integral to all themes, it is applied particularly to fisheries management, as detailed in Article 7.5. Paragraph 7.5.1 includes a statement to the effect that: "*States should apply the precautionary approach widely to conservation, management, and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment*." Among the objectives of the Code are:

(i) to establish principles for responsible fishing and fisheries activities, taking into account all their relevant biological, technological, economic, social, environmental, and commercial aspects;

(ii) to establish principles and criteria for the elaboration and implementation of national policies for responsible conservation of fisheries resources and fisheries management and development;

(iii) to serve as a reference to help states establish or improve the national legal and institutional framework to ensure responsible fisheries and to formulate and implement appropriate measures;

(iv) to provide guidance that may be used where appropriate in the formulation and implementation of international agreements and other legal instruments, both binding and voluntary;

(v) to facilitate and promote technical, financial and other cooperation in conservation of fisheries resources and fisheries management and development; to promote the contribution of fisheries to food security and food quality, giving priority to the nutritional needs of local communities;

(vi) to promote protection of living aquatic resources and their environments and coastal areas;

(vii) to promote the trade of fish and fishery products in conformity with relevant international rules and to avoid the use of measures that constitute hidden barriers to such trade;

(viii) to promote research on fisheries as well as on associated ecosystems and relevant environmental factors;

(ix) to provide standards of conduct for all persons involved in the fisheries sector.

In 1999, FAO also adopted three non-binding instruments, known as International Plans of Action (IPOAs), to address three specific problems in ocean fisheries and promote implementation of the Code. The IPOA on the 'Management of Fishing Capacity' commits the international community to address this problem and sets standards for bringing fishing capacity in line with sustainable fishing. Another of these IPOAs concerns the 'Conservation and Management of Sharks' while the other deals with the problem of 'Seabird By-catch in long line Fisheries'. A final IPOA, adopted by FAO in 2001, concerns the growing incidence of 'Illegal, Unreported and Unregulated Fishing'.

The Code is although a voluntary, non-binding agreement, but it contains sections that are similar to those in several binding agreements such as; The Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (the Compliance Agreement), and the Agreement for the Implementation of the Provisions of the UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (the UN Straddling Stocks Agreement of1995) and Convention on Biological Diversity of 1995.

10.0 The International Plan of Action for the Conservation and Management of Sharks

The International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) includes all sharks, skates, ray & chimaera fisheries, from both target and non-target fisheries, whether they be industrial, artisanal or traditional fisheries or fishing programmes designed to reduce risk of shark attack on humans.

The voluntary IPOA-Sharks was developed by FAO within the framework of the 'Code of Conduct for Responsible Fisheries' in response to the request made in CITES Resolution Conf. 9.17. It was authorized by the FAO Committee on Fisheries in 1999 and is part of the CCRF. The IPOA-Sharks was adopted because of the continuing widespread concern over the increase of shark fishing and the consequences that it has for shark populations in the world's oceans.

The overall objective of the IPOA-Sharks is to ensure the conservation and management of sharks and their long-term sustainable use. There are three guiding principles associated with meeting this objective:

- *Participation: States that contribute to fishing mortality on a species or stock should participate in its management.*
- *Sustaining stocks: Management and conservation strategies should aim to keep total fishing mortality for each stock within sustainable levels by applying the precautionary approach (a response to uncertainty in the face of risks to the environment. It involves acting to avoid serious or irreversible potential harm, despite lack of scientific certainty as to the likelihood, magnitude, or causation of that harm).*
- *Nutritional and socio-economic considerations: Management and conservation objectives and strategies should recognize that in some low-income food-deficit regions and/or countries, shark catches are a traditional and important source of food, employment and/or income. Such catches should be managed*

on a sustainable basis to provide a continued source of food, employment and income to local communities.

The aim of the Shark Plan is to:

- *Ensure that shark catches from directed and non-directed fisheries are sustainable;*
- *Assess threats to shark populations, determine and protect critical habitats and implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use;*
- *Identify and provide special attention, in particular to vulnerable or threatened shark stocks;*
- *Improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States;*
- *Minimize by-catch (unutilized incidental catches of sharks);*
- *Contribute to the protection of biodiversity and ecosystem structure and function;*
- *Minimize waste and discards from shark catches in accordance with article 7.2.2.(g) of the Code of Conduct for Responsible Fisheries (for example, requiring the retention of sharks from which fins are removed);*
- *Encourage full use of dead sharks;*
- *Facilitate improved species-specific catch and landings data and monitoring of shark catches; and*
- *Facilitate the identification and reporting of species-specific biological and trade data.*

The IPOA-Sharks applies to the waters of States where sharks are caught by their own or foreign vessels and to States which catch sharks on the high seas. However, CITES Resolution Conf.12.6, adopted in 2002, requires that CITES continues its involvement in encouraging and monitoring implementation of the IPOA-Sharks and associated sustainable shark fisheries management measures.

11.0 Regional institutional mechanism- IOTC

The Indian Ocean Tuna Commission (IOTC) is an intergovernmental organisation responsible for the management of tuna and tuna-like species in the Indian Ocean. It works to achieve this by promoting cooperation among its Contracting Parties (Members) and Cooperating Non-Contracting Parties in order to ensure the conservation and appropriate utilisation of fish stocks and encouraging the sustainable development of fisheries. The resolutions adopted by IOTC are bounded in nature. Over the years, IOTC has adopted several resolutions aimed at (i) strengthening data collection; (ii) improving fisheries monitoring, control and surveillance (MCS) especially at high seas; (iii) curbing illegal, unreported and unregulated (IUU) fishing; (iv) monitoring status of stocks and implementing management measures; (v) minimizing negative impact of fishing on biodiversity such as reduction of by-catch; and, (v) adopting direct measures for vulnerable stocks.

While, most of the resolutions adopted by IOTC directly or indirectly affect the shark fisheries in its domain; the following resolutions are specific in regards to shark fisheries:

Resolution 13/06: *On a scientific and management framework on the Conservation of sharks species caught in association with IOTC managed fisheries.* This Resolution prohibits, as an interim pilot measure, the retention onboard, transhipment, landing or storing any part or whole carcass of oceanic whitetip sharks (*Carcharhinus longimanus*) by all vessels on the IOTC record of authorized vessels or authorised to fish for tuna or tuna-like species, with the exception of observers who are permitted to collect biological samples (vertebrae, tissues, reproductive tracts, stomachs) from oceanic whitetip sharks that are dead at haulback and artisanal fisheries for the purpose of local consumption, and will conduct a review and an evaluation of the interim measure in 2016. India has objected to this resolution and it is not binding on India.

Resolution 12/09: *On the conservation of thresher sharks (family Alopiidae) caught in association with fisheries in the IOTC area of competence*. This Resolution prohibits the retention onboard, transhipment, landing, storing, selling or offering for sale any part or whole carcass of the three species of Thresher sharks (family Alopiidae) by all vessels on the IOTC record of authorised vessels. Observers are permitted to collect biological samples (vertebrae, tissues, reproductive tracts, stomachs) from thresher sharks that are dead at haulback.

Resolution 05/05: *Concerning the conservation of sharks caught in association with fisheries managed by IOTC*. This resolution includes minimum reporting requirements for sharks, calls for full utilisation of sharks and includes a ratio of fin-to-body weight for shark fins retained onboard a vessel.

Resolution 13/05: *On the conservation of whale sharks (Rhincodon typus).* This Resolution aims to mitigate the interactions between whale sharks and purse seine fishing gear; gather additional information from CPCs on the interaction rates with other fishing gears, in particular gillnets and longlines in the IOTC area of competence.

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Annexure 6: Shark species of India: their abundance and status

Family	Genus+species	Common name	Abundance in fishery	Areas of occurrence	Gears used for exploitation	IUCN status
Alopiidae	Alopias pelagicus	pelagic thresher shark	****	marine, pelagic-oceanic, EC & WC	longlines and drift gill nets	VU
	Alopias superciliosus	big-eye thresher shark	****	marine, pelagic-oceanic, EC & WC	longlines and drift gill nets	VU
	Alopias vulpinus	thresher shark	***	marine, pelagic-oceanic, EC & WC	longlines and drift gill nets	VU
Carcharhinidae	carcharhinus albimarginatus	silvertip shark	***	marine, benthopelagic, reef associated, EC & WC	longlines and gill nets	NT
	Carcharhinus altimus	bignose shark	*	marine, demersal, reef associated, EC & WC	bottom trawl, longlines and gill nets	DD
	Carcharhinus amblyrhynchoides	graceful shark	****	marine, coastal-pelagic, EC & WC	gill nets and longlines	NT
	Carcharhinus amblyrhynchos	blacktail reef shark	***	marine, coastal-pelagic, reef associated, EC & WC	longlines	NT
	Carcharhinus amboinensis	pigeye shark	*	marine/brackish, reef associated, demersal, EC & WC	longlines	DD
	Carcharhinus brachyurus	copper shark	*	marine, reef associated, meso-pelagic, WC	bottom trawl and longlines	NT
	Carcharhinus brevipinna	spinner shark	****	marine, reef associated, pelagic, EC & WC	longlines, bottomset gill nets and hook & line	NT
	Carcharhinus dussumieri	whitecheek shark	****	marine, reef associated, mesopelagic, EC & WC	trawl and bottom set gill nets	NT
	Carcharhinus falciformis	silky shark	*****	marine, reef associated, epipelagic, EC & WC	longlines and bottom set gill nets	NT
	Carcharhinus galapagensis	galapagos shark	*	marine, reef associated, pelagic, WC	longlines and bottom set gill nets	NT
	Carcharhinus hemiodon	pondicherry shark	!	marine/brackish, demersal, EC & WC	hook & line, bottom set gill nets and bottom trawl	CR
	Carcharhinus leucas	bull shark	****	marine/brackish/freshwater, demersal, EC & WC	longlines and hook & line	NT
	Carcharhinus limbatus	blacktip shark	*****	marine/brackish, reef associated, pelagic, EC & WC	longlines, hook & line, bottom set gill nets and bottom trawl	NT
	Carcharhinus longimanus	oceanic whitetip shark	****	marine, pelagic-oceanic, EC & WC	longlines	VU
	Carcharhinus macloti	hardnose shark	****	marine, demersal, EC & WC	gill nets and longlines	NT

	Carcharhinus melanopterus	blacktip reef shark	*****	marine/brackish, reef associated, demersal, EC & WC	gill nets and longlines	NT
	Carcharhinus obscurus	dusky shark	****	marine/brackish, reef associated, pelagic, EC & WC	longlines, hook & line and bottom set gill nets	VU
	Carcharhinus plumbeus	sandbar shark	*	marine/brackish, benthopelagic, EC & WC	longlines, bottomset gill nets and hook & line	VU
	Carcharhinus sealei	blackspot shark	*	marine, reef associated, shallow water, EC & WC	gill nets and hook & line	NT
	Carcharhinus sorrah	spot-tail shark	*****	marine, reef associated, coastal, EC & WC	gill nets and longlines	NT
	Galeocerdo cuvier	tiger shark	*****	marine/brackish, benthopelagic, EC & WC	longlines, hook & line, bottom set gill nets and bottom trawl	NT
	Glyphis gangeticus	Ganges shark	!	marine/brackish/freshwater, demersal, EC	no information	CR
	Glyphis glyphis	speartooth shark	!	marine/brackish/freshwater	no information	EN
	Lamiopsis temminckii	broadfin shark	**	marine/brackish, demersal, EC & WC	gill nets and longlines	EN
	Loxodon macrorhinus	sliteye shark	***	marine, demersal, EC & WC	gill nets and longlines	LC
	Negaprion acutidens	sicklefin lemon shark	**	marine/brackish, reef associated, demersal, EC &WC	gill nets and longlines	VU
	Prionace glauca	blue shark	**	marine, pelagic-oceanic, EC & WC	longlines, hook & line, pelagic & bottom trawls	NT
	Rhizoprionodon acutus	milk shark	*****	marine/freshwater/brackish, benthopelagic, EC & WC	bottom trawl, gill nets, longlines, hook & line,	LC
	Rhizoprionodon oligolinx	grey sharpnose shark	*****	marine, reef associated, demersal, EC & WC	bottom trawl, gill nets, longlines, hook & line,	LC
	Scoliodon laticaudus	spadenose shark	*****	marine/brackish, demersal, EC & WC	longlines, hook & line, gill nets, traps and bottom trawl	NT
	Triaenodon obesus	whitetip reef shark	****	marine, reef associated, demersal, EC& WC	gill nets and longlines	NT
Lamnidae	Isurus oxyrinchus	shortfin mako shark	****	marine, pelagic-oceanic, EC & WC	gill nets, longlines and hook & line	VU
	Isurus paucus	longfin mako	**	marine, pelagic-oceanic, EC & WC	gill nets, longlines and hook & line	VU
Rhincodontidae	Rhincodon typus	whale shark	!	marine, pelagic-oceanic, EC & WC	gill net	VU

Stegostomatidae	Stegostoma fasciatum	zebra shark	***	marine/brackish, reef associated, demersal, EC & WC	drift gill net	VU
Squalidae	Squalus acanthias	piked dogfish	**	marine/brackish, benthopelagic, EC & WC	trawl net	VU
	Squalus mitsukurii	shortspine spurdog	***	marine, benthopelagic, EC & WC	trawl net	DD
Hemigaleidae	Chaenogaleus macrostoma	hooktooth shark	****	marine, demersal, EC & WC	gill nets and longlines	VU
	Hemigaleus microstoma	sicklefin weasel shark	***	marine, demersal, EC & WC	gill nets and longlines	VU
	Paragaleus randalli	slender weasel shark	**	marine, demersal, EC & WC	trawl net	NT
	Hemipristis elongata	snaggletooth shark	***	marine, demersal, EC & WC	gill nets, bottom trawl and longlines	VU
Traikidae	Iago omanensis	bigeye houndshark	****	marine, bathydemersal, WC	trawl and gill net	LC
	Iago mangalorensis	Mangalore houndshark	****	marine, pelagic-oceanic, WC	trawl	NE
	Iago sp.		****	marine, bathydemersal, EC	trawl and gill net	NE
	Mustelus mosis	Arabian smoothhound shark	****	marine, demersal, EC & WC	trawl and gill net	DD
	Mustelus sp.		*****	marine, demersal, EC	trawl	NE
Sphyrnidae	Eusphyra blochii	winghead shark	**	marine/brackish, benthopelagic, EC & WC	gill nets, stake nets, seines, longlines and hook & lines	NT
	Sphyrna lewini	scalloped hammerhead	*****	marine/brackish, pelagicoceanic, EC & WC	longlines, hook & line, gill nets and trawl nets	EN
	Sphyrna mokarran	great hammerhead	****	marine/brackish, lagicoceanic, EC & WC	longlines, hook & line, gill nets and trawl nets	EN
	Sphyrna tudes	smalleye hammerhead	*	marine, benthopelagic, WC	no information	VU
	Sphyrna zygaena	smalleye hammerhead	****	marine/brackish, elagicoceanic, EC & WC	longlines, hook & line, gill nets and trawl nets	VU
Proscylliidae	Eridacnis radcliffei	pygmy ribbontail catshark	**	marine, bathydemersal, EC & WC	bottom trawls	LC
	Proscyllium magnificum	magnificent catshark	*	marine, bathydemersal, EC	bottom trawls	NE
Echinorhinidae	Echinorhinus brucus	bramble shark	****	marine, bathydemersal, EC & WC	bottom trawls & longlines	DD
	Echinorhinus cookei	prickly shark	*	marine, benthopelagic, EC	gillnet, bottom trawls & longlines	NT

Hexanchidae	Heptranchias perlo	sharpnose sevengill shark	**	marine, bathydemersal, EC & WC	bottom trawls and longlines	NT
	Hexanchus griseus	bluntnose sixgill shark	**	marine, bathydemersal, WC	gillnet, longline, traps, pelagic and bottom trawls	NT
Hemiscyllidae	Chiloscyllium arabicum	Arabian carpetshark	****	marine, demersal, WC	no information	NT
	Chiloscyllium griseum	grey bambooshark	****	marine/ brackish, reefassociated, EC & WC	gillnet & hook and line	NT
	Chiloscyllium indicum	slender bambooshark	***	marine/ freshwater/ brackish, demersal, EC & WC	gillnet & hook and line	NT
	Chiloscyllium plagiosum	whitespotted bambooshark	***	marine, reef-associated, EC & WC	gillnet & bottom trawl	NT
	Chiloscyllium punctatum	Brownbanded bambooshark	***	marine, reef-associated, EC	gillnet,bottom trawls, beach seine and hook and line	VU
Ginglymostomatidae	Nebrius ferrugineus	Bambooshark	***	marine, reef-associated, EC & WC	longlines, gillnets, fixed bottom nets and bottom trawls	VU
Pseudocarcharhiidae	Pseudocarcharhias kamoharai	crocodile shark	*	marine, pelagic-oceanic, WC	pelagic & tuna longlines	NT
Odontaspididae	Carcharias taurus	sand tiger shark	*	marine, reef-associated, EC & WC	bottom and pelagic trawls, fixed bottom nets and longline	VU
	Odontaspis ferox	small-tooth sand tiger shark	*	marine, demersal	fixed bottom nets and longline	VU
	Odontaspis noronhai	bigeye sand tigershark	*	marine, demersal	fixed bottom nets and longline	DD
Scyliorhinidae	Apristurus investigatoris	broadnose cat shark	*	marine, bathydemersal, WC	trawl net	DD
	Bythaelurus hispidus	bristly catshark	*	marine, benthopelagic, WC	trawl net	NT
	Cephaloscylliu m silasi	Indian swellshark	*	marine, benthopelagic	trawl net	DD
	Halaelurus quagga	quagga catshark	*	marine, demersal	trawl net	DD
Somniosidae	Centroscymnus crepidator	longnose velvet dogfish	**	marine, bathydemersal, WC	bottom trawls	NT
	Zameus squamulosus	velvet dogfish	*	marine, benthopelagic, WC	bottom trawls, longlines	DD
Etmopteridae	Etmopterus lucifer	blackbelly lanternshark	*	marine, benthopelagic	bottom trawls	DD
	Etmopterus pusillus	smooth lanternshark	*	marine, benthopelagic wc	bottom trawls, fixed bottom nets and line gear	LC
Centrophoridae	Centrophorus atromarginatus	dwarf gulper shark	***	marine, benthopelagic WC & EC	bottom trawls, fixed bottom nets and	DD

					line gear	
	Centrophorus granulosus	gulper shark	***	marine, bathydemersal, EC & WC	bottom trawls, pelagic trawls and hook & line	LC
	Centrophorus moluccensis	smallfin gulper shark	***	marine, bathydemersal,	bottom trawls	VU
	Centrophorus squamosus	leafscale gulper shark	***	marine, bathydemersal, WC	bottom trawls, fixed bottom nets and line gear	DD
	Centrophorus uyato	little gulper shark	*	marine, bathydemersal, EC & WC	bottom trawls, fixed bottom nets and line gear	VU
	Deania profundorum	arrowhead dogfish	*	marine, bathydemersal, WC	bottom trawls, fixed bottom nets and line gear	NE
Myliobatidae	Aetobatus flagellum	longheaded eagle ray	**	marine, bathydemersal, WC	bottom trawl and inshore bottom set gill nets	EN
	Aetobatus ocellatus	spotted eagle ray	*****	marine/brackish, reef associated, WC & EC	bottom trawl and inshore bottom set gill nets	NT
	Aetomylaeus maculatus	mottled eagle ray	*	marine/brackish, reef associated, WC & EC	bottom trawl and inshore bottom set gill nets	EN
	Aetomylaeus milvus	brown eagle ray	*	marine, benthopelagic, WC & EC	bottom trawl	NE
	Aetomylaeus nichofii	nieuhof's eagle ray	***	marine/brackish, demersal, WC & EC	bottom trawl and inshore bottom set gill nets	VU
	Aetomylaeus vespertilio	ornate eagle ray	**	marine, benthoopelagic, WC & EC	bottom trawl, inshore bottom set gill nets and traps	EN
Rhinopteridae	Rhinoptera javanica	flapnose ray	*****	marine/brackish, reef associated, WC & EC	bottom trawl and inshore bottom set gill nets	VU
	Rhinoptera jayakari	Oman cownose ray	*	marine, benthopelagic	trawl and inshore bottom set gill nets	NE
Mobulidae	Manta birostris	giant manta ray	**		gill net	VU
	Manta alfredi	reef manta ray	*	marine, reef associated/ benthopelagic, WC & EC	no information	VU
	Mobula thurstoni	Smoothtail mobula	**	marine, pelagic-oceanic, WC & EC	gill net	NT
	Mobula japanica	Spinetail mobula	***	marine, reef associated, WC & EC	gill net	NT
	Mobula tarapacana	Chilean devil ray	***	marine, reef associated, oceanodromous, WC & EC	gill net	DD

	Mobula kuhlii	shortfin devil ray	***	marine, pelagic-oceanic, WC & EC	gill net	DD
	Mobula eregoodontek e	Longhorned mobula	**	marine, pelagic-oceanic, WC & EC	gill net	NT
Dasyatidae	Dasyatis centroura (?)	roughtail sting ray	***	marine/ brackish, demersal WC & EC	bottom trawl	LC
	Dasyatis microps	smalleye sting rays	*	marine / brackish, demersal/ deepwater, EC	bottom trawl	DD
	Dasyatis zugei	pale edged sting ray	***	marine/brackish, demersal, WC & EC	bottom trawl	NT
	Himantura fai	pink whipray	***	marine, reef associated, WC & EC	bottom trawl and longline	LC
	Himantura fluviatilis (?)	cowtail stingray	!	marine, reef associated, WC & EC	bottom trawl and longline	NE
	Himantura gerrardi	white spotted whip ray	*****	marine/brackish, demersal, EC	bottom trawl and gill net	VU
	Himantura granulata	mangrove whipray	**	marine / brackish, reef associated, WC & EC	bottom trawl	NT
	Himantura imbricata	scaly whip ray	*****	marine/brackish/ fresh, demersal, WC & EC	bottom trawl and gill net	DD
	Himantura jenkinsii	jenkin's whipray	*****	marine/brackish, demersal, WC & EC	bottom trawl, gill net and line gear	LC
	Himantura leoparda	leopard whipray	***	marine, benthopelagic, WC & EC	bottom trawl and gill net	VU
	Himantura marginata	blackedge whip ray	**	marine/brackish, demersal,	bottom trawl and gill net	DD
	Himantura pastinacoides	round whipray	**	marine, demersal, EC	bottom trawl	VU
	Himantura uarnacoides	Whitenose whipray	****	marine, demersal, EC	bottom trawl	VU
	Himantura uarnak	reticulate whipray	*****	marine/brackish, reef associated, WC & EC	bottom trawl	VU
	Himantura undulata	honeycomb whipray	****	marine, demersal, WC & EC	bottom trawl and longlines	VU
	Himantura walga	dwarf whipray	*	marine, demersal	bottom trawl	NT
	Neotrygon kuhlii	blue spotted stingray	****	marine, reef associated, WC & EC	bottom trawl	DD
	Neotrygon cf. trigonoides	mask ray	***	marine, reef associated, WC	bottom trawl	NE
	Pastinachus sephen	cowtail stingray	*****	marine/brackish/ fresh, reef associated, WC & EC	bottom trawl and hook & line	DD
	Pteroplatytrygon violacea	pelagic sting ray	***	marine / pleagic, oceanic WC & EC	bottom trawl, gill net and longlines	LC
	Taeniura lymma	blue spotted fan tail ray	***	marine reef associated, WC & EC	bottom trawl, gill net and longlines	NT

	Taeniura meyeni	blotched fantail ray	***	marine, reef associated, EC	bottom trawl, gill net and longlines	VU
	Urogymnus asperrimus	porcupine ray	!	marine/brackish, reef associated, WC & EC	bottom trawl and gill net	VU
Plesiobatidae	Plesiobatis daviesi	deepwater stingray	**	marine, bathydemersal, WC & EC	bottom trawl	LC
Gymnuridae	Gymnura japonica	Japanese butterfly ray	**	marine, demersal, EC	bottom trawl, gill net and trammel net	DD
	Gymnura micrura	smooth butterfly ray	***	marine/ brackish, demersal WC & EC	bottom trawl	DD
	Gymnura poecilura	long tailed butterfly ray	****	marine, demersal, WC & EC	bottom trawl and trammel net	NT
	Gymnura zonura	zonetail butterfly ray	****	marine, reef associated, WC & EC	bottom trawl, gill net and trammel net	VU
Narcinidae	Benthobatis moresbyi	dark blind ray	*	marine, bathydemersal, WC	bottom trawl	DD
	Narcine brunnea	blind ray	*	marine, demersal, WC & EC	bottom trawl	NE
	Narcine prodorsalis	tonkin numbfish	*	marine demersal, EC	bottom trawl	DD
	Narcine timlei	spotted numbfish	**	marine, demersal, WC & EC	bottom trawl	DD
Narkidae	Narke dipterygia	numb ray	**	marine, inshore and offshore continental waters, WC & EC	bottom trawl	DD
Torpedinidae	Torpedo fuscomaculata	black spotted torpedo	**	marine, brackish, reef associated, WC & EC	bottom trawl	DD
	Torpedo marmorata	marbled electric ray	**	marine/brackish, reef associated, WC & EC	bottom trawl	DD
	Torpedo sinuspersici	mottled electric ray	***	marine/ reef associated, WC & EC	bottom trawl	DD
	Torpedo zugmayeri	electric ray	*	marine/ wc	bottom trawl	NE
Hexatrygonidae	Hexatrygon bickelli	sixgill stingray	*	marine/bathydemersal, WC	bottom trawl	LC
	Anoxypristis cuspidata	pointed saw fish	!	marine/freshwater/brackish, benthopelagic, WC & EC	bottom trawl and gillnet	EN
	Pristis microdon	largetooth saw fish	!	marine/freshwater/brackish, demersal, WC & EC	bottom trawl and gillnet	NE
	Pristis pristis	common sawfish	*	marine/freshwater/brackish, demersal, WC & EC	bottom trawl and gillnet	CR
	Pristis zijsron	longcomb saw fish	!	marine/freshwater/brackish, demersal, WC & EC	bottom trawl and gillnet	CR

Rhinidae	Rhina ancylostoma	bowmouth guitarfish	**	marine/ reef associated, WC & EC	bottom trawl and gillnet	VU
Rhinobatidae	Glaucostegus granulatus	granulated guitar fish	****	marine/demersal, WC & EC	bottom trawl and gillnet	VU
	Glaucostegus thouin	clubnose guitarfish	**	marine/demersal, WC & EC	bottom trawl and gillnet	VU
	Glaucostegus variegatus	stripenose guitarfish	***	marine/demersal, WC & EC	bottom trawl and gillnet	DD
	Rhinobatos annandalei	annandale's guitarfish	***	marine/brackish/ demersal, WC	bottom trawl and gillnet	DD
	Rhinobatos lionatus	smoothback guitarfish	*	marine/brackish/, EC	bottom trawl and gillnet	DD
	Rhinobatos obtusus	widenose guitar fish	**	marine/demersal, WC & EC	bottom trawl and gillnet	VU
	Rhinobatos punctifer	spotted guitarfish	***		bottom trawl and gillnet	DD
	Rhinobatos schlegelii	brown guitarfish	****	marine/demersal, EC	bottom trawl and gillnet	DD
Rhynchobatidae	Rhynchobatus australiae	white spotted guitarfish	***	marine; coastal, reefassociated;	bottom trawl and gillnet	VU
	Rhynchobatus djiddensis	giant guitarfish	!	marine; brackish; reefassociated;	bottom trawl and gillnet	VU
	Rhynchobatus palpebratus	eyebrow wedge fish	*	marine; coastal; reefassociated;	bottom trawl and gillnet	NE
Rajidae	Cruriraja andamanica	andaman leg skate	*	marine; bathydemersal, EC	bottom trawl and gillnet	DD
	Dipturus johannisdavisi	travancore skates	*	marine; bathydemersal, WC	bottom trawl and gillnet	DD
	Dipturus sp.		**	marine; bathydemersal, WC	bottom trawl and gillnet	NE
	Fenestraja mammillidens	prickly skate	*	marine; bathydemersal, WC	bottom trawl and gillnet	DD
	Okamejei powelli	Indian ringed skates	*	marine; demersal, WC	bottom trawl and gillnet	DD
	Raja miraletus (?)	brown ray	*	marine; demersal, WC	bottom trawl and gillnet	LC
	Rostroraja alba (?)	white skate	*	marine; demersal, WC	bottom trawl and gillnet	EN

Source: CMFRI NPOA-Shark Guideline, 2015

******** Predominant in commercial shark landings;**** Common occurrence; *** Moderate occurrence;** Rare occurrence;* Isolated reports only; ! Protected under WPA, 1972; (?) Needs confirmation***

EC East Coast; WC West Coast

CR Critically Endangered; EN Endangered; VU Vulnerable; NT Near Threatened; DD Data Deficient; LC Least Concern

****

Annexure 7: National Legal Instruments Concerning Conservation and Management of Shark Fisheries

1.0 The Merchant Shipping Act, 1958

The Merchant Shipping Act, 1958 (MS Act, 1958) was enacted to foster the development and ensure the efficient maintenance of an Indian mercantile marine in a manner best suited to serve the national interests. For this purpose the Act provides for establishment of National Shipping Board to provide for the registration of Indian ships and generally to amend and consolidate the law relating to merchant shipping. The Act is not particularly aimed at management of fishing sector. However, it provides definition of fishing vessels and other requirements for their registration by the Mercantile Marine Department of the Department of shipping. The Act is administered by the Ministry of Shipping, Road Transport and Highways (MSRTH).

Relevant provision of the Act related to fishing

The MS Act, 1958 was amended in 1983 (Amendment Act 12 0f 1983) to provide for registration and control of Indian fishing boats to give effects to the recommendations of the fisheries enquiry committee. A new Part XV-A was added to the Act and Section 435-B defines an Indian fishing boat as follows:

- *every fishing vessel, as defined in clause (12) of section 3[36];*
- *every sailing vessel, whether or not fitted with mechanical means of propulsion, solely engaged in fishing for profit;*
- *every boat or craft of any other type used solely for fishing which the Central government may, by notification in the Official Gazette, specify to be a fishing boat for purposes of this section. Which is owned wholly by persons to each of whom any of the descriptions specified in clause (a) or in clause (b) or in clause (c), as the case may be, of section 21 applies or which satisfies such other requirements as the Central government may, by notification in the Official Gazette, specify.*

The Mercantile Marine Department administers implementation of MS Act, 1958 under guidance and directives of Directorate General of Shipping. Area of implementation covers wide-ranging aspects of Registration of ships and all related matters. The MMDs attend to all statutory duties bestowed upon it by the Directorate General of Shipping, MSRTH, which also include attending to all international obligations relating to IMO mandatory instruments.

2.0 The Marine Products Export Development Authority Act, 1972 (MPEDA Act, 1972)

This is the first such act to deal with the exploitation of living marine resources in India. This Act provides for the establishment of the Marine Products Export Development Authority (MPEDA), which is responsible for the development of the marine products industry and more specifically for marine exports. The Act states

[36] ***"fishing vessel" means a ship fitted with mechanical means of propulsion which is exclusively engaged in fishing for profit.***

that marine products shall include all varieties of fishery products such as shrimp, prawn, lobster, crab, fish, shell-fish, other aquatic animals or plants and any other products which the Authority may declare to be marine products for the purposes of this Act.

The Authority shall be a body corporate whose functions shall include: developing and regulating off-shore and deep-sea fishing; registering fishing vessels, processing plants or storage premises for marine products; fixing standards and specifications for marine products for purposes of export; carrying out inspection of marine products in any fishing vessel, processing plant, storage premises for the purpose of ensuring the quality of such products; and regulating the export of marine products. All owners of fishing vessels, processing plants or storage premises for marine products shall apply to the Authority for registration.

The Act further provides for the following matters: cess levied on marine products exported; constitution of the Marine Products Export Development Fund; powers of the Central Government to prohibit or control imports and exports of marine products; penalties; etc.

Definitions:

- *"Fishing vessel" means a ship or boat fitted with mechanical means of propulsion which is exclusively engaged in sea-fishing for profit;*
- *"Marine products" includes all varieties of fishery products known commercially as shrimp, prawn, lobster, crab, fish, shell-fish, other aquatic animals or plants or part thereof and any other products which the Authority may, by notification in the Gazette of India, declare to be marine products for the purposes of this Act;*

Management of fishing in maritime zones of India: The Act also specifies that the Authority will undertake measures for the conservation and management of off shore and deep sea fishery. However, the Act or the rules and regulations framed there under do not have clearly defined mechanisms to undertake such measures. While the Act provides for fishing vessels to register under the Act, there are no stipulations on input control for the conservation of fishery resources. Further, the MPEDA Act has a weak enforcement mechanism and depends only on its own officials (Chapter 7 of MPEDA Rules).

However, registration under the Act is must for the owner of a fisheries entity to export and to get any subsidy from the MPEDA. Further, the Act is limited to mechanized/ motorized fishing vessels by definition.

3.0 The Wild Life (Protection) Act, 1972

The objective of the Act is to provide for the protection of Wild animals, birds and plants and for matters connected therewith or ancillary or incidental thereto. The Act is applicable to whole of India. In the Act, the term 'animal' implies amphibians, birds, mammals, and reptiles, and their young, and also includes, in the cases of birds and reptiles, their eggs. As per the Act hunting of animal includes, (a) capturing, killing, poisoning, snaring, and trapping or any wild animal and every attempt to do so, (b) driving any wild animal for any of purposes, and (c) injuring or destroying or taking any part of the body of any such animal, or in the case of wild birds or reptiles, damaging the eggs of such

birds or reptiles, or disturbing the eggs or nests of such birds or reptiles. "Wildlife" includes any animal, bees butterflies, crustacean, fish and moths; and aquatic or land vegetation which forms part of any habitat. The Act specifies that No person shall hunt any wild animal specified in Schedule, I, II, III and IV of the Act except as have acted in good faith (self defense) or if the wild animal has become dangerous to human life or is so disabled or diseased as to be beyond recovery.

The Act also specifies that the State Government may, by notification, declare its intention to constitute any area other than area comprised with any reserve forest or the territorial waters as a sanctuary if it considers that such area is of adequate ecological, faunal, floral, geomorphological, natural or zoological significance, for the purpose of protecting, propagating or developing wildlife or its environment. Entry into any such sanctuary for legal businesses is subject to the permission of the concerned Chief Wildlife Warden.

Relevant species under Schedule I	***Schedule III***
Gangetic dolphin (*Platanista gangetica*)	Sponges (all Calcareans)
Snubfin Dolphin (*Oreaella brevezastris)*	
Audithia Turtle (*Pelochelys bibroni*)	
Crocodiles (including the Estuarine or salt water crocodile) (*Crocodilus porosus* & *Crocodilus palustris*)	
Gharial (*Gavialis gangeticus*)	
Ganges Soft-shelled Turtle (*Trionyx gangeticus*)	
Green Sea Turtle (*Chelonia mydas*)	
Hawksbill Turtle (*Eretmochelys imbricata inlscata*)	
Indian Soft-shelled Turtle (*Lissemys punctata punctata*)	
Leathery Turtle (*Dermochelys coriacea*)	
Logger Head Turtle (*Caretta caretta*)	
Olive Back Logger Head Turtle (*Lepidochelys olivacea*)	
Peacock-marked Soft-shelled Turtle (*Trionyx hurum*)	
Whale Shark (*Rhincodon typus*)	
Sharks and Rays	
Anoxypristis cuspidate	
Carcharhinus hemiodon	
Glyphis gangeticus	
Glyphis glyphis	
Himantura fluviatilis	
Pristis microdon	
Pristis zijsron	
Rhynchobatus djiddensis	
Urogymus asperrimus	
Corals	

4.0 Territorial Sea, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Acts, 1976

As per the Territorial Sea, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Acts, 1976 the Indian seas are divided into four zones: 1)

Territorial waters; 2) Contiguous zone; 3) Exclusive Economic Zone, and 4) Continental Shelf.

As per the Act, the limit of the territorial waters is 12 nautical miles from the nearest point of the appropriate base line. The contiguous zone of India is an area beyond and adjacent to the territorial waters and the limits of contiguous zone lies at a distance of 24 nautical miles from nearest point of the appropriate base line. The Exclusive Economic Zone (EEZ) is an area beyond and adjacent to territorial waters and the limits of such zone is 200 nautical miles from the base line.

The starting point of all these zones envisaged in 1976 Act is from the nearest point of 'appropriate base line'. The 'base line' is defined in Section 2 of the Geneva Convention of Territorial Sea and Contiguous Zone, 1958. As per the convention, the normal base line for measuring the limits of the territorial waters is the low water line along the coast as marked on large-scale chart officially recognised by the coastal state.

The continental shelf of India comprises seabed and subsoil of the sub marine areas that extend beyond the limit of its territorial waters through the natural promulgation of its land territory to the outer edge of continental margin or to a distance of 200 nautical miles from the appropriate base line where the outer edge of the continental margin does not extend up to that distance.

Relevancy to those zones lie in the fact that the 1976 Act was passed pursuant to amendment introduced in Article 297 by the 1976 amendment of the Constitution. The Article 297 reads:

"Things of value within territorial waters or continental shelf and resources of the exclusive economic zone to vest in the Union:

(1) All lands, minerals and other things of value underlying the ocean within the territorial waters, or the continental shelf, or the exclusive zone, of India shall vest in the Union and be held for the purpose of the Union.

(2) All other resources of the exclusive economic zone of India shall also vest in the Union and be held for the purpose of the Union.

(3) The limits of the territorial waters, the continental shelf, the exclusive economic zone, and other maritime zones, of India shall be such as may be specified, from time to time, by or under any law made by the Parliament.

The 1976 Act was passed to safeguard the interests of the nation, to provide for a general legal framework specifying the nature, scope and extent of India's rights, jurisdiction and control in relation to various maritime zones, the maritime boundaries between India and other states whose coasts are opposite or adjacent to those of India, and for the exploration and protection of the resources of our continental shelf and the EEZ. As the preamble to 1976 Act reads, this was the first comprehensive legislation on the law of sea which India had enacted. The Act is administered by the Ministry of External Affairs.

It is pertinent to note that besides India having in generality exclusive sovereign rights in respect of continental shelf, it also has over the continental shelf:

a) Sovereign rights for the purposes of exploration, exploitation, conservation and management of all resources.

b) Exclusive rights and jurisdiction for the maintenance or operation of artificial islands, off-shore terminals, installation and other structures and devices necessary for the exploration and exploitation of the resources of the continental shelf or the convenience of shipping or for any purpose.

c) Exclusive jurisdiction to authorise, regulate and control scientific research, and

d) Exclusive jurisdiction to preserve and protect the marine environment and to prevent and control marine pollution.

Provisions for fisheries management: With regard to fisheries and related activities in the continental shelf/ EEZ, the Act has many provisions. First, the Act introduces controlled access to marine waters. It clearly says that "no person (including a foreign Government) can explore the continental shelf/ EEZ or exploit its resources or do any other activity unless he is granted by the Central Government to do so."

Thus the Act has provisions for controlling access, both for Indian and foreign vessels irrespective of their make and intention. The Act introduces the concept of sustainable use of fishery resources by specifying that for preservation of marine environment and marine resources, the Central Government can declare any area as 'designated' and can impose any restriction and modification as deemed fit in the continental shelf and the designated area.

Further, any breach of the Act is punishable with imprisonment which may extend to three years, or with fine, or with both. Although, the Act never specifically mentioned 'Indian nationals' in respect of its provision, the clauses, such as 'whoever' 'no person' used in the Act should be applicable to the Indian nationals as well.

The Act also specifies that the Central government reserves the rights regarding formation and implementation of act and rules covering exploitation or any other use of the continental shelf and EEZ and grant of licenses for the same (Section 15)[37].

5.0 The Coast Guard Act, 1978

[37] Power to Tax in Territorial Waters (Great Eastern Shipping Company v. State of Karnataka and ors.)

According to the decision of Karnataka High Court, "The reasonable inference that should be drawn from Clause (1) of Article 297 of the Constitution is that the makers of Constitution intended to exclude the territorial waters as one vest with the Union of India. This view of ours, it appears to us, also stands to reason. Just as one State is separated by the boundaries prescribed by means of a legislation made by the Parliament from the other, the territorial waters, which is abutting the land of the State also forms part of the State. So far as the country is concerned, the Union of India has been constituted by union of States or Union Territories by means of geographical boundaries. So far as the State which is surrounded by the water, in our view, the boundary of that State, in the absence of a law made by the Parliament excluding the territorial waters as being part of that State, the same should be included as part of that State." So the court held the power to tax vests with state government (Accessed from http://www.legalserviceindia.com/article/l38-Power-To-Tax-In-Territorial-Waters.html).

An Act to provide for the constitution and regulation of an armed force of the Union for ensuring the security of the maritime zones of India with a view to the protection of maritime and other national interests in such zones and for matters connected therewith. The Act is administered by the Ministry of Defence.

Fisheries management provisions: This Act provides the basic frame work for surveillance and control mechanism for Indian marine waters as specified under the other Acts. The Act specifies that the duty of the Coast Guard is *to enforce the provisions of such enactments as are for the time being in force in the maritime zones.*

Reading this with the provisions made under the Territorial Sea, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Acts, 1976 and the MZI Act, 1981, the Coast Guard is responsible for controlling foreign fishing vessels and their activities in the Indian marine waters.

The other duties as specified in the Act are:

- *ensuring the safety and protection of artificial islands, offshore terminals, installations and other structures and devices in any maritime zone;*
- *providing protection to fishermen including assistance to them at sea while in distress;*
- *taking such measures as are necessary to preserve and protect the maritime environment and to prevent and control marine pollution;*
- *assisting the customs and other authorities in anti-smuggling operations;*
- *such other matters, including measures for the safety of life and property at sea and collection of scientific data, as may be prescribed.*

6.0 The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981

This Act regulates foreign fishing within Indian maritime zones. Foreign fishing vessels will be allowed to pursue any activity within the Indian maritime zone only if they have a license or permit. The Act clearly specifies the type of offences, penalties and legal proceedings pertaining to a foreign fishing vessel and the powers vested in authorized officers to enforce the Act. The Rules framed under the Act provides for licenses and permits for the use of foreign fishing vessels for fishing in the maritime zones of India. The remaining provisions specify terms and conditions for obtaining licenses and/or permits. The rules also set the terms and conditions for carrying out fishing activities, payment of fees, size, type of fish which may be caught, reports, inspection, transport of fish, and other (additional) conditions as may be specified in the licence or permit. However, the Act does not establish sustainable fishing as a criterion.

Definitions:

- *"fish" means any aquatic animal, whether piscine or not, and includes shell fish, crustacean, molluscs, turtle (Chelonia), aquatic mammal (the young, fry, eggs and spawn thereof), holthurians, coelenterates, sea weed, coral (Porifera) and any other aquatic life.*

- *"fishing" means catching, taking, killing, attracting or pursuing fish by any method and includes the processing, preserving, transferring, receiving and transporting of fish;*
- *"Vessel" includes any ship, boat, sailing vessel or other description of vessel.*
- *"Foreign vessel" means any vessel other than an Indian vessel; "Indian vessel" means a vessel owned by Government or by a corporation established by a Central Act or a Provincial or State Act, or a vessel which is owned wholly by a citizen of India or a company in which not less than sixty percent of the share capital is held by Indian citizens or a registered co-operative society every member whereof is a citizen of India or where any other co-operative society is a member thereof, every individual who is a member of such other co-operative society is a citizen of India; and which is registered under the Merchant Shipping Act, 1958, or under any other Central Act or any Provincial or State Act.*

Management of fishing in maritime zones of India: The Act specifies following measures in regard to fishing in Indian maritime zone:

- *No foreign vessel without a permit or license from the Central Government can undertake fishing in the maritime zone of India as per the Act.*
- *A person holding a licence under this section shall ensure that every person employed by him complies in the course of such employment, with the provisions of this Act, or any rule or order made there under and the conditions of such licence.*
- *Indian nationals employing a foreign vessel also need a license or permit under the Act to do operation in maritime zone of India.*
- *The Central Government reserves the right to suspend or cancel the license if it found any breach in conduct as per the provisions of the Act.*
- *The Coast Guard is authorized under the Act to stop or board a foreign vessel in any maritime zone of India and search such vessel for fish and for equipment used or capable of being used for fishing and check their license and/ or other necessary documents and conduct enquiries pertaining to the upholding of the provisions of the Act.*
- *In case the investigating Coast Guard officer has any reasonable doubt that the vessel is breaching the Act it may seize the boat/ gear and arrest the crew if necessary.*
- *Depending on the nature and place of offence the punishment in form of fine may ranges from Rs 50 000 to Rs 15 00 000. In case of a company, all the persons who are liable for the offence will be punished. The offence may be in the form of breaching of provisions of the act in the territorial water (maximum offence) or EEZ or failure to facilitate or cooperate with the Coast Guard, etc.*

7.0 The Biological Diversity Act, 2002

The Biological Diversity Act was enacted to provide for conservation of biological diversity (BD), sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources. The act states that considering the rich biological diversity of India and India's commitment as a party to the UN Convention on Biological Diversity which came into force in 1993, it is imperative that India exercises sovereign rights over its biological

resources and fulfil its obligation of conservation and sustainable use of biological resources.

The Act is applicable to whole of India. It defines BD as the variability among living organisms from all sources and the ecological complexes of which they are part, and includes diversity within species or between species and of eco-systems. The biological resources in the Act includes plants, animals and micro-organisms or parts thereof, their genetic material and by-products (excluding value added products) with actual or potential use or value, but does not include human genetic material.

The act imposes certain restriction on Indian, non-resident Indian and foreign nationals on use of biological resources. However, Central Government, in consultation with the National Biodiversity Authority may remove the biological resources generally traded as commodity.

A major achievement of the Act is that it sets certain duties for the central and State Governments relating to BD. The Act specifies that a national strategy should be developed for the conservation and promotion and sustainable use of biological diversity including measures for identification and monitoring of areas rich in biological resources. The Government is also expected to take measures to improve BD and BR if they are threatened by overuse. For this reason the Central Government in consultation with the State Government may issue notifications about threatened species.

Further, the Act suggested conducting an Environmental Impact Assessment study for any project which is likely to have a negative environmental impact. That is regarding a new project in fishery, which is an extractive industry an EIA study deemed necessary as per the Act.

8.0 Marine Fishing Regulation Acts of the coastal States/Union Territories

The Marine Fishing Regulation Act of the coastal States/ UTs in India was a response to the growing levels of conflict in the coastal waters during the early seventies. To reduce the conflicts and also allow for regulation of fisheries in the territorial waters, the Ministry of Agriculture formulated a Model bill, which was circulated to the coastal States/ UTs in 1979. Based on the Model Bill all the coastal States/ UTs have enacted the Marine Fishing Regulation Act and the rules and regulations there under. Goa (then a UT), Karnataka and Kerala were the first states to enact their MFRA in 1980. The UT of Puducherry is the last to enact the MFRA in 2008.

The MFRAs have provisions for regulating fishing and conservation measures in the territorial waters. These include regulation of mesh size to avoid catching of juvenile fish, maximum-minimum fish sizes, regulation of gear to avoid over-exploitation of certain species, reservation of zones for various fishing sectors to provide exclusive rights to traditional fishermen to fish unhindered in near shore areas and also for declaration of closed seasons during fish breeding period to avoid catching of young juvenile fish. The other important aspects include vessel movement control, vessel inspection, registration and license and colour coding.

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Annexure 8: List of Stakeholder Consultation and Field Visits undertaken for preparation of NPOA-Shark

Date & Venue	Meeting/Workshop/ Consultation	Outcome
24-26 March 2008, Beruwala, Sri Lanka	1st Regional Consultation on Sharks	National and regional statuses of shark fisheries were discussed. Needs identified.
9-11 August, 2009, Kulhudhuffushi, Maldives	2nd Regional Consultation on Sharks	Roadmap for preparation of N/ROPA-Sharks developed. BOBLME joined the initiative.
1 October 2009, Thoothoor, Kanyakumari	Interaction with Association of Deep Sea Going Artisanal Fishermen (ADSGAF) No. of participants = 40	Fishermen informed that they were now seeking opportunities in tuna longlining and shark fishing was not the only source of livelihoods. However, it is shark fishing that brought them prosperity and they would like to continue fishing sharks.
June-August 2010, Chennai, Tamil Nadu	Interaction with shark traders No. of participants = 5 trading houses	Traders informed that shark fin trade was growing at a steady rate. The material was sourced from all around India, though the major share of the raw material came from Gujarat, Tamil Nadu and Andhra Pradesh.
14 July 2013, Thoothoor, Kanyakumari, Tamil Nadu	Interaction with Association of Deep Sea Going Artisanal Fishermen (ADSGAF) No. of participants = 45	Fishermen informed that they understand the need to conserve sharks. On pilot experiment of using shark identification guide prepared by IOTC, fishermen said actual picture of the species and local name could be more useful. In addition, some basic training in shark identification would be useful as fishermen liked rapid identification of sharks (spending least time in such activities). However, a formal logbook system could not be developed.
4-7 September 2013, Veraval, Gujarat	Stakeholder Interaction No. of participants = 60 (different meetings)	Fishermen informed that post fishing ban of whale shark, new fisheries were developed along the Gujarat coast and sharks are mostly coming as a by-catch. However, since considerable volumes of sharks were landed along the coast, post-harvest activities such as drying, shark in brine and finning were popular activities.
25th March 2014, Trivandrum, Kerala	First Meeting of the National Mission for Conservation of Sharks-India (NMCSI) No. of participants = 85	The Mission recommended the (i) need for improved data collection and analysis and targeted research and development. Research should not be the sole responsibility of the Government alone; independent researchers, NGO's and fishermen

		associations should also be involved in the process; (ii) review the existing conservation and management measures on sharks with support from community associations; (iii0 document best practices followed by other countries and customize it to meet the local needs; (iv) identify the gaps in existing conservation measures and improve it to increase shark population; (v) initiate focused education and awareness programmes and create awareness amongst community members; and (vi) improved coordination and consultation among all stakeholders, including merchants.
15 May 2014, Visakhapatnam, Andhra Pradesh	Meeting with members of the District Fishermen's Youth Welfare Association (DFYWA), Visakhapatnam and Department of Fisheries, Andhra Pradesh No. of participants = 54	The DFYWA members informed that while targeted fishing for shark was not carried out in the area, large quantities of small sharks came as by-catch in the gill nets, trawls and in hook and line fishing. These sharks were not much in demand for their fins (due to the small-size) but were in good demand as fresh fish and also after drying. The Association were also willing to participate in awareness programmes conducted by the DoF or any other agency.
25 July 2014, Chennai, Tamil Nadu	Second Meeting of NMCSI No. of participants = 81	Shark Merchants expressed their concern on banning of export of shark fins, which according to them enjoyed a good market in Singapore, Taiwan, China, Hong Kong, Japan, etc. and generated considerable revenue. They were also concerned that in a highly competitive market, competitors would only benefit from such measures with no real benefit to the shark stocks. The merchants further said that they collected shark products such as fins in processed form and at that level it was not possible for them to distinguish between prohibited and non-prohibited species. Fishermen said that it was difficult to identify endangered species while fishing or practice selective fishing. The fishermen were also of the view that releasing endangered species was not possible because there is no provision in the nets and long lines to release the species. Fishermen also suggested holistic measures and controlling of poaching in Indian water as against

		stock specific approach. Fishermen were also concerned whether the officials inspecting the catch had enough skills to identify different species.The fishermen and merchants also suggested having seasonal fishing bans to avoid fishing of sharks while they were breeding or in areas identified as hot spots of shark populations. For educating and creating awareness among fishermen and the traders, it was suggested that there should be information displayed on banned species at the fishing harbours, fish landing centres, etc. CMFRI suggested that to ensure catching/landing of only adult sized sharks, large hooks or large mesh-size nets should be used and breeding areas of sharks could be avoided during breeding period. CMFRI is also working on these aspects to provide guidance to the fishers. The workshop also suggested involving fishermen associations in monitoring shark catch and providing such data for better monitoring of the stocks.
20 November 2014, Mangaluru, Karnataka	Third Meeting of NMCSI No. of participants = 40	Representative from National Fishworkers Forum said that while fishermen were not against shark conservation, however, conservation measure or policies should be made after consulting fishermen to ensure their support. The workshop further recommended that (i) feasible conservation measures should be evolved and should be adopted for saving sharks: (ii) data regarding sharks under viviparous, oviparous, and ovoviviparous categories should be collected to design shark conservation measures; (iii) special programmes should organized for conservation organizations, environmentalists, media to provide field-level inputs on conservation of sharks; (iv) fisheries colleges and use of information and communication technology (ICT) will facilitate conservation drive; (v) Government may consider giving a permanent structure to community-driven NMCSI and incorporating it within the shark conservation measures to establish a link between the government and

		the community.
22 January, 2015, Mumbai, Maharashtra	Fourth Meeting of NMCSI No. of participants = 130	The Workshop recommended that the consumption of shark and shark products should be discouraged at the consumer end. It also suggested proper implementation of CCRF at the State/UT fisheries level; conducting regular meetings with all stakeholders and creating village level awareness programmes.
24 April, 2015, Nellore, Andhra Pradesh	Fifth Meeting of NMCSI No. of participants = 40	The Workshop encouraged the regulation of hooks and line in fisheries sector. It also suggested that fishermen must be involved in policy and decision-making. On conservation of sharks, the Workshop suggested that training should be provided to fishermen and enforcement officials on identification of scheduled or protected species of sharks. The Workshop further suggested that fishermen should try to avoid catching baby or juvenile sharks. It was also suggested that a dedicated law could be considered for conservation of sharks in lieu of their protection under Wildlife (Protection) Act.
17 June 2015, Veraval, Gujarat	Sixth Meeting of NMCSI No. of participants = 70	It was informed that there was 64 percent reduction in the shark landings in Gujarat since 1990s. Rapid Stock Assessments conducted by CMFRI also showed declining stock of sharks. In addition, it was informed that majority of sharks caught in Gujarat consisted of pregnant sharks. Therefore, studies on identification of breeding areas and the time of breeding should be promoted and regulatory measures such as area and seasonal closures for shark fishing, gear restrictions, etc. should be considered. Fishermen said that they were incurring losses due to ban on export of shark fins as value of shark catch was declining. The Workshop recommended that (i) data on breeding seasons and breeding grounds should be collected; (ii) all data must be reported species /group wise; (iii) data should be collected on various shark-based products and their trade values; (iv) there should be efforts made to provide real-time data on status of protected species and (vi) all measures must be

		reviewed for practicality and acceptability by stakeholders and it must be ensured that it benefits the community as a whole.
13 August, 2015, Paradip, Odisha	Seventh Meeting of NMCSI No. of participants = 45	In Odisha, sharks constituted only 0.3---0.5 percent of the total marine fish landing. Fishermen said that they considered sharks as *'Sagar Kanya'* (Daughter of the Sea) and did not target sharks. They were also willing to release any sharks that were accidentally caught on the hook---lines or nets and release them back to the sea, if they were still in good condition. For those sharks that were caught and not released, the local fishermen would learn how to better utilize the entire fish.
5 November 2015, Kolkata, West Bengal	Eighth Meeting of NMCSI No. of participants = 65	The Workshop recommended that there was a need for shark identification guide for awareness creation. The Workshop also emphasized on curbing pollution of seas and oceans and uniform ban to save the sharks and other marine species. The Workshop also suggested that alternate livelihood such as making handicraft items from shell, skeleton, etc could be considered for promotion.

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Annexure 9: Bibliography on shark fisheries (including rays and skates) in India

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Annexure 10: National Plan of Action on Implementation of Monitoring, Control and Surveillance in Marine Fisheries

A. Resource Estimation

- Marine fish landings should be estimated regularly on the basis of a scientifically designed programme, which should be uniform for all coastal States and Union Territories (UTs). The monitoring of fish landings should include data on various biological aspects of commercially important fin and shellfish species. Consolidation of fish landings at designated fishing harbours and fish landing centres (FLCs) will improve the quality of data and provide better estimates on the fish landings.
- The scientifically designed programme should allow segregation of data on fish landings from the territorial waters and those from the Exclusive Economic Zone (EEZ).
- Stock assessment should be carried out at regular intervals. The revalidation of potential yield estimates should be conducted for commercially important fin and shellfish stocks every five years. While revalidating potential yield estimates and arriving at Maximum Sustainable Yields (MSY), the data available with different agencies should also be taken into account.

B. Estimation of Fishing Effort and Adjustment of Fishing Capacity

- The fishing capacity should be estimated for each coastal State and UT using scientific methods. Besides estimating the fleet size in absolute numbers, parameters such as gross tonnage and engine horse power should also be included in the next marine fisheries census, which is likely to be conducted during the Eleventh Five-Year Plan period.
- The deployment of fishing fleet/ effort by the coastal States/ UTs in their territorial waters should be commensurate with the potential yield estimated for such area. Deployment of fishing fleet/ effort in the EEZ should be coordinated by the Central Government. The coastal States/ UTs should also devise a consultative mechanism to coordinate and regulate fishing fleet within their territorial waters and also in the EEZ; for the latter in consultation with the Central Government.
- Adjustment of fishing fleet/ effort should be undertaken on a regular basis by the coastal States/ UTs for the their territorial waters and for the EEZ by the Central Government using controls which target both inputs (*e.g.* fishing area, fishery effort) and outputs (*e.g.* analysis of fisheries potential).
- Besides ongoing programmes for collection of statistics on fish landings, it should also be made mandatory for the fishing vessels to file log sheets containing information on species-wise fish catch, area of operation, effort deployed, etc after each fishing trip to the designated authority. In the beginning this requirement may be restricted to the harbor-based mechanized fishing vessels. In the longer-term, this data collection mechanism could also be extended to the other categories of fishing vessels.

C. Registration and Licensing of Fishing Vessels

- All sea-worthy unregistered and unlicensed fishing vessels should be registered/ licensed in a time-bound manner.
- To overcome the shortage of manpower, the Mercantile Marine Department (MMD) may consider delegating the powers of registering fishing vessels less than 20 meters Length Overall (LOA) to the Department of Fisheries (DoF) of the coastal States/ UTs.
- The registration of fishing vessels by the coastal States/ UTs should be uniform and consistent using a minimum set of parameters, which should include (i) name and address of owner; (ii) name of fishing vessel; (iii) vessel size (length and tonnage)/ horse power; (iv) boat builder/ supplier; (v) material of construction and if applicable, structural requirement; (vi) type of fishing; (vii) year of construction; (viii) place of registry; (ix) requirements of certified crew (fishing operations and engine/ machinery operation).
- The fishing vessels should be registered specifically for the type of fishing, the type of gear to be used and the period and frequency of operation. The vessels used for more than one type of fishing should register as multipurpose fishing vessels with details on the types of fishing and the fishing seasons. Such details in the registration data would be useful for arriving at fishing effort deployed in the marine waters and would also enable adjustments in the fishing fleet as and when required.
- The licence or inspection certificate is a document that needs to be renewed annually. The requirements for issuing a licence should aim at meeting guidelines for design, construction and equipment of fishing vessels; area of operation; type of fishing; insurance; minimum safety equipment; reporting as provided for in the law and minimum requirements for working and living conditions as appropriate for different classes of vessels.
- Insurance of the fishing vessel and crew should be a mandatory requirement for registration and also for grant of licence. In the case of the artisanal sector (traditional fleet both motorized and non-motorized), the Government may consider subsidizing the insurance premium.
- The colour coding of fishing vessels should be mandatory to indicate the port of registry and the licensed zone of operation. To avoid overlaps in colour coding, the coastal States/ UTs may together decide on the colour patterns to be used by the fishing vessels.

D. Infrastructure Development

- The existing fisheries infrastructure facilities in the coastal States/ UTs in terms of landing and berthing facilities (such as fishing harbours and FLCs), ice plants, cold storages, fish markets, boat building yards, etc should be inventoried.
- The existing landing and berthing facilities cater to the requirements of about 25 percent of the fishing fleet in the country. This situation is leading to acute congestion in the fishing harbours and FLCs. In many cases the navigational channels/ approaches to the fishing harbours and FLCs are silted and cause delays in landing of fish besides posing a safety hazard. Therefore, a thorough assessment of the existing infrastructure facilities and the actual requirements in terms of new units and or modernization of the existing facilities for each coastal State/ UT should be made.
- Considering the need to minimize post-harvest losses and to improve hygienic handling of fish at the fishing harbours and the FLCs, the concerned agencies

owning the facilities should adopt and implement hygienic standards so as to conform to international standards for food safety.

E. Zonation of Fishing Grounds

- The zonation of fishing grounds for different categories of fishing vessels is provided in the Marine Fishing Regulation Act (MFRA) of the coastal States/ UTs. The zones vary from state to state and are largely based on the extent of the continental shelf and the size of the different categories of fishing vessels. Keeping in view the safety of fishing vessels, the license for fishing in a particular area should be dependent on the size of the vessel and its capability to fish in a particular area.

F. Surveillance

- Surveillance at sea is at presently done by the Indian Coast Guard (ICG), who check crew identification, vessel documents and safety equipment on board. Surveillance should also be carried out at port through random inspections by the designated agency.
- The coastal States/ UTs should make provisions to provide Identity Cards to the marine fishers and such cards should be issued after making proper verification of their antecedents.
- A comprehensive surveillance mechanism should be evolved and such a mechanism should involve the ICG, State/ UT Governments and also the stakeholders. In this regard, the responsibilities for surveillance should be split between the ICG for the EEZ and the State/ UT Government (DoF or Marine Enforcement Police) for the territorial waters. The involvement of stakeholders (*e.g.* fishers) is crucial for effective surveillance both at port and at sea. Emphasis should be laid on shore-based MCS programmes with greater community-participation, as it is cost-effective.
- The recommendations for communication equipment and distress signalling should be as per recommended international guidelines and should be appropriate to the size and type of the fishing vessels.
- Fishing vessels operating in territorial waters should use Channel 16 exclusively for distress communication. Separate channels should be used for other communication. For distress signalling, the Distress Alert Transmitter (DAT) devised by the Indian Space Research Organization and the ICG has proved to be successful and should be promoted for use by the fishers. For vessels over 15 meter LOA, fitment of an AIS for tracking and collision prevention is recommended.
- The Central Government may consider creation of a central database of fishing vessels. The coastal States/ UTs may also consider setting up of Fisheries Intelligence Wings for effective surveillance.

G. Review of Fisheries Legislation

- To regulate fishing in the EEZ by wholly Indian owned and Indian flagged fishing vessels, the Central Government should enact a central legislation, which should *inter alia* include provisions for MCS, fisheries management (inclusive of safety requirements) and resource conservation and enforcement. Such legislation should also be compatible with the International voluntary and non-voluntary instruments (*e.g.* the 1982 United Nations Convention on the Law of the Sea, the

United Nations Fish Stocks Agreement, the 1995 Code of Conduct for Responsible Fisheries, IMO/FAO/ILO Voluntary Codes for Fishing Vessels Part A and B).

- A thorough review of the existing fisheries and supporting legislation enacted by the Central Government should be undertaken. Wherever necessary, such legislation should be amended to include requirements of MCS, fisheries management, resource conservation and also the requirements of International voluntary and non-voluntary instruments. All relevant provisions concerning marine fisheries sector contained in the Central legislation should be implemented in a coordinated manner.
- The MFRAs of the coastal States/ UTs contains adequate provisions to implement MCS within their respective jurisdictions. However, many such provisions are not implemented by the coastal States/ UTs, due to inadequate manpower, funding constraints, etc. In view of the importance of MCS in the marine fisheries sector, the coastal States/ UTs should deploy adequate manpower and also make appropriate funding provisions. Wherever required and feasible, some provisions may also be considered for delegation to the other relevant agencies in the State/ UT (*e.g.* Marine Enforcement Wing, Coastal Protection Police).

H. Fisheries Policy and Management Frameworks

- Based on the 2004 Comprehensive Marine Fishing Policy of the Central Government, all coastal States/ UTs should formulate their policies with adequate involvement of all concerned stakeholders. The State/ UT policy should clearly define the objectives and goals of fisheries development. It should be comprehensive and not only include the topical requirements of the fisheries sector but also ensure that the fruits of development reach the end users. The policy should ensure decentralization and adopt the '*Principle of Subsidiarity'*. The policy may also consider promoting rights-based fisheries management to the extent possible. Further, such policy documents should be dynamic in nature and allow for periodic revisions and adoption of new developments to assist in sustainable growth of the fisheries sector.
- Management plans for major fish stocks should be formulated by the Central Government in coordination with the concerned States/ UTs for sustainable use of the fisheries resources. In a data-deficient situation, such plans may also rely on the 'precautionary approach'. The plans, wherever feasible, may also consider fixed time schedule for allowing the stocks to be harvested, *ex situ* and *in situ* conservation and management measures and stock enhancement using proven technologies such as artificial reefs, fish aggregating devices and sea ranching.
- The MCS, which is an integral part of fisheries management, should be implemented in stages. The first stage should include mandatory registration and licensing. The second stage should take up enforcement of the provisions contained in the rules and regulations. Involvement of stakeholders from the very beginning would help promoting voluntary compliance by the fishers and other concerned user groups. This situation can help in making MCS successful and also cost-effective.
- Adequate provision of funds for implementation of MCS and other fisheries management measures is a pre-requisite. The Central Government and the States/ UTs must ensure that adequate budgetary provisions are made to cover the requirements of logistics, manpower, surveillance, human resource development, etc.

- Safety, like MCS, is also an integral part of fisheries management. Development of management plans for fish stocks should take into account the safety of fishers and ensure that such plans do not put the fishers, especially the artisanal sector, at risk.
- Effective fisheries management programmes should aim at minimizing post-harvest losses and ensuring that the harvested resources are available as food fish to the people and also put to other productive uses.
- To coordinate various activities related to fisheries management (*e.g.* management plans, MCS, safety at sea, exercise of coastal State jurisdiction, port State and flag State control), the Central Government and the coastal State/ UT Governments may consider setting up of dedicated Fisheries Resource Management and Enforcement Units (FRMEU) within their organizational frameworks.

I. Capacity Building and Empowerment

- The DoF is the nodal agency for fisheries development in the coastal States/ UTs. Therefore, it should be ensured that the DoF is adequately staffed in terms of trained technical manpower to address the issues of sustainable fisheries development within their jurisdiction. In this regard, the coastal States/ UTs may consider reorganizing the existing capacity and or creating new capacity to meet the growing requirements of fisheries management. The Workshop also felt the need for empowerment of the DoF and its staff to meet the increasing challenges of maintaining balance between fishery resource exploitation and conservation.
- The capacity building of the staff of the Fisheries Division in the Central Government, MMD, ICG, DoF of the coastal States/UTs and other concerned organizations should be initiated in a planned manner. A Gap analysis may be undertaken to arrive at the actual needs of capacity building.
- Similarly, strengthening of the fisheries institutions and other agencies concerned with the implementation of fisheries management (*e.g.* community-based organizations) should be taken up in a time-bound manner.
- The fishing community, as the grassroots practitioners of fisheries, should be empowered to participate in the fisheries management programmes. Their skills and capacities should be enhanced through short-term and highly focused vocational trainings and hands-on workshops. The boat owners, who at times may not be the actual practitioners, should also be involved in the training programmes on resource management.
- The socio-economic well-being of fisher community should be improved. Besides strengthening their safety nets, the working and living conditions of fishers on board fishing vessels should also be improved.
- The Workshop recognized the need for political will to support fisheries management that would allow sustainable use of the resources and stem depletion of fish stocks. In this regard the Workshop also felt that the fisheries sector has the potential to contribute to national economy and, therefore, should receive better recognition.

J. Community Mobilisation, Communication and Awareness

- Fisher communities in the coastal States/ UTs should be mobilized to participate and assist in the implementation of fisheries management programmes. Fisher cooperative should be strengthened. Co-management should be promoted,

wherever feasible. Involvement of the Panchayati Raj institutions would facilitate the process at the grassroots level.

- Community interaction programmes should be undertaken on issues such as resource management and formulation of management plans, MCS, safety and survival, health, hygiene and literacy. Women must be included in such programmes and activities may also be conceived for them to participate in MCS programmes.
- The print and electronic media should be made use of to the fullest extent in educating fishers and other stakeholders on the need for fisheries management. The mass media should also be used for building the capacity of the stakeholders.
- There is a greater need for information collection, collation and dissemination. Stories of success (and also failures) in fisheries management, indigenous knowledge in fisheries management, etc. can enhance fisheries conservation and management measures and should be documented and shared with fishers and other stakeholders. Information on fisheries census should be disseminated to the stakeholders with minimum time lag and they should be educated on the consequences of changes noted in the census from the previous year's data. Students from the universities/ colleges/ school and public personalities should also be involved in the exercise. Fullest use of information technology and Geographical Information System should be made.
- Vocational education for fishers and non-formal education of fisher's children should also be considered as a necessity for preparing the community to take ownership of the resources.

K. Coordination and Networking

- Formal and effective linkages should be established between the key players – Ministry of Agriculture/DoF of the coastal States/UTs/ICG/MMD for implementation of the fisheries management programmes in general and MCS activities in particular.
- The Central Government may consider constituting an interdisciplinary Ministerial/ Departmental committee to coordinate and collaborate on the implementation of the approved action plan and also monitor the progress through performance indicators. To make the MCS programme effective in the EEZ, regional cooperation may also be necessary and the Ministry of Agriculture may considering initiating suitable mechanisms for the purpose.

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Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project to lay the foundations for a coordinated programme of action designed to better the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries.

The Food and Agriculture Organization (FAO) is the implementing agency for the BOBLME Project.

The Project is funded principally by the Global Environment Facility (GEF), Norway, the Swedish International Development Cooperation Agency, the FAO, and the National Oceanic and Atmospheric Administration of the USA.

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