MOST URGENT
By E-mail/Speed post

F. No. 27035/03/2013-Fy (IC)
Government of India
Ministry of Fisheries, Animal Husbandry & Dairying
Department of Fisheries

Krishi Bhawan, New Delhi
Dated the 30th September, 2022

To,
Shri Nagaraj Kulkarni,
Sr. Technical Director (Scientist-F),
NIC,
Krishi Bhawan,
New Delhi
E-mail: kulkarni@nic.in

Subject: National Plan of Action for Conservation and Management of Shark (NPOA Sharks) - reg.

Sir,

I am directed to enclose herewith the draft 'National Plan of Action for Conservation and Management of Sharks' (NPOA- Sharks).

It is requested that draft 'National Plan of Action for Conservation and Management of Sharks' (NPOA- Sharks) enclosed herewith may kindly be uploaded on the website of Department of Fisheries, Govt. of India inviting the comments of stakeholders by 30th October, 2022 on the Email: jsfy@nic.in.

Encl.As above.

Yours faithfully,

(Dr. Sanjay Pandey)
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National Plan of Action for Conservation and Management of Sharks in India

BAY OF BENGAL LME

सत्यमेव जयते

National Plan of Action for Conservation and Management of Sharks in India

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Acronyms

ABNJ	Areas Beyond National Jurisdiction
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
ICAR-CMFRI	Central Marine Fisheries Research Institute of the Indian Council of Agricultural Research
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 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
MoFAH&D	Ministry of Fisheries, Animal Husbandry and Dairying
MoEF&CC	Ministry of Environment, Forest & 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 NPMF	National Plan of Action National Policy on Marine Fisheries, 2017
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 the Law of the Sea
UNFSA	United Nations Fish Stocks Agreement
UT	Union Territory

जतिन्द्र नाथ स्वेन, आईएएस
सचिव
Jatindra Nath Swain, IAS
Secretary

मत्स्यपालन, पशु पालन एवं डेयरी मंत्रालय
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Foreword

Sharks are among the Earth's most ancient creatures with an evolutionary history dating back to 450 million years. Their existence predates the first dinosaurs, insects and mammals. The world's oceans are reported to contain more than 500 species of sharks. They range in size from the small dwarf lanternshark, which is only 17 centimetres in length, to the whale shark the largest fish in the world, which reaches approximately 12 metres in length. Sharks are found in all seas and are common to depths up to 2,000 metres.

Sharks have rightly been called as the tigers of the seas. As top predators in the food pyramid of the ocean ecosystem, sharks play an important role in maintaining the species in the food chain and serving as an indicator for ocean health. Their ecosystem services are wide ranging – from indirectly maintaining the seagrass and coral reef beds to supporting the economy through ecotourism. It is often said that a live shark is hundred times more valuable than a dead shark.

Sharks are harvested primarily for their meat, fins, skin, cartilage and liver. Shark meat is an important component of the diet in many developing countries. It is also highly valued in some developed countries. Shark fins are the most valuable of shark products and are used for making traditional shark fin soup, a delicacy in many South-east and Far-east Asian countries. The value of world trade in shark commodities is approximatley USD 1 billion per year.

Despite surviving 5 mass extinctions, sharks are now one of the most threatened groups of animals on the planet. A major cause of their depleting populations is the demand for shark fins. According to studies, trade of fins represents between 1.1 and 2.2 million tons of annual shark catches in the world's oceans. Up to 73 million sharks are killed each year to satisfy the demand of the international shark fin market.

Sharks are slow growing, although they live long. Their reproductive rates are also low, which means that if overfished their populations are slow to recover. This makes the sharks highly vulnerable to overexploitation and making many shark species moving to threatened and endangered categories.

Acknowledging these key attributes of sharks, the Food and Agriculture Organization (FAO) of the United Nations rightly recognized the need for formulating the International Plan of Action for Conservation and Management of Sharks (IPOA-SHARKS). The objective of the IPOA-SHARKS is to ensure the conservation and management of sharks and their long-term sustainable use. The IPOA-SHARKS applies to States in the waters of which sharks are caught by their own or foreign vessels and to States the vessels of which catch sharks

on the high seas. Though voluntary, the IPOA-Shark also urges the States to adopt and implement a national plan of action for conservation and management of shark stocks (Shark-plan) if their vessels conduct directed fisheries for sharks or if their vessels regularly catch sharks in non-directed fisheries.

The Bay of Bengal Programme Inter-Governmental Organisation (BOBP-IGO), following the directives of its Governing Council, embarked on the preparation of the National Plan of Action for Conservation and Management of Sharks in India (NPOA-Sharks). I'm glad to see that based on extensive consultations with the stakeholders in the coastal States, the BOBP-IGO has prepared a very comprehensive NPOA-Sharks for India. The Plan provides an updated status on the shark fisheries in India, the National Plan of Action, and the implementation framework and a time-line. The NPOA-Sharks also provides a bibliography of scientific works carried on the sharks in India. I thank Dr Y S Yadava, Director, BOBP-IGO and his colleagues at the BOBP-IGO for bringing out the NPOA-Sharks, which would be a valuable document for progressing the conservation and sustainable management of shark fisheries in India.

(Jatindra Nath Swain)

Acknowledgements

The preparation of the 'National Plan of Action for Conservation and Management of Sharks in India' has been possible owing to the excellent collaboration and support that the Bay of Bengal Programme Inter-Government Organisation (BOBP-IGO) received from a range of stakeholders. While it may not be possible to acknowledge each and every individual who supported us in this exercise, we would like to place on record our sincere thanks to the following national and international Governmental and Non-Governmental Organizations, Fishermen Associations, Experts, Fishermen and Traders. The BOBP-IGO would also like to thank the reviewers who went through the first draft and offered valuable suggestions that helped us in improving the document.

1. Ministry of Fisheries, Animal Husbandry and Dairying, Government of India
2. Ministry of Environment, Forest and Climate Change, Government of India
3. Department of Fisheries of the Coastal States and Union Territories
4. Fishery Survey of India
5. ICAR-Central Marine Fisheries Research Institute
6. College of Fisheries, Veraval
7. Institute of Rural Management, Anand (support through Interns)
8. The World Bank
9. Global Environment Facility (GEF)
10. Food and Agriculture Organization of the United Nations
11. International Union for Conservation of Nature (IUCN)
12. Worldwide Fund for Nature (WWF)
13. TRAFFIC
14. Bay of Bengal Large Marine Ecosystem Project
15. International Collective in Support of Fishworkers
16. South Indian Federation of Fishermen Societies
17. Association of Deep Sea Going Artisanal Fishermen
18. Experts
19. Fishermen
20. Traders

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Preface

The development of the 'National Plan of Action for Conservation and Management of Sharks in India' or in short the '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 of the national scenarios as also in building a regional picture of the shark fisheries in the Bay of Bengal 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 the 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 adorn 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 the 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 places, 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 objectives of this extensive engagement were 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 said as the backbone of the NPOA-Sharks. The assessment 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 and promote 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 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 the published data of the ICAR-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. Mr Rajdeep Mukherjee, Policy Analyst at the BOBP-IGO provided valuable assistance in analysis of data and contributing to the chapters in various ways. Dr C Babu, Senior Scientific Assistant, FSI shouldered the task of bibliographic compilation and also assisted in analysis of the FSI data from their exploratory surveys.

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 the error that 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
29 October 2021

Yugraj Singh Yadava
Director, BOBP-IGO

Executive Summary

The National Plan of Action for the Conservation and Management of Sharks (NPOA-Sharks) is India's first step towards ensuring sustainability of the ecological and economic services from the sharks and its fishery. 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); the 1979 Convention on the Conservation of Migratory Species of Wild Animals (CMS); the 1982 United Nations Convention on the 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); the Bay of Bengal Programme Inter-governmental Organisation (BOBP-IGO) and the Bay of Bengal Large Marine Ecosystem (BOBLME) Project. Several approaches were adopted for developing the NPOA-Shark. The baseline status was arrived at from literature review and analysis of landing figures and other available fishery and non-fishery data. The NPOAs of some of the major shark harvesting countries were analysed to understand the best practices followed by them. To understand the viewpoints of the community, extensive stakeholder consultations were organized along the coast and also some focussed community-level appraisals were carried out in Gujarat and Tamil Nadu.

India is one of the largest marine fishing nations in the world with 8,118 km of coastline and 2.02 sq. km of Exclusive Economic Zone (EEZ). The marine fisheries potential of the country is 5.31 million tonnes (2018 estimate) against which the current production level (2019) is estimated at 3.69 million tonnes. The marine fishing fleet comprises about 1 69 771 fishing craft of which 27,537 (16 %) are traditional and 99,421 (59 %) are motorized traditional crafts. The mechanized fishing vessels (MFVs) comprise 42,813 vessels – 25 percent of the total. The sector contributed about Indian Rupees (INR) 62 thousand crores to the GDP (GVA at 2011-12 prices) during 2019-2020, which is 0.47 percent of the total GVA and 3.17 percent of the GVA from agriculture, forestry and fishing at constant prices (2011-12). India is the fourth largest fish exporting country. The fisheries sector is also one of the major contributors of foreign exchange earnings. The country has exported a record 11,49,510 tonnes of marine products in 2020-21 valued at INR 43,720.98 crores.

It is estimated that approximately 3.77 million people depend on marine fisheries sector for their livelihoods (2016), many of whom specialize in shark fishing. Shark meat is a local delicacy and enjoys a large clientele, especially along the southern Indian coast. Presently, India is the third largest shark fishing nation after Indonesia. The country lands about 6 percent of the global shark catches in terms of weight (Average, 2015-19).

Sharks, comprising true sharks, rays, skates and chimaera (Chondrichthyans), are traditionally caught in coastal artisanal fisheries in India. Sharks are particularly vulnerable to over-exploitation because of their life-history 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 the 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 the species are considered safe.

At the national level, India harvested about 43,738 tonnes of shark in 2019. 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 have now moved 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, growing awareness on the ecological importance of sharks and policy measures. In terms of the 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 (ICAR-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 percent to 0.26 percent while CPUE has declined from 12.64 kg per hour to 3.35 kg per hour.
- Out of the 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.

Exploratory surveys show 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 sharks landed in India stood at Rs. 278 crores in 2010. 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, 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.

The 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-Sharks 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 the 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 *Rhyncobatus djiddensis* under the Wild Life (Protection) Act of 1972. The protection provided to whale shark led to the total decline of whale shark fishing in Gujarat.

India also has an elaborate legal and policy framework to manage fisheries. The marine fisheries come under the 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 although a model Bill is under purview. The National Policy on Marine Fisheries (NPMF), 2017 emphasises on the sustainable development of fisheries and also takes an ecosystem approach to fisheries management as the guiding model. The NPMF, 2017 denotes a major departure from the previous policies with a focus on justice and equity. However, the policy measures should be supported by effective implementation measures such as an improved fisheries Monitoring, Control and Surveillance (MCS).

During the consultations carried out with the 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 in to 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-Sharks is based on an Ecosystem Approach to Fisheries and Precautionary Principles. It directly contributes to the basic tenets of IPOA-Sharks. Two basic approaches are suggested in 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 a seasonal ban or specific area closures.
- Initiate research to catalogue sharks in the 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 the Wild Life (Protection) Act, 1972; and 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, the 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 the necessary initiative within the Government for discussion and adoption of the same

The total cost of NPOA-Sharks for first three years is estimated at INR 35.51 crores or US$ 4.73 million, which is about 0.06 percent of the GDP from marine fisheries. Considering that such measures will have fishery-wide positive impacts, the actual cost of NPOA-Sharks is expected to be feasible and viable.

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Section 1: Background

This Section details the process adopted and the timeline for preparation of the NPOA-Sharks. Sharks, which is used as an umbrella term for shark, skates and rays, are amongst the oldest known living organisms on earth and play an important role in the marine food web. To sustain shark fishery in the Bay of Bengal and contribute to the global effort on conservation of sharks, the BOBP-IGO in 2007 took a decision to develop the National and Regional Plans of Action for the Conservation and Management of Sharks for its member-countries (Bangladesh, India, Maldives and Sri Lanka). These led to two regional shark consultations in 2008 and 2009 where member-countries presented their national status reports on shark fishery and drew a roadmap for the future work. In the case of India, the Fishery Survey of India (FSI), Mumbai and the ICAR-Central Marine Fisheries Research Institute (CMFRI), Kochi of the Indian Council of Agricultural Research (ICAR) were identified for the scientific and technical backstopping. Subsequently, in 2012, the Bay of Bengal Large Marine Ecosystem Project (BOBLME), having similar goals and domain, also joined the initiative. The preparation of the Plan was progressed on one hand through scientific review and on the other hand through engagement of stakeholders. The BOBP-IGO in cooperation with the Association of Deep Sea Going Artisanal Fishermen (ADSGAF) 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) to consult with the 09 coastal States, the outcomes of which would contribute to the process and accelerate the development of NPOA-Sharks. Several parallel international developments informed and enriched the preparation process, including CITES decision to restrict trade of five species of sharks and all Manta Rays in 2013 and the concurrent policy decision in India, first, the fin-attach policy, effectively prohibiting finning at sea and subsequent ban on export of shark fins from India. The objective of this document is to fulfil India's commitment and responsibility towards conservation and sustainable use of sharks. The earlier version of the NPOA-Shark was submitted to the Government of India in 2015. However, the document was reviewed in view of the recent policy changes, such as the new National Policy on Marine Fisheries, 2017. The updated version of the document was submitted to the Government in October 2021.

1.0 Background

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

Sharks, rays and skates (together comprise the class Chondrichthyes), hereafter 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 504 million US dollar (US$) in 2019. It has increased over 15 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 the 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

[1] *Estimated from FAO Fishstat J Database*

and 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 the case of India, the Fishery Survey of India (FSI), Mumbai and the ICAR-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 the 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***.

Following the two regional consultations, the ICAR-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 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 the management of shark fisheries.

During the same time, the 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 ICAR-CMFRI and shared with the fishing communities in India (and the other member-countries of the BOBLME Project and the South-East Asian 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.

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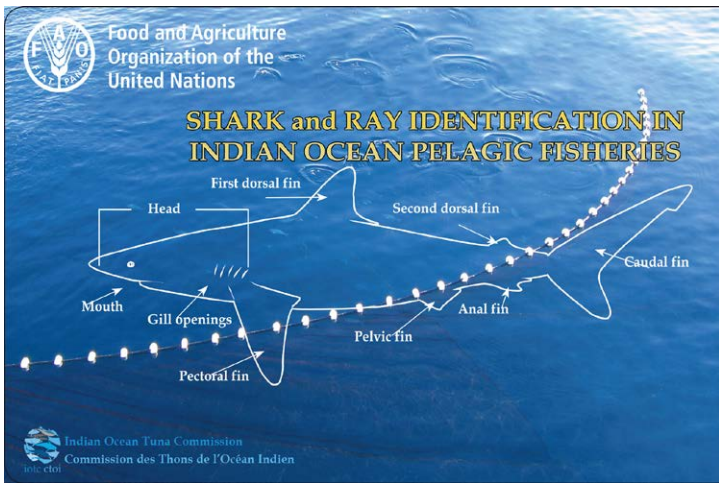
[2] *Raje, S.G., S. Sivakami, G. Mohanraj, P.P. Manoj Kumar, A. Raju and K.K. Joshi, 2007. An Atlas on the Elasmobranch Fishery Resources of India. CMFRI, Spl.Publ.No.95.253 pp.*

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 ICAR-CMFRI provided fishery-related data on shark fishery;

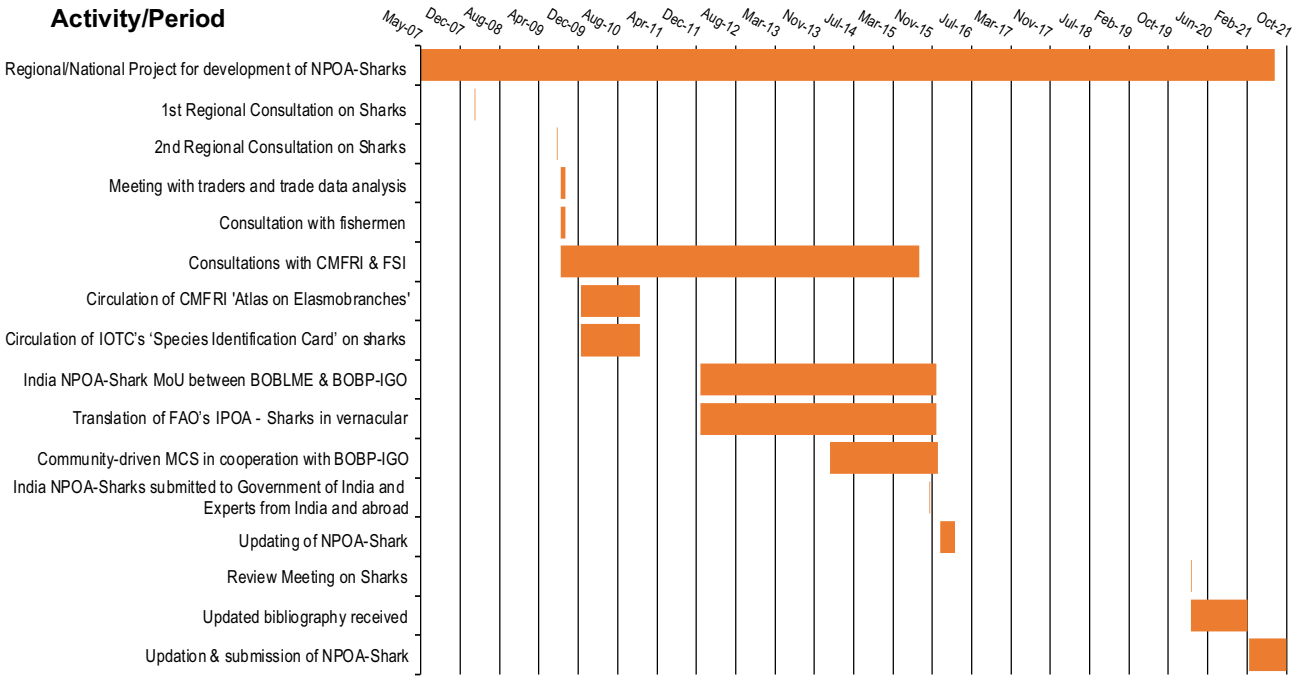
(ii) Fishery-independent data on shark fishery was collected from different publications of FSI, who is responsible for conducting exploratory surveys in the Indian Exclusive Economic Zone (EEZ) at regular intervals to gauge the status of resources;

(iii) Information on time-series data on national and 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 was collected through focus group discussions and workshops involving fishermen from across the country.

Adopting a broad consultative approach for development of NPOA-Sharks 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 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-Sharks. The Gantt chart of project activities is given in ***Figure 1***.

Figure 1:

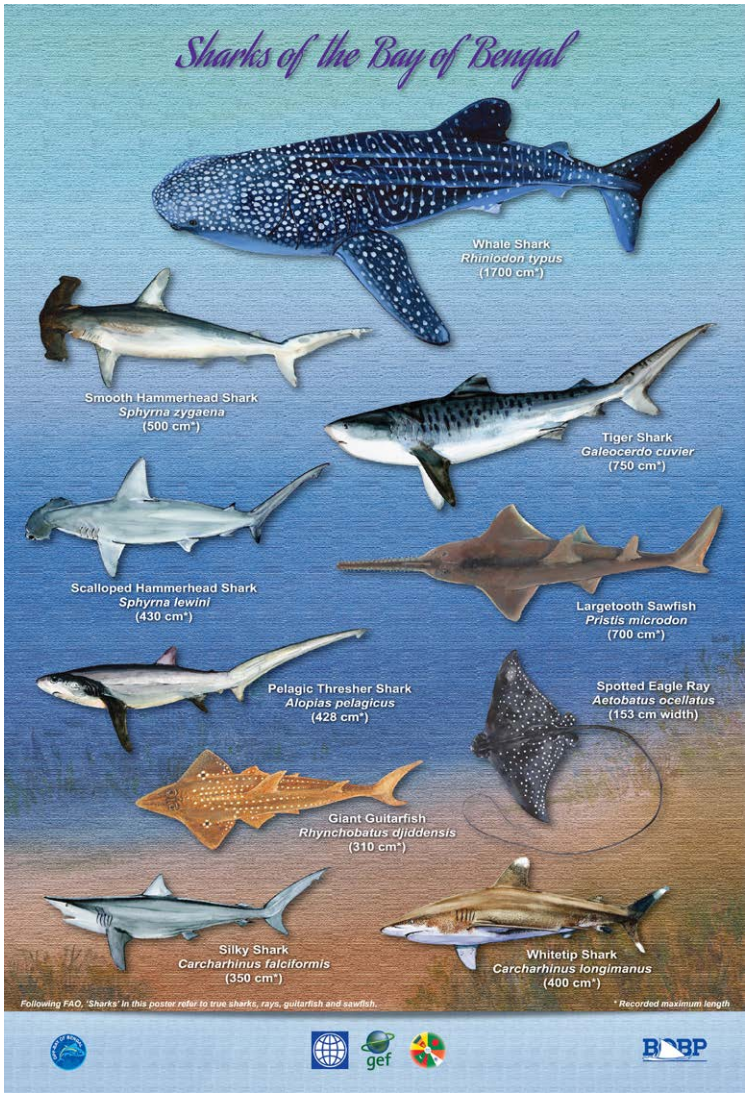


1.2 Parallel development at national and international levels contributing to NPOA-Sharks

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 ICAR-CMFRI in 2012 instituted an ICAR funded five-year research programme on "Assessment of Elasmobranch Resources in the Indian Seas". During 2012-2017, ICAR-CMFRI completed the first phase of the National Project "Assessment of Elasmobranch Resources in the Indian Seas" and based on the results of the first phase, the Institute is now carrying out the second phase. The Institute is currently (2017-2024) carrying out a project entitled, "Developing Management Plans for Sustainable Exploitation and Conservation of Elasmobranchs in India." During 2017-2020, ICAR-CMFRI also completed a preliminary project on "Assessing

Image 1: Sharks of the Bay of Bengal

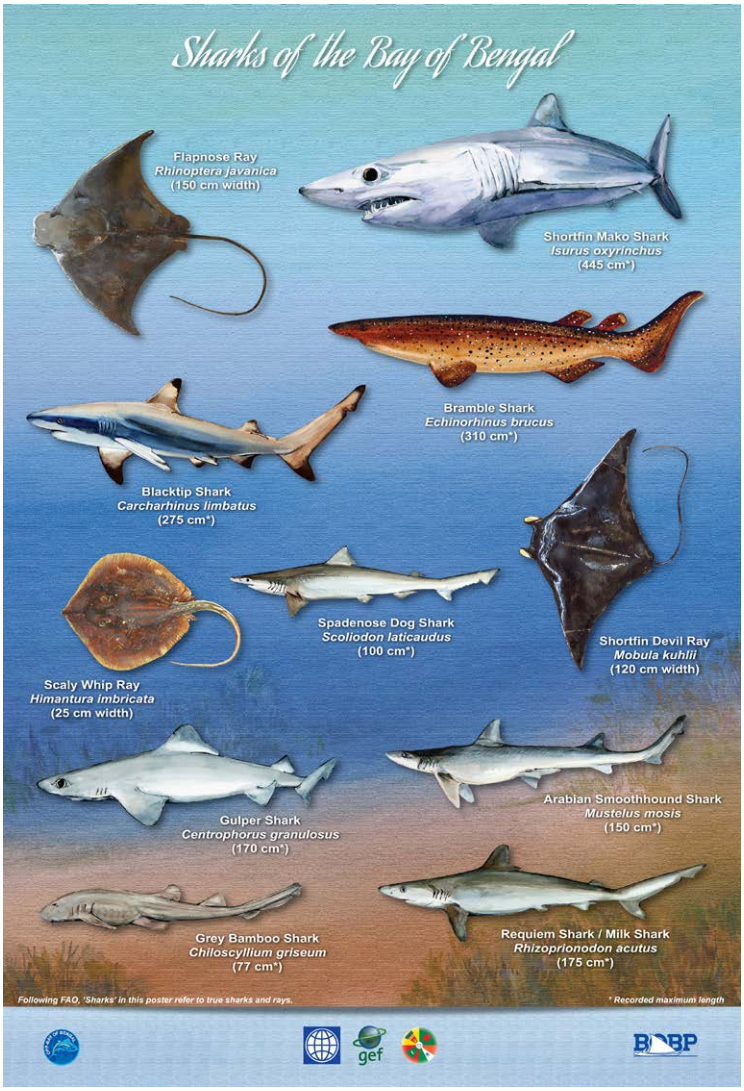


the status of Elasmobranchs Protected under the Indian Wildlife Act, 1972" and a project on "Shark and Ray of Non-Fin Commodities". The latter project was carried out in collaboration with FAO, Rome. Since 2012, ICAR-CMFRI has also conducted several stakeholder consultations and awareness campaigns in all the maritime States to evolve region-specific plans. In 2015, ICAR-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.

In 2015, the BOBP-IGO received the GEF/World Bank Grant to undertake a project "Ocean Partnership for Sustainable Fisheries and Biodiversity Conservation: Models for Innovation and Reform". The larger focus of the Project was on development of sustainable tuna fisheries in the Bay of Bengal region. As sharks form by-catch in tuna fisheries, to create awareness on some of the common sharks available in the Indian Seas, a set of two posters was prepared and distributed amongst the stakeholders (***see images 1 & 2).***

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)

Image 2: Sharks of the Bay of Bengal



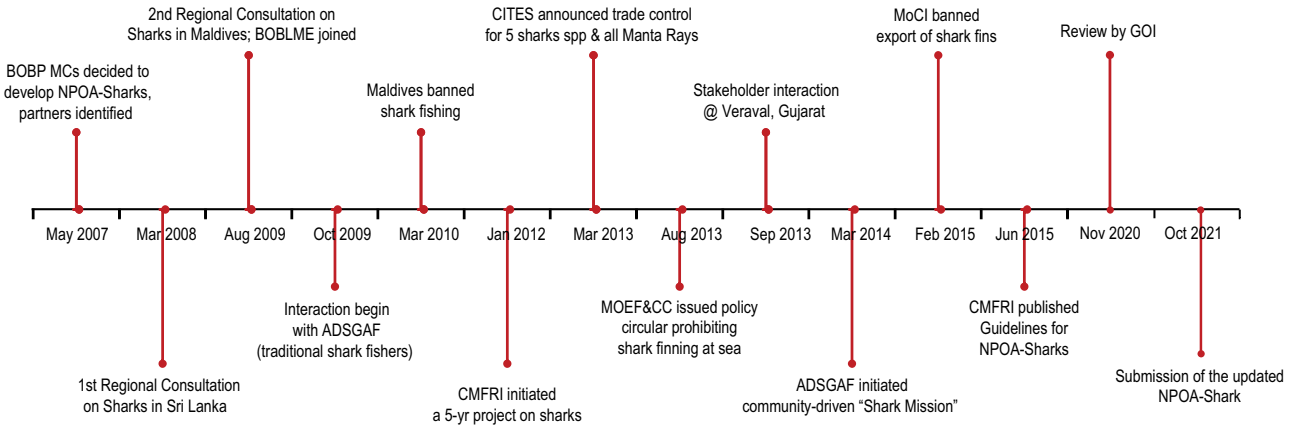
of the State/UT Governments, academia, NGOs and Community-based Organizations (CBOs). The objective of the Mission was to organize consultations in each of the 09 coastal States, the outcomes of which would contribute to the process and accelerate the development of NPOA-Sharks. Further, a separate exercise 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 (***Image 3***).

Image 3: Vernacular versions of IPOA-Shark prepared by the BOBP-IGO

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

Figure 2:



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 Fisheries (DoF)[3], Ministry of Fisheries, Animal Husbandry and Dairying (MoFAH&D)[4], 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 Convention on the 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 four sections. Section 1.0 provides information on the process followed to develop the NPOA-Sharks. Section 2.0 gives an overview of the marine fisheries sector of India. Section 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. Section 4.0 outlines the NPOA-Sharks developed on the basis of needs identified during the assessment of shark fishery in India. The NPOA-Sharks is also followed by an 'Implementation Plan', providing who does what, timelines, outputs and the indicative budget. The Report is further supplemented by additional information in the form of ten annexures. Annexure 9 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 the future possibilities.

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[3] *As per the Constitution of India, DoF, MoFAH&D is responsible for 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, the DAHD&F is primarily responsible for implementation of NPOA-Sharks.*

[4] *In May 2019, the Government of India set up the 'Ministry of Fisheries, Animal Husbandry and Dairying.' The Department of Fisheries was also set up within the Ministry to deal with matters related to fisheries and aquaculture. In this report, reference is made to the Ministry of Agriculture and Farmers' Welfare and also to the recently set up Ministry of Fisheries, Animal Husbandry and Dairying.*

Section 2: Marine Fisheries Sector of India

The fisheries sector occupies a very important place in the socio-economic development of India. 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. With a coastline of 8,118 km and an Exclusive Economic Zone of 2.02 million sq. km, India is one of the largest fisheries producers in the world. The marine fisheries production has increased from 0.53 million tonnes in 1950 to 3.69 million tonnes in 2019 with a CAGR of 3.10 percent. The highest landings were in 2017 when the volume increased to 3.95 million tonnes. The estimated potential yield of the country is 5.31 million. Overall, during the last decade (2010-19), the landings hovered around 3.56 million tonnes. Mechanized fishing vessels make 80 percent of the landings although they constitute 25 percent of the fishing fleet. Of the marine fishing fleet of 1,69,771 crafts, the balance 16 percent are of traditional human powered craft and 59 percent are motorized craft. The marine fisheries support about 3.77 million people traditionally known as the fishermen community. Over the years, India has also emerged as a major exporter of fish and is one of the eight countries which consecutively exported more than US$ 5 billion worth of fish during the last five years. The GVA from the sector is about 62 thousand crores in 2019-20 at constant prices (2011-12) which is about 0.50 percent of the total GVA in 2019-20. Much of the development of the sector can be attributed to the sound Planning processes, which includes. the National Policy on Marine Fisheries (NPMF), 2017 to guide the sectoral development. The Policy mission is to "meet the national, social and economic goals, livelihood sustainability and socio-economic enrichment of the fisher community and to guide the coordination and management of marine fisheries in the country during the next ten years". Along with stock depletion, climate change is emerging as a major challenge for the marine fisheries sector and future development will much depend on tackling these twin challenges.

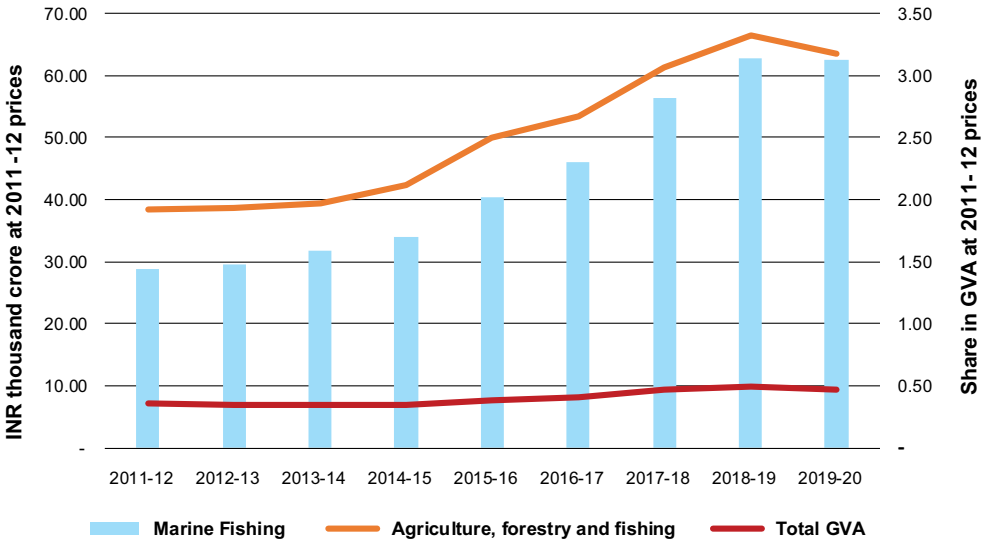
2.0 Introduction

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 into commercial enterprises. The gross value addition (GVA) from the sector has increased from about 29 thousand crore in 2011-12 to 62 thousand crores in 2019-20 at constant prices (2011-12). The rate of GVA from the marine fisheries sector outpaced that of the agriculture and allied sector as can be seen from its increased share in the GVA from agriculture and allied sector. However, growth of the sector is in synce with the growth of the economy and its (marine fisheries sector's) share in total GVA remains more or less constant (**Figure 3**).

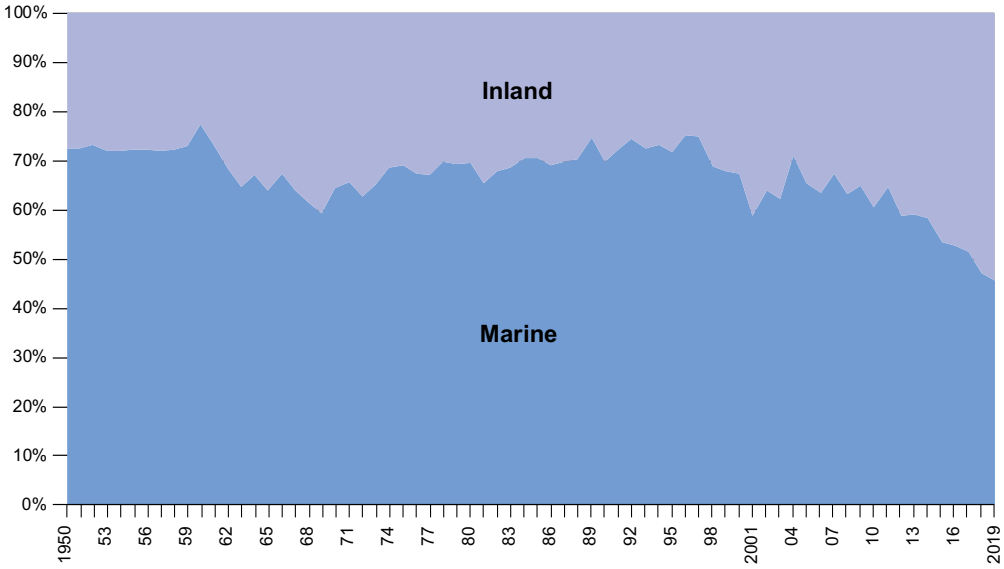
The marine fisheries sector has also been one of the major contributors of foreign exchange earnings. In 2020-21, the country has exported marine products worth Rs 11,200.69 crores other than shrimp and this is largely generated from marine fishing.

Figure 3: Contribution (%) of the marine fisheries sector in the GVA of the agriculture and allied sector (source: National Accounts Statistics, 2018)



Marine fisheries hold a special position in the developmental experience of the fisheries sector in India. Owing to the long coastline of the country and a set of skilled operators, marine fisheries has made rapid progress contributing to the bulk of fisheries production in India. However, since 1990s the share of marine capture fisheries in the 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 are 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 worldwide demand (***Figure 4***).

Figure 4: Sectoral composition of fisheries production in India, 1950 - 2019



Data: FAO. 2021. Fishery and Aquaculture Statistics.

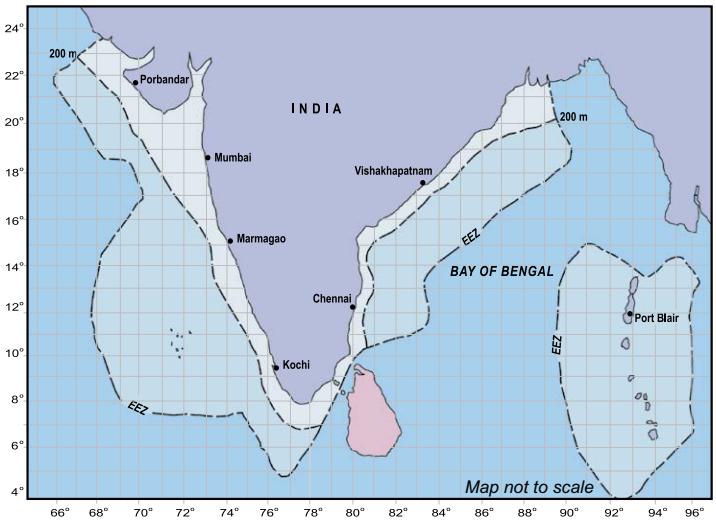
2.1 Marine fisheries resources

After declaration of the Exclusive Economic Zone (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 5***). 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 percent 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.

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 (A&N Islands).

Figure 5: Exclusive Economic Zone of India



2.2 The policy framework

Although fish is an integral part of the Indian culture and mythology, there was no significant effort to develop fisheries until India gained independence in 1947. The first attempt to do so was through the planning exercise (Five-Year Plans) initiated in the 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 the fisheries sector. Subsequently, in the Second FYP the 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)[5] 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 sq. km. In this backdrop, the 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.*[6]' 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 the development of line industries, such as boat building, net making and manufacturing of marine diesel engines[7].

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5 *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.*

6 *http://planningcommission.nic.in/plans/planrel/fiveyr/5th/5planch5.html (Art 5.20).*

7 *Silas, E G (1977) Indian fisheries 1947 - 1977. Technical Report. CMFRI, Kochi (Pp 2).*

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.'

2.2.1 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 emphasised 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 and 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.

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 also highlighted on the need for increased effort in offshore waters. To achieve this, the report 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 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 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.

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[8]: 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

[8] *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.*

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 bio–diversity.

The Policy also underscored the need for a departure from the open access 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:

- ***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 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 also be 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 the 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[9].

Based on the decisions of a 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 was 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 were given five years to move from the 45 days closed season to 60 days.

2.3 The National Policy on Marine Fisheries, 2017

As CMFP, 2004 completed over a decade of existence, a need was felt to review the policy and substantiating it to reflect the changing needs and aspirations of the marine fisheries sector.

Subsequently, in 2017, the Government adopted the National Policy on Marine Fisheries, 2017 (NMFP, 2017). The Policy aims at ensuring the health and ecological integrity of the marine living resources of India's EEZ through sustainable harvests for the benefit of present and future generations of the nation. The broad vision of the Policy is "A healthy and vibrant marine fisheries sector that meets the needs of the present and future generations"; while the mission reads as "to meet the national, social and economic goals, livelihood sustainability and socio-economic enrichment of the fisher community and to guide the coordination and management of marine fisheries in the country during the next ten years". The Policy has seven corner stones or pillars to guide the sector towards its vision and mission, namely: (i) sustainable development; (ii) socio-economic enrichment of fishers; (iii) principle of subsidiarity; (iv) partnership; (v) inter-generational equity;

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

(vi) gender justice; and (vii) precautionary approach. It also aims to set the stage for blue revolution in the country.

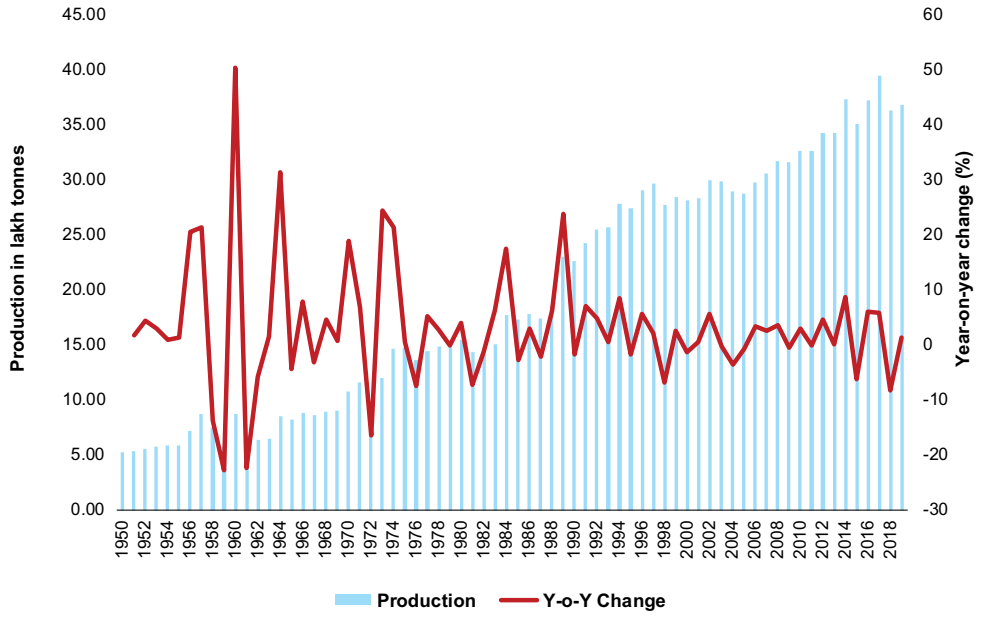
The NPMF, 2017 lays emphasis on developing an ecosystem-based fisheries management system and has identified fisheries management, fisheries MCS, post-harvest, climate change and social welfare as major areas of intervention. It also calls for regional cooperation on management and conservations of sharks.

2.4 Trend in marine fish production

The marine fisheries production has increased from 0.53 million tonnes in 1950 to 3.69 million tonnes in 2019 with a CAGR of 3.10 percent. The highest landings were in 2017 when the volume increased to 3.95 million tonnes. Overall, during the last decade (2010-19), the landings hovered around 3.56 million tonnes. The technological changes in the fishing fleet over the years can be seen in the production trend (**Figure 6**). In phase 1, the base was low (average 0.7 million tonnes) while fluctuations were high as fishing was mostly passive and the landings were largely determined by the environmental conditions. In phase 2, the base increased to an average of 1.35 million tonnes and production became relatively stable as mechanization enhanced the capacity to chase the fish. In the third and the current phase, the average production again doubled to 2.98 million tonnes and compared to the previous phases, production is more stable. Apart from the technological innovation, support services such as the Potential Fishing Zone (PFZ) notification issued by the INCOIS is likely to have played a role here. Among the coastal States and the Union Territories, in 2019, Tamil Nadu produced the maximum fish (0.775 million tonnes) followed by Gujarat (0.749 million tonnes) and Kerala with 0.544 million tonnes. The redtoothed triggerfish was the major resource in the harvest (0.274 million tonnes) followed by ribbonfish (0.219 million tonnes), penaeid prawns (0.195 million tonnes), non-penaied prawns (0.180 million tonnes), lesser sardines (0.171 million tonnes), Indian mackerel (0.162 million tonnes), threadfin breams (0.153 mt) and oil sardines (0.145 mt). Of the total landings, 1.69 mt (48%) constituted the pelagic resources, 1.20 mt (34%) demersal resources, 0.44 mt (12%) crustaceans and 0.23 mt (6%) was contributed by the molluscs.

Indian Oil sardine constitutes the major fishery of India. During 2000-19, on an average, Indian Oil sardines constituted about nine percent of the total landings followed by croakers (6.73%), tiger prawns (5.77%) and Bombay-duck (4.92%). The redtoothed triggerfish, which dominated the catch in 2019 was a minor fishery prior to 2018 and signifies an anomaly. During 2000-19, while most of the major fisheries have experienced

Figure 6: Marine Fish Landings in India (Source: FAO Fishstat J 2021)



negative or moderate growth (**Table 1**), Indian mackerel was an exception and recorded a double digit growth figure with increasing production trend. Clupeids, jacks and hairtails have also shown a relatively rapid growth during the period. Sudden fall of the Indian oil sardines during 2018-19 is another anomaly, as sardines were expanding with the rising sea surface temperature (SST) like mackerels.

Rank analysis of the top fisheries of 2019 shows that along with traditional major fisheries such as oil sardines and mackerels, new fisheries are emerging over time (**Table 2**). Whil their impact on the overall landing composition remains small, there is a need to further investigate landing composition dynamics to understand internal (fisheries related) and external factors such as climate change.

Table 1: Major marine fisheries of India during 2000-19

Major fisheries	Average production	Share	Growth rate
Indian oil sardine	3,06,094	9.34	-1.21
Croakers, drums nei	2,20,661	6.73	-3.30
Giant tiger prawn	1,89,162	5.77	0.58
Bombay-duck	1,61,174	4.92	-1.83
Natantian decapods nei	1,52,086	4.64	2.05
Hairtails, scabbardfishes nei	1,43,954	4.39	4.16
Clupeoids nei	1,39,471	4.26	10.05
Indian mackerel	1,24,274	3.79	10.11
Anchovies, etc. nei	95,138	2.90	1.43
Sea catfishes nei	87,006	2.65	-1.28
Percoids nei	73,337	2.24	
Ponyfishes(=Slipmouths) nei	70,070	2.14	3.47
Jacks, crevalles nei	68,950	2.10	5.91
Cephalopods nei	65,541	2.00	
Sharks, rays, skates, etc. nei	65,457	2.00	-2.79
All species	32,77,648	100.00	1.70

Estimated from FAO Fishstat J Database 2021. NEI = Not anywhere included.

Table 2: Rank analysis of top fisheries of 2019

		Ranks in…			
Rank in 2019	**Fisheries**	**1950-66**	**1966-86**	**1987- 2018**	**Remarks**
1.	Red-toothed triggerfish	41	47	55	Emerging
2.	Clupeoids nei	6	4	11	Established
3.	Hairtails, scabbardfishes nei	3	7	7	Established
4.	Giant tiger prawn	41	47	5	Established
5.	Natantian decapods nei	2	2	6	Established
6.	Indian mackerel	1	6	3	Established
7.	Marine fishes nei	33	3	1	
8.	Threadfin and dwarf breams nei	41	47	55	Emerging
9.	Indian oil sardine	1	1	2	Established
10.	Croakers, drums nei	7	4	3	Established
11.	Jacks, crevalles nei	14	14	16	Established
12.	Marine molluscs nei	41	47	43	Emerging
13.	Bombay-duck	4	5	4	Established
14.	Various squids nei	41	47	55	Emerging
15.	Stolephorus anchovies nei	41	47	55	Emerging

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 the low value by-catches (LVB) and discards mounted by the ICAR-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 percent 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**

2.5 Fishing crafts

The marine fishing fleet comprises 1,69,771 fishing craft of which 16 percent are of traditional and 59 percent are motorized traditional crafts as per the Marine Fisheries Census 2016. The mechanized fishing vessels (MFVs) comprise 42 813 vessels – 25 percent of the total ***(Table 4***). However, 80 percent of the marine fish production comes from the MFVs. As seen by the number of traditional craft and small-mechanized vessels, the major fishing activities are still concentrated in the areas within 0 to 70-80 meter depth zone. As compared to the west coast, concentration of traditional craft (including motorized) is more on the east coast (about 85 % of the total crafts in the coast). The scale of mechanization is also reflected in the total fish landings of the two coasts.

In terms of fishing gear, mechanized trawls land about 50 percent of the production followed by dolnets (6.71%) and ringseines (6.28%). Outboard gillnets and ringseines contribute about nine percent and seven percent respectively. Purse seine is another important gear and contributes about six percent **(Table 5)**. In the recent years, there is an active promotion of longlining in India to target deep sea fishes such as tunas.

The trawlers usually target prawns and Indian mackerels, while the gillnetter and purse seiners target mackerels and sardines. Ringseiners were especially developed to target shoals of oil sardines. Different fishing gear and their target fisheries are given in ***Table 6.***

Table 4: Coast-wise detail of fishing vessels in India

#	Craft/Gear	East coast	West coast	Total
Mainland India				
Mechanized				
1.	Trawlers	9,815	20,671	30,486
2.	Gillnetters	2,563	3,939	6,502
3.	Dol/Bagnetters	191	3,203	3,394
4.	Liners	47	2	49
5.	Ringseiners	297	646	943
6.	Purse seiners	0	1,189	1,189
7.	Others	31	57	88
				Total
8.	Total mechanized (1 to 7)	12,944	29,707	42,651
9.	Motorized	56,961	38,996	95,957
10.	Non-motorized	15,468	10,221	25,689
11.	Mainland Total	85,373	78,924	1,64,297
Islands (A&N Island and the Lakshadweep)				
12	Mechanized			162
13	Motorized			3464
14	Non-motorized			1848
15	Island Total			5474
National				
16	Mechanized			42,813
17	Motorized			99,421
18	Non-motorized			27,537
19	Grand Total			1,69,771

Source: For Mainland India: National Marine Fisheries Census 2016; For Islands: Handbook of Fishery Statistics 2018

Table 5: Gear-wise contribution in marine fish landings (2008-2012 average)

Gear Name	Landings (million tonnes)	%
Mechanized Trawl net	1.78	50.68
Mechanized Dolnet	0.24	6.71
Mechanized Gillnet	0.19	5.48
Mechanized Purse seine	0.21	5.88
Mechanized Ringseine	0.22	6.28
Other mechanized gears	0.08	1.91
Outboard Gillnet	0.31	8.79
Outboard Ringseine	0.26	7.45
Other outboard gears	0.09	2.52
Non-mechanized gears	0.09	2.63
Total	3.50	100.00

Adopted from TV Sathianandan, 2013

Table 6: Species targeted by different fishing fleet (1 – highest; 4 – lowest)

Fleets/rank/ species	1	2	3	4	5
1. Trawlers	Penaeid prawns (*Metapenaeus dobsoni, Metapenaeus affinis, Parapenaeopsis stylifera, Fenneropenaeus indices*)	Indian mackerel (*Rastrelliger kanagurta*)	Seer fish (*Scomberomorus commerson, Scomberomorus guttatus, Scomberomorus cavalla*)	Carangids (*Megalapsis cordyla Decapterus russelli, Selarcrumen ophthalmus*)	Sardines (*Sardinella longiceps. Dussumieriaa cuta, Sardinella albella*)
2. Gill netters	Wolf herrings (*Chirocentrus dorab Chirocentrus nudus*)	Indian mackerel (*Rastrelliger kanagurta*)	Sardines (*Sardinella longiceps, Dussumieria Acuta* *Sardinella albella*)	Snappers (*Lutjanus argentimaculatus, Lutjanus malabaricus, Lutjanus johnii*)	Perches (*Lates calcarifer*)
3. Purse seiners	Indian mackerel (*Rastrelliger kanagurta*)	Sardines (*Sardinella longiceps, Dussumieria acuta, Sardinella albella*)	Carangids (*Megalaspis cordyla, Decapterus russelli, Selarcrumen ophthalmus*)	Pomfrets (*Pampu sargenteus, Pampus, chinensis, Parastromateus niger*)	Lizard fishes (*Saurida tumbil, Sauridaundo quamis*)
4. Ringseiners (IBM)	Oil sardine (*Sardinella longiceps Dussumieria, acuta Sardinella albella*)	Lesser sardines (*Dussumieria acuta Sardinella albella*)	Anchovies (*Stolephorus commersoni, Stolephorus indicus, Encrasicholina punctifer*)	Indian mackerel (*Rastrelliger kanagurta*)	Tunas, Clupeids (*Tenualosa ilisha, Tenualosa toli, Anadontosto machacunda*)

Image 4: A sample of fishing crafts in India

2.6 Fisher population

One of the most significant characteristic of the Indian fisheries sector is its small-scale nature. As per the NMFC, 2016 the total fisher population of India was 3.77 million. Tamil Nadu has the highest fisher population followed by Odisha and Andhra Pradesh (**Table 7**).

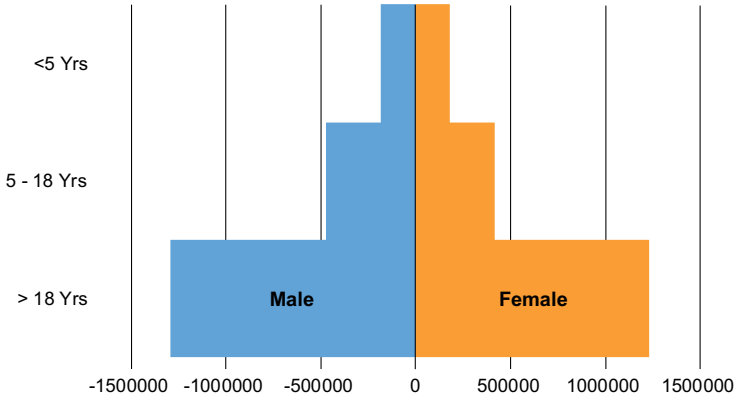
There are about 934 females per thousand males in India. The sex ratio in Puducherry is the highest in the country at 998 while West Bengal has the lowest at 884. The age structure of the population shows that the adult population constitutes the bulk. Adult males and females make 34 percent and 33 percent of the population respectively. Children (below 18 years) make about 33 percent of the population. About 16 percent of population is below 5 years of age (**Figure 7**).

The marine fisheries sector provides employment to about 1.45 million people directly in the value chain. Of which, 0.9 million fishers are engaged in active fishing and about 0.5 million fishers are engaged in various other fishing related activities.

Table 7: Basic fisheries profile of costal states and UTs of India

S. No.	District	Fishermen families	Families below poverty line as per Ration Card issued (%)	Fisher population
1	Andaman & Nicobar	5,944	22	26,521
2	Andhra Pradesh	1,55,062	30	5,17,435
3	Daman-Diu	3,163	20	15,836
4	Goa	2,986	24	12,651
5	Gujarat	67,610	19	3,54,992
6	Karnataka	32,479	21	1,57,989
7	Kerala	1,21,637	22	5,63,903
8	Lakshadweep	4,163	15	27,934
9	Maharashtra	87,717	24	3,64,899
10	Orissa	1,15,228	22	5,17,623
11	Puducherry	14,347	29	50,270
12	Tamil Nadu	2,01,855	25	7,95,708
13	West Bengal	81,067	22	3,68,816
14	INDIA	8,93,258	24	37,74,577

Figure 7: Population structure of fishers as of 2016



2.7 Fish exports

In early 1970s, when marine fisheries was still in the artisanal state in terms of technology, the Government set up the Marine Exports 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, the export of marine products increased from a meagre 15 732 tonnes in 1961-62 to a record 11,49,510 tonnes in 2020-21. This has added INR 43,720.98 crores to the GDP. India is the fourth largest exporter in terms of average value of export during last five years (2015-19) and one of the eight countries which has exported fish worth over US$ 5 billion during th last five years.

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 (74% in value), followed by frozen fish (7%), squid (5%) and cuttlefish (4%).

2.8 Fisheries potential

The Indian marine environment harbours more than 15,000 species, representing 15 percent of the global biodiversity. There are over 3,000 species of fish, compared with around 1,200 in the next richest marine region, the western Atlantic, and around 500 species of corals compared with about 50 species in the western Atlantic. India is one among the 12 mega-biodiversity countries with a wide range of coastal ecosystems such as estuaries, lagoons, mangroves, salt marshes, mud flats, rocky, sandy and muddy coasts, coral reefs, seaweeds, seagrass beds and more.

In 2018, the Working Group set up for Revalidating the Potential Yield (PY) of Fishery Resources in the EEZ of India estimated the PY as 5.31 million tonnes **(Table 8)**. Demersal and pelagic resources contribute 43.28 percent and 49.56 percent respectively to the potential yield. About 60 percent of the resources are located along the west coast covering the states of Gujarat, Maharashtra, Goa, Daman and Diu, Karnataka and Kerala. On the east coast, Tamil Nadu, with its relatively longer coastline has the largest share of the resources, which is roughly equivalent to Andhra Pradesh, Odisha and West Bengal. In terms of depth-wise allocation of the resources, 93 percent of the resources are within 0 – 200-meter depth zone **(Table 9)**. Owing to the rich coastal waters, the Indian marine fisheries traditionally concentrated on the near-shore waters.

2.9 Impact of climate change

Fishes are poikilothermic–their body temperature varies with the surrounding environmental thermal conditions. While most poikilothermic organisms are capable of functioning over a wide range of temperatures, the metabolic costs of this are likely to be high. Some fishes are also affected by climate change during embryonic development and in fishes exhibiting temperature- dependent sex determination, differences in

Table 8: Potential yield estimates for fish resources in the Indian EEZ

Resource	Potential Yield (t)	Contribution (%)
Demersal (mainland)	22 98 281	43.28
Pelagic (mainland)	26 31 827	49.56
Lakshadweep (ex. oceanic)	14 490	0.27
A & N Islands (ex. oceanic)	43 794	0.82
Oceanic (for entire EEZ)	2 30 832	4.35
Others	91 369	1.72
Total	53 10 593	100

Source: Handbook of Fishery Statistics, 2018

Table 9: Potential yield estimates for the coastal States and UTs

State/coast	Depth (Meters)		
	0-200	200-500	Total
Gujarat and Daman & Diu	8 95 862	--	--
Maharashtra	4 57 416	--	--
Goa	1 90 146	--	--
Karnataka	6 04 603	--	--
Kerala	9 40 282	--	--
Total for West Coast	30 88 309	83 615	31 71 924
West Bengal	3 41 894	--	--
Odisha	2 92 568	--	--
Andhra Pradesh	3 16 109	--	--
Tamil Nadu	8 23 834	--	--
Puducherry	61 302	--	--
Total for East Coast	18 35 707	13 846	18 49 553
Lakshadweep (ex. Oceanic)	--	--	14 490
Andaman & Nicobar (ex. Oceanic)	--	--	43 794
Oceanic	--	--	2 30 832
Grand total	49 24 016	97 461	53 10 593

Source: Handbook of Fishery Statistics, 2018

Table 10: Impact of climate change on Indian marine fisheries

Species	Change observed
Indian oil sardine	Marine regime shifts have occurred during 1976/77, 1988/89 and 1998, which is similar to observations from other parts of the globe. Regime shifts have altered the production and distribution of some commercially important marine fishes (Indian oil sardine, mackerel and catfishes) from Indian waters. Climate change [increasing Sea Surface Temperature (SST)], which has taken place during the past 40 years appears to have resulted in the shifting of distribution of oil sardine to the northern latitudes in the Arabian sea and the Bay of Bengal. In 1961-1976, more than 50% of the all India sardine catch was from 8°-11°N latitude, 25-50% from 11°-15°N and <1% from 15°-20°N along the west coast. The catch was very low or nil along the east coast. In 1997-2006, the distributional range has spread, with more than 50% of the all India sardine catch continuing from 8°-11°N latitude, 10-25% from 11°-15°N and 1-10% from 15°-20°N along the west coast; while it is 10-25% from 8°-13°N, 1-10% from 13°-19°N and <1% from 19°-21°N along the east coast.
Demersal, cephalopod and crustacean species	The SST showed a negative correlation in the northeast coast with total landings, demersal, cephalopod and crustacean landings resulting in low catch in the succeeding year with increase in the current year SST.
Threadfin breams	The spawning season of two dominant species of threadfin breams *Nemipterus mesoprion* and *N. japonicus* is shifting towards cooler months. Off Kochi, threadfin breams showed a very strong relation to bottom water temperature. The preferred temperature was about be 23.8°C. Catches increased when actual temperature was close to the preferred temperature.
Indian mackerel	The Indian mackerel *Rastrelliger kanagurta*, one of the commercially important pelagic fish, is able to adapt to rise in SST by extending distribution towards northern latitudes, and by descending to depths. During 1961-76, the mackerel catch along the northwest coast of India contributed about 7.5% to the all India mackerel catch, which increased to 18% during 1997-06. In the northeast coast, the mackerel catch contributed 0.4% to the all India mackerel catch during 1961-76, which increased to 1.7% during 1997-06. Mackerel was conventionally caught by surface drift gillnets by artisanal fishermen. However, in recent years, the fish is increasingly getting caught in bottom trawl nets operated by the large mechanized boats at about 50 m depth. In 1985, only 2% of the total mackerel catch was from bottom trawlers. In the last five years, about 10% of the mackerel catch is by the bottom trawlers. This shows that the fish descends down to overcome warmer surface waters.
Phytoplankton	Laboratory experiments on the effect of SST on seven marine phytoplankton species showed that the microalgae grew faster at higher temperature (29°C), but the decay set-in earlier than at lower temperature (24°C). The dominance ranking of the microalgae differed between the two temperatures. This shows temperature-related changes in the abundance and species dominance of phytoplankton, indicating potential impacts at the base of the food web in the marine ecosystems.
Cobia and silver pompano	The climate resilience of eggs and larvae of cobia (*Rachycentron canadum*) and silver pompano (*Trachinotus blochii*) were assessed by experimental studies in order to elucidate the optimum temperature range required for obtaining maximum seed production. For Cobia, it was observed that temperature plays a vital role in yolk-sac utilisation as well as on the growth of cobia larvae. At the end of 52 hours post-hatch, the lowest yolk-sac volume and maximum length was recorded at a temperature range of 31° to 33°C. In the case of silver pompano, increase in temperature reduced the hatching rate, time taken for mouth as well as anal opening and metamorphosis. Survival rate proportionately declined with increase in temperature. A temperature range of 29°-31°C may be advantageous in the larviculture of silver pompano for better survival as well as growth rate. The average increase of 2°C in water temperature resulted in reduced growth of about 10 to 33% from 7 days post-hatch (dph) to 12 dph. The reduced growth rate coupled with change in pigmentation of larvae can be taken as the resilience response of silver pompano larvae to combat the temperature stress. Cobia and silver pompano are candidate species for mariculture.
Ribbon fish, Bombay duck	Strong association was found between the monthly average of percentage maturity data of ribbonfish (from 2007 to 2014) with corresponding night SST. Analysis of Pearson's Correlation between maturity percentage and length at maturity showed that the variability in temperature negatively influences the length at maturity of Bombay duck and ribbonfish.

temperature as low as 1°-2°C can significantly alter the sex ratio of populations. Phenological changes also abound. Spawning activity has shifted in some species to comparatively cooler months, and hatching success decreases at higher temperatures.

It is predicted that pelagic fishes, which generally spawn year round, and have higher generation turnover, will adapt faster than their benthic counterparts. Adaptation at different rates will cause shifts in the current ecological balance, resulting in the loss of biodiversity. Some species may also suffer changes in their distributional range. Thus, it has become exceedingly clear that the varied risks posed by global warming and climate change present a significant danger to the health and survival of the denizens of the marine world, necessitating timely action and global cooperation to avert such a disaster.

Table 10 (opp. page) summarizes the impact of climate change on Indian marine fisheries from research carried out by the ICAR-CMFRI, which is the nodal agency for this purpose.

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Section 3: Assessment of Shark Fisheries in India

This chapter delineates the status of shark fisheries in India. Sharks are all Chondrichthyans, or cartilaginous fishes. 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). With few exceptions, these cartilaginous fishes exhibit: (1) slow growth; (2) late age at maturity; (3) low fecundity and productivity (small, infrequent litters); (4) long gestation periods; (5) high natural survivorship for all age classes; and (6) long life. Globally, the estimated landings of sharks were 0.69 million tonnes in 2019. It has increased at an average rate of about 2 percent per year since 1950 when landing was about 0.28 million tonnes. However, shark landing is likely to be under-reported. Indonesia, Spain, India, Mexico and USA were among the top five shark fishing nations during the last decade (2010-19). During this period, these countries together removed on an average 66 543 tonnes of sharks per year. Trade is often identified as the major global driver of shark fishery. The value of shark trade (import and export combined) has increased nearly 13 times during the period 1976 to 2019. Shark fins (dired, salted) is the main product in the shark trade offering. It constitutes 10 percent of the net quantity exported and 44 percent of the value of the export in 2019. In India, there are about 73 genera and 160 species of sharks. However, there is divergence of views on this and more research is needed. Most of the shark species (59%) occurring in the Indian waters are globally threatened. The landing and exploratory survey figures show that there is considerable decline in the 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 shark fisheries important.

3.0 Importance of shark fisheries

Sharks are an ecologically important common pool resource in the Indian Exclusive Economic Zone (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 have outlived the Dinosaurs'.

Sharks are apex predators – different species play the role of the apex predators in their respective ecosystems. Their role in the ocean ecosystem is akin to tigers and lions in the jungle. Sharks are also an important commercial species. The value of the global trade (export+import) in shark products is estimated at US$ 1,013 million in 2019. It has increased over 13 folds since 1976 (US$ 81 million) (FAO 2019). ***Table 11*** on page 50 summarizes the different ecological and economic services provided by the sharks.

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 the 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

Table 11: Ecological and economic services provided by the 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 results 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 in many parts of the world since the earliest times. Consumption of shark meat finds a mention in literature as early as the 4th 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 2019, 121,192 tonnes of shark products 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 check 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. Used in prepairing, shark fin soup has a traditional and virtually exclusive market among the Chinese ethnic groups established in different parts of the world, but little elsewhere. Thus, domestic sales in primary producing countries, such as, Indonesia, India, 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 2019, 8,979 tonnes of shark fin was produced globally. (FAO, 2021)
Sharks keep sea grass beds and other 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 the 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).	Shark oil products - Oil from the shark's 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 oils from shark is 3,874 tonnes in 2019. (FAO, 2021).
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 the 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.	

number of young ones produced and the size of the breeding biomass)[10]. The prominence of shark fishing for commercial purpose could be traced back to the early 1940s, when several target shark fisheries were developed in response to the market for retinol from the shark liver (the famous Cod Liver Oil). 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 occurs in the Indian waters[11, 12]. Considering the common pool nature of the shark resources and as many shark species are 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.

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[10] *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.*

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

[12] *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.*

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 the 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 (***Table 12*** and ***Figure 8***)[13].

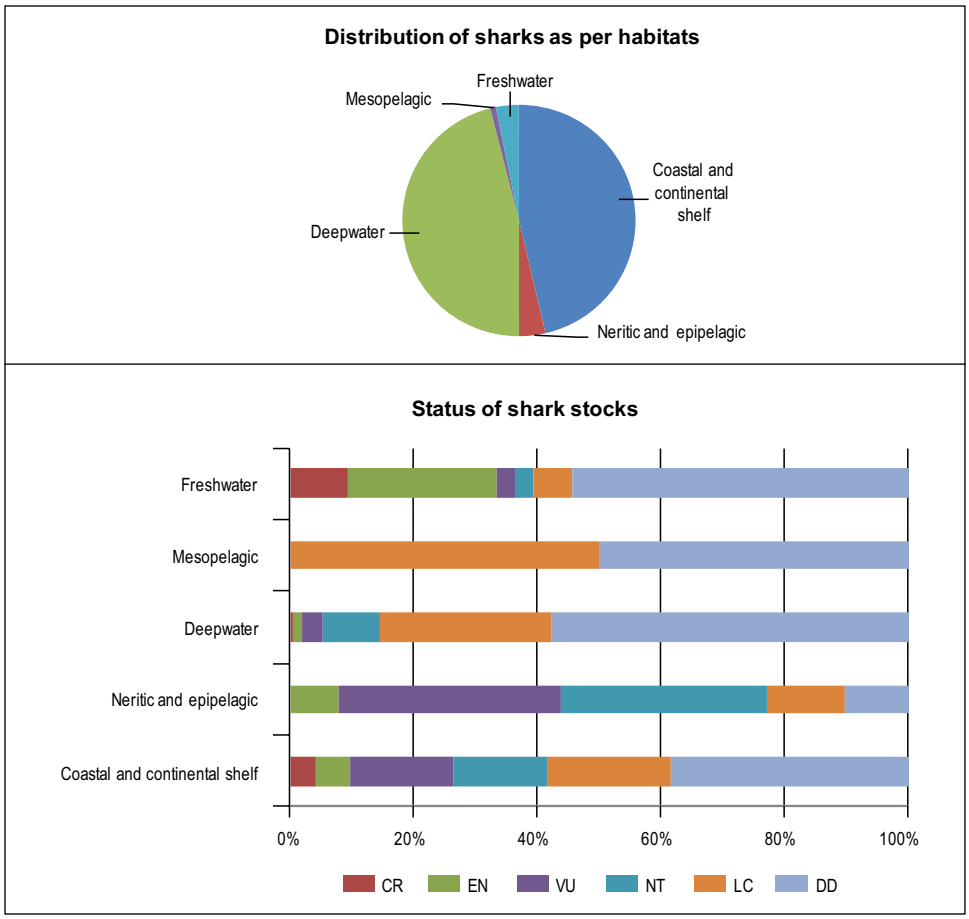
Table 12: IUCN Red List status of major species

Family/Species		Status
Hammerhead sharks (*Sphyrna spp.)*	Scalloped hammerhead (*Sphyrna lewini*)	Endangered Globally
	Great hammerhead (*S. Mokarran*)	
	Sooth 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 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

[13] *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.*

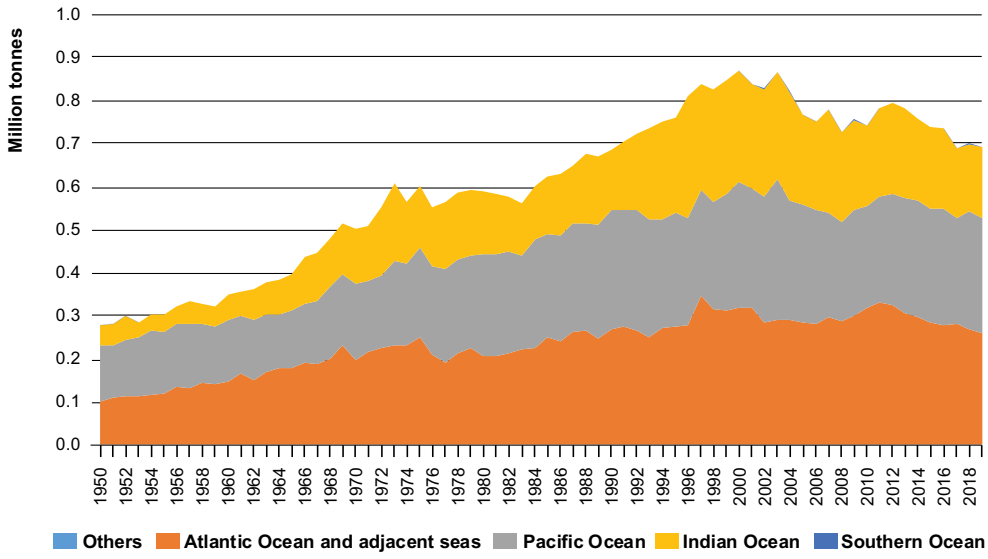
Figure 8: Distribution and status of sharks stocks



3.2 Production and trade: Global scenario

Globally, the estimated landings of sharks were 0.69 million tonnes in 2019. It has increased at an average rate of about 2 percent per year since 1950 when landing was about 0.28 million tonnes[14] (***Figure 9***). Landings reached its peak at 0.87 million tonnes in 2000 and since then seem to stabilize around 0.74 million tonnes. However, various studies show that this is an under reporting. It is estimated that the actual shark catch

Figure 9: Total and ocean-wise estimated landing of sharks, 1950-2019



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

(excluding other related species) could be about 4 times higher than what is reported by FAO and was about 1.44 million tonnes in 2000 and declined slightly to 1.41 million tonnes 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[15,16].

The Atlantic Ocean and its surrounding seas produce about 40 percent of the global shark catches, followed by the Indian Ocean and the Pacific Ocean. Catch across all the oceans seems to be slowing down post the peak periods. In the Pacific Ocean, the catch peaked in 1996 and in the Atlantic Ocean in 1997. In the Indian Ocean, the catch peaked in 2003. The current catch levels are at 80 percent of the peak level catch in the Atlantic Ocean, 62 percent of the peak level catch in the Indian Ocean and 81 percent of the peak level catch in the Pacific Ocean.

Indonesia, Spain, India, Mexico and USA were among the top five shark fishing nations during the last decade (2010-19). During this period, these countries together removed on an average 66 543 tonnes of sharks per year. India remains a prominent shark-fishing nation throughout the last seven 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 and during last three decades.

The relative contribution of some European nations such as France has also declined during the period (1950-2019) (***Table 13 & Figure 10***). 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.

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.

Table 13: Top 10 shark fishing nations over the decades

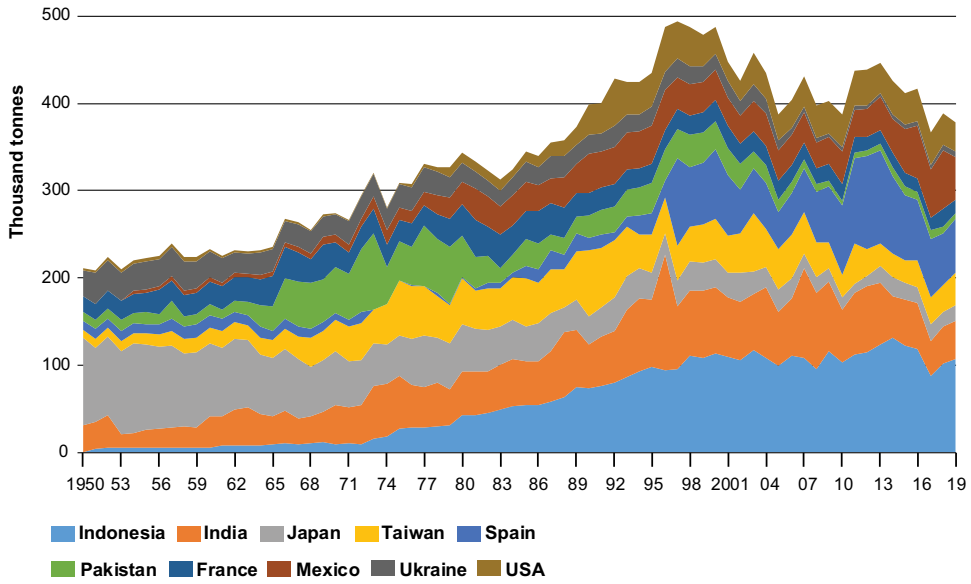
1950-59	1960-69	1970-79	1980-89	1990-99	2000-09	2010-19	1950-2019
Japan	Japan	Pakistan	India	Indonesia	Indonesia	Indonesia	Indonesia
UK	Norway	Japan	Indonesia	India	India	Spain	India
India	India	India	Taiwan	Taiwan	Spain	India	Japan
France	France	Taiwan	Japan	Pakistan	Taiwan	Mexico	Taiwan
Norway	UK	Former USSR	Pakistan	USA	Argentina	USA	Spain
Taiwan	Pakistan	Norway	France	Mexico	Mexico	Taiwan	Pakistan
Spain	Taiwan	France	Mexico	Spain	USA	Argentina	France
South Korea	Spain	UK	Brazil	Japan	Malaysia	Malaysia	Mexico
Pakistan	South Korea	Indonesia	UK	Argentina	Japan	Brazil	UK
Indonesia	Former USSR	South Korea	Peru	Sri Lanka	France	Nigeria	USA

Source: Computed from FAO Fishstat J Database

[15] *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.*

[16] *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.*

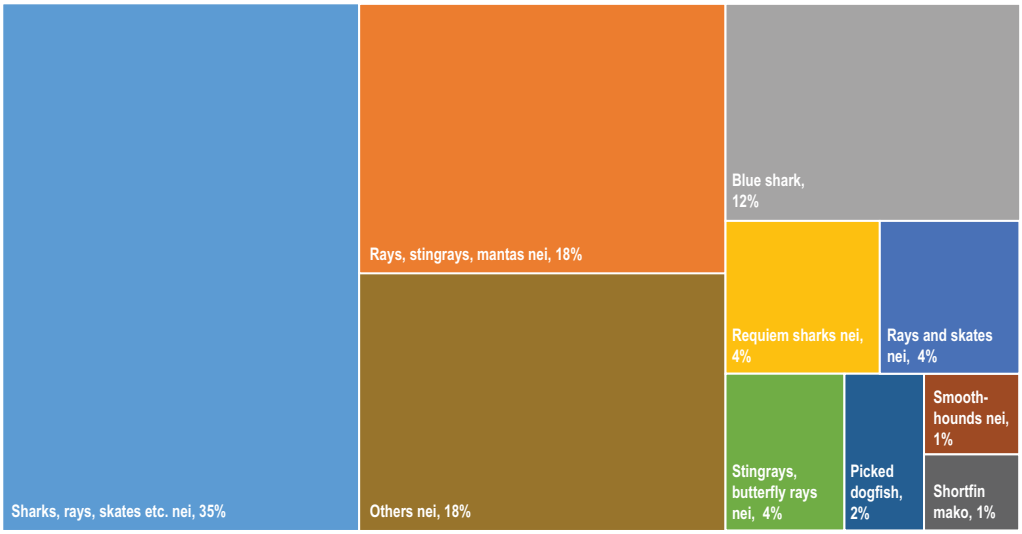
Figure 10: Relative contribution of major shark fishing nations during 1950-2019



According to a recent FAO study (*Musick and Musick,* 2011), only 20 percent of the reported catch was identified to the species level in 2007[17]. 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 11***).

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

Figure 11: Species-wise composition of shark catch during 2010-19



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

Figure 12: Major shark products exported and their trends during 1976-2019 in export earning

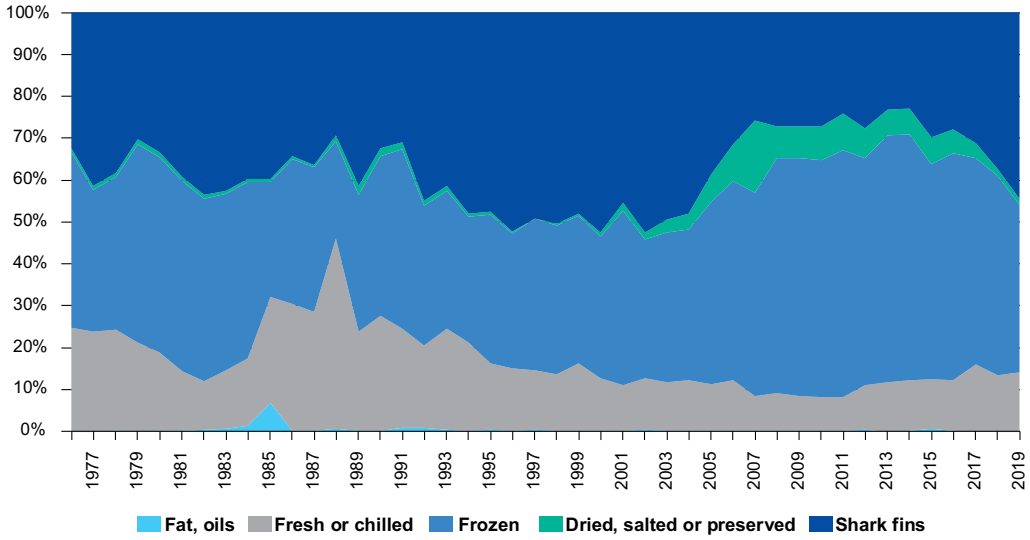
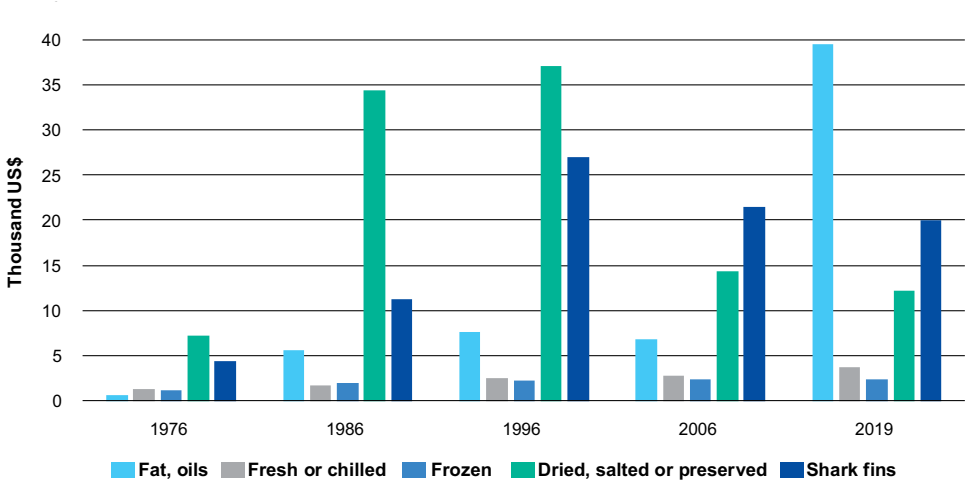


Figure 13: Unit value realization of different products from sharks



Trade is often identified as the major global driver of shark fishery. The value of shark trade (import and export combined) has increased nearly 13 times during the period 1976 to 2019. Shark fins (dired, salted) is the main product in the shark trade offering. It constitutes 10 percent of the net quantity exported and 44 percent of the value of the export in 2019. Other than shark fins, frozen products (fillet, whole fish) also make major contribution to the export earnings. (***Figure 12***).

From the perspective of value realization, oil and fat from sharks currently command the highest per unit value (US$39,500/tonne) followed by shark fins (US$ 19,965.19/tonne) and dried and salted or preserved shark products (US$ 12,263.63/tonne) (***Figure 13***). However, in terms of volume, oil and fat and dried, salted or preserved products are niche commodities.

3.3 International institutional mechanism

Restricting the trade of species for their conservation can be traced back to the London Convention of 1933[18] (Convention Relative to the Preservation of Fauna and Flora in their Natural State), which is also referred to

[18] *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.*

as the Magna Carta of wildlife conservation[19]. 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 in 1935, and British India acceded partially in 1939. In 1950, it was ratified by Portugal and in 1963, the then-independent Tanganyika (now Tanzania) 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 the 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 the 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[20].

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 if 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 (RFMOs). The RFMOs have now become instrumental in driving the regional cooperation and the management of the areas beyond national jurisdiction (ABNJ).

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.

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,

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[19] *Philippe Sands, Principles of International Environmental Law (Cambridge: Cambridge University Press, 2003) at 524.*

[19] *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.*

and international level. Although voluntary, adhering to IPOA-Sharks leads to the national duty of responsible utilization of marine resources, specified in the UNCLOS 1982; sustainable trade practices; and 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 since ages. Many shark- based industries were developed along the north-west and southern coasts of India. While in Gujarat, extraction of oil from whale shark flourished, in southern coast, sharks were also valued for their meat. Shark fishing and the 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 the 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 6 percent of the global catch during the last decade. On the domestic front, India has produced 82,000 tonnes of shark in 2019-20 (Handbook of Fisheries Statistics, 2020 of the Government of India). Today, Andhra Pradesh is the largest producer of sharks, followed by Gujarat, West Bengal and Maharashtra (2019-20).

In terms of livelihoods, the sole dependency on shark fisheries is waning, which flourished during the 1990s. This is largely on account of the ban on the whale shark fisheries in 2001[21], stipulation on landing sharks with their fins attached in 2013[22] and ban on export of shark fins in 2015[23]. Although, many fishermen groups, such as fishermen from Thoothoor area in the Kanyakumari district of Tamil Nadu continued to identify themselves with shark fisheries till recently, they are, however, now 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 fishes are increasingly becoming vulnerable to fishing. Different studies and anecdotal information collected from practicing shark fishers are indicating that a marked decline in the 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 uses different types of gear and many of them being non-selective, it would be difficult to avoid the catching 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-community along the Indian coastline on matters relating to shark fisheries, the following major issues have emerged, which need to be addressed through the National Plan of Action for Conservation and Management of Sharks (NPOA-Shark).

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[21] *Notification*

[22] *Notification*

[23] *Notification*

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 on the status of shark and acceptable conservation measures

Research gaps covering areas such as taxonomy, biological aspects, gear targeting sharks, real-time data, distribution and socio-economic profit

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. They are the Department of Fisheries (DoF) of the coastal States/UTs; FSI and ICAR-CMFRI. The DoF and ICAR-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 the Fisheries academic institutions) for projects and research-based works. The main sources and the information available from these sources are given in the following ***Table 14***.

The DoF and ICAR-CMFRI use a multi-stage stratified random sampling method, developed by ICAR-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 based on fishing intensity and geographical considerations. 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.

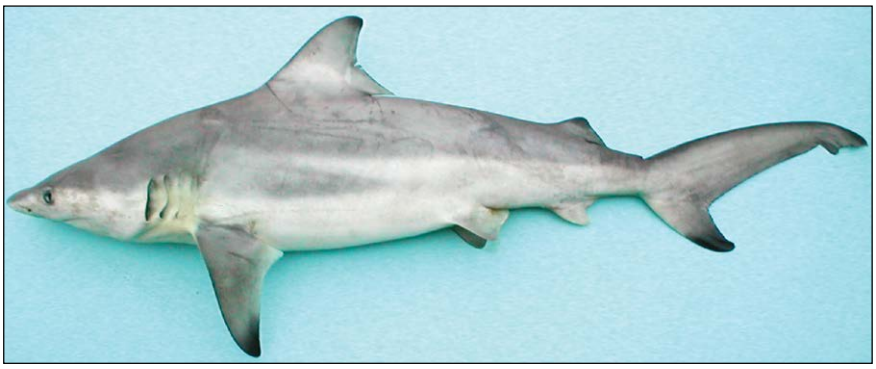
While both DoF and ICAR-CMFRI presumably use the same sampling design, the final estimates on most occasions markedly differ. This difference in findings is more often attributed to the inefficient implementation of the design. Therefore, there is a need to establish a procedure by the Government to find out the reasons for such differences and addressing it. Meanwhile, it is also necessary to ensure the reliability of one dataset over the other at the ground-level for reporting purposes, such as reported in the 'Handbook of Fisheries Statistics' of the Ministry of Fisheries, Animal Husbandry and Dairying (MoFAH&D). For 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 the

Image 5: Commonly occurring shark species of India



Carcharhinus amblyrhynchoides

Carcharhinus leucas

Rhizoprionodon acutus

Sphyrna zygaena

Table 14: 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
ICAR-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 Biological aspects	Daily/Web-based Periodic
	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
Ministry of Fisheries, Animal Husbandry and Dairying, 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.

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 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 (***Table 15***). The earlier studies (Day, 1878; Raje *et al.,* 2002) have put the number of shark species in India from 67-110 species (***Table 16***).

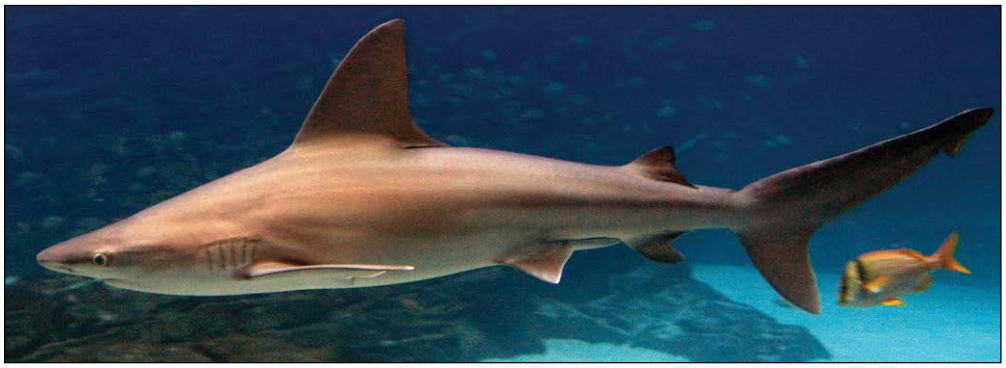
On the other hand, from the exploratory survey data of FSI (2010-14), 34 species of sharks have been reported. *Alopias pelagicus (*pelagic thresher shark), *Carcharhinus limbatus (*blacktip shark) and the *Alopias superciliosus (*Bigeye Thresher Shark) were the most frequently caught species during the experimental surveys (forming 51% of the counts) (***Table 17***).

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,

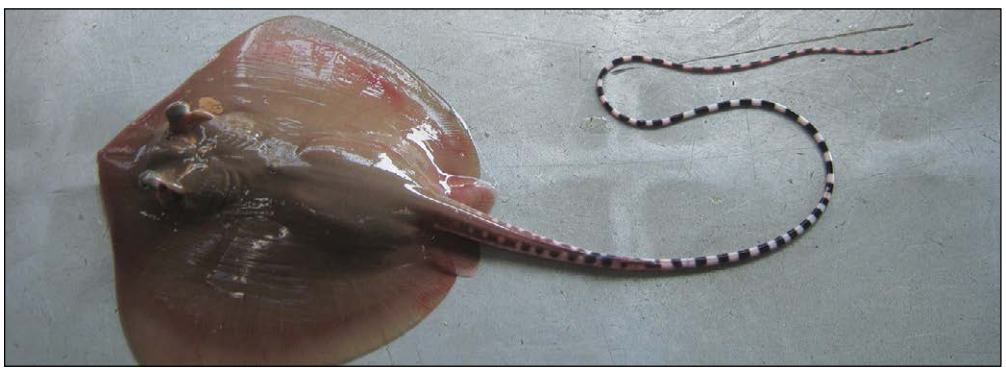
Image 6: Endangered, protected and other sharks and rays of India

White tip shark

Gangetic shark



Sandbar shark



Himantura gerrardi

Table 15: Number of shark species occurring in India's maritime 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. ICAR-CMFRI Marine Fisheries Policy Series No. 2, 104p. (Abbreviated as CMFRI NPOA Shark Guidelines, 2015)

Image 7: Protected and other sharks species of India

Thresher shark

Tiger shark

Whale shark

Black tip shark

Table 16: 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
ICAR-CMFRI (2015)	88	53	19	160

Table 17: Shark species 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 limbatus	1	*Carcharinus macloti*	3
Carcharhinus albimarginatus	14	*Carcharinus melanopterus*	2
Carcharhinus amblyrhinchus	3	*Carcharinus sorrah*	1
Carcharhinus amblyrhynchos	30	*Carcharinus sp.*	2
Carcharhinus brevipinna	26	*Galeocardo cuvier*	1
Carcharhinus dussumieri	9	*Galeocerdo cuvier*	2
Carcharhinus falciformis	29	*Galeocordo cuvier*	6
Carcharhinus limbatus	101	*Hammer Head Shark*	1
Carcharhinus longimanus	3	*Isurus oxyrhinchus*	1
Carcharhinus macloti	16	*Isurus oxyrhincus*	2
Carcharhinus melanopterus	21	*Isurus oxyrinchus*	2
Carcharhinus obscurus	1	*Loxodon macrorhinus*	11
Carcharhinus obsucrus	1	*Makaria mazara*	1
Carcharhinus sorrah	11	*Sphyrna lewini*	2
Total	**34 spp**		**519 counts**

Source: FSI (2015)

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), the Maldives (51 elasmobranchs) and Thailand (145 elasmobranchs). However, a higher number (137-207 species) has been reported from the seas around Indonesia[24].

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

[24] *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.*

Table 18: Latitude and longitude-wise total number of sharks caught in exploratory longline surveys of FSI 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 19: Latitude and longitude-wise total number of sharks caught in exploratory trawl surveys of FSI 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

3.5.2 *Distribution and status of stocks*

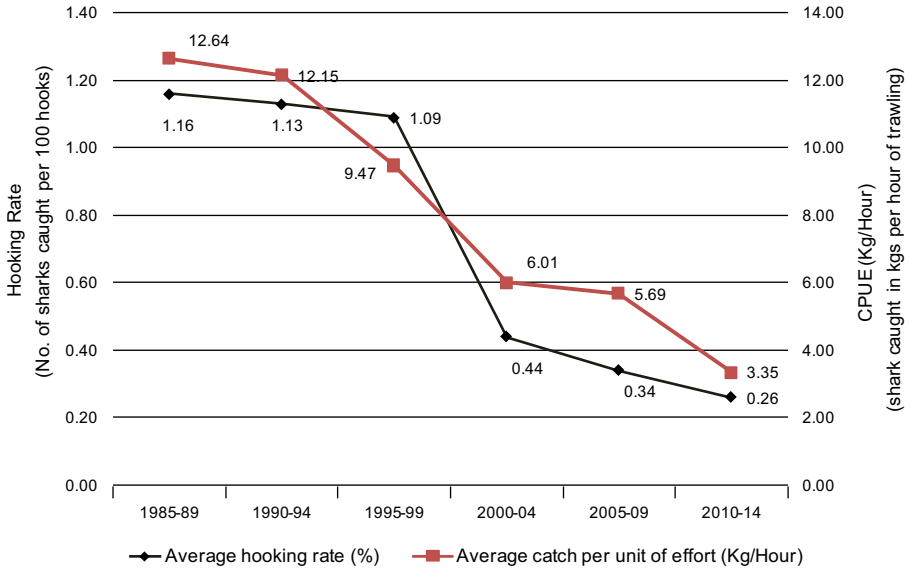
The results of exploratory survey conducted by FSI, landing data and anecdotal information from fishermen show that there is a considerable decline in shark population in the Indian waters over the last three decades. In addition, as ICAR-CMFRI has noted, most of the shark species (59%) occurring in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

Sharks are caught in shallow waters by near-shore artisanal fisheries to deeper water mechanized gillnet, trawler and logline fishery. It indicates that sharks are more or less distributed all along the Indian EEZ (***Tables 18 & 19***).

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 18 & 19*** 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 14***).

Figure 14: Trend in Hooking Rate and CPUE for sharks from the Indian EEZ



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 the hooking rate and the CPUE (***Figures 15-26***).

According to ICAR-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 20***) and ***Annexure 6***.

In summary, during the last three decades, the hooking rate has declined by 78 percent and the CPUE has declined by 73 percent for shark fisheries in India. Although imprecise, the hooking rate and the 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.

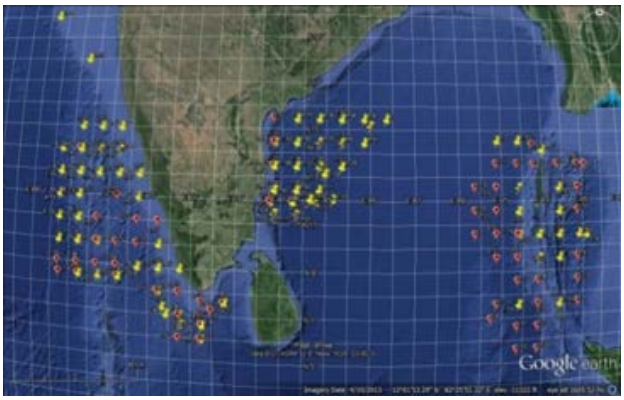


Figure 15: Hooking Rate 1985-89

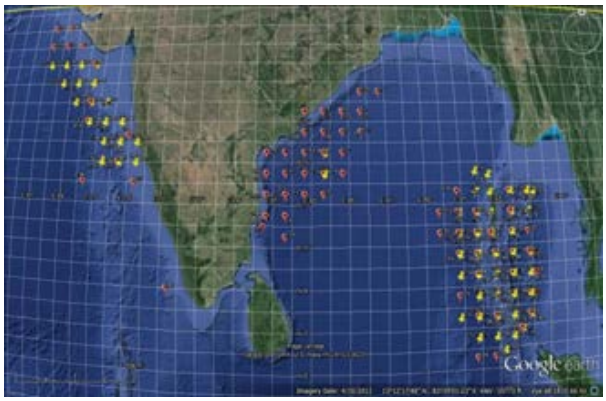


Figure 16: Hooking Rate 1990-94

Figure 17: Hooking Rate 1995-99

Figure 18: Hooking Rate 2000-04

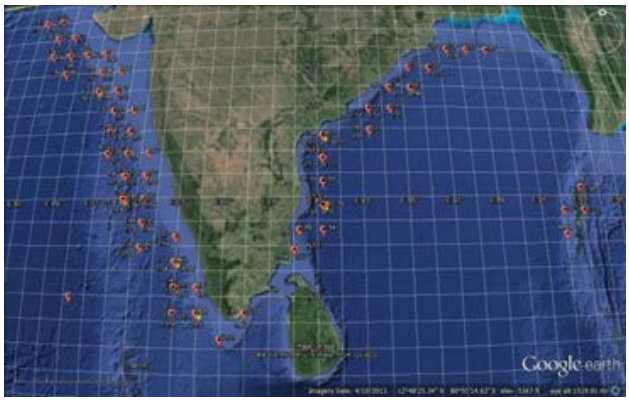


Figure 19: Hooking Rate 2005-09

Figure 20: Hooking Rate 2010-14

Hooking rate > 1%

Hooking rate < 1%

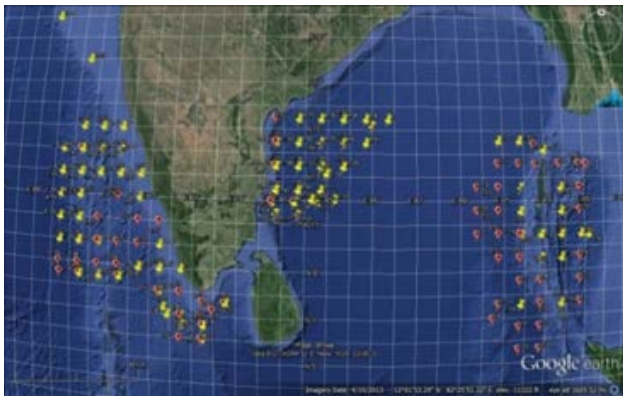


Figure 21: CPUE for sharks 1985-89

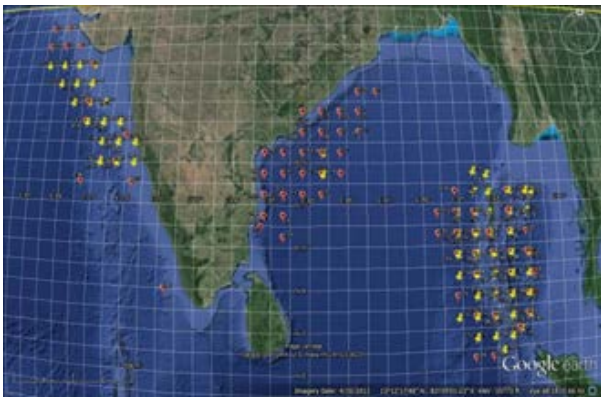


Figure 22: CPUE for sharks 1990-94

Figure 23: CPUE for sharks 1995-99

Figure 24: CPUE for sharks 2000-04

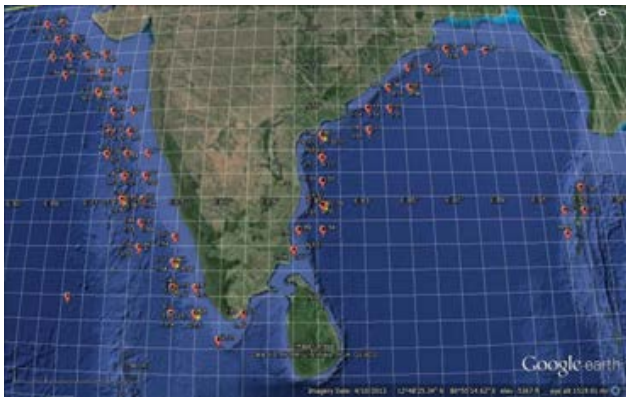


Figure 25: CPUE for sharks 2005-09

Figure 26: CPUE for sharks 2010-14

CPUE > 20 kg/Hr CPUE < 20 kg/Hr

Table 20: 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 ICAR-CMFRI NPOA Shark Guidelines, 2015

Table 21: 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 ICAR-CMFRI NPOA Sharks Guidelines, 2015

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 the 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.

Separately, ICAR-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 the 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 21*** *on pre-page*).

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 shows that sharks contribute > 50 percent in long line fishery and about 8 percent in trawl fishery. However, the exploratory survey also indicates that while there is substantial decline in the hooking rate and the CPUE during the last three decades, the catch composition remains more or less same (***Table 22***).

The records available with ICAR-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 the Kochi Fisheries Harbour in Kerala (***Table 23***). 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.

Table 22: 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

Image 8: Sharks - The journey from sea to market

Table 23: 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.

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.

3.6 Shark Fishery: Production and Trade

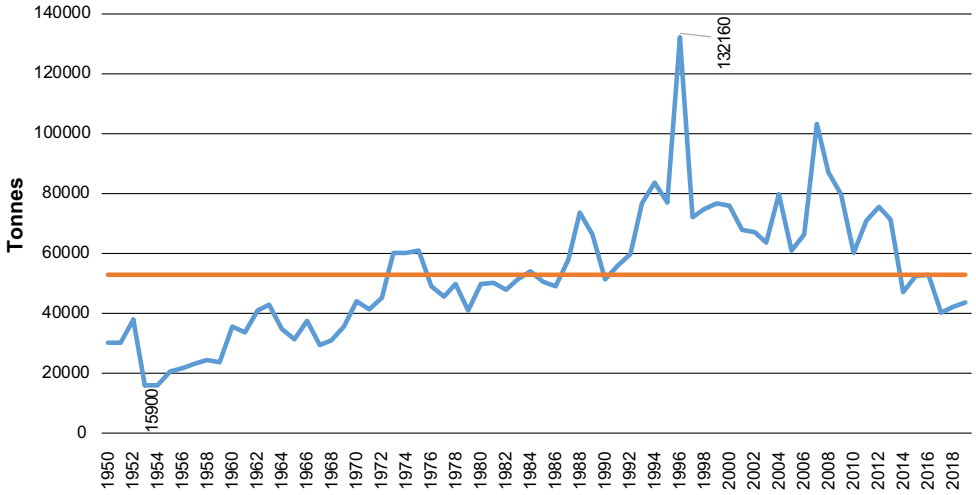
3.6.1 Trends in production

During the last seven decades (1950-2019), the annual shark landings in India has increased until early 2000s after which a declines is observed. The lowest production was recorded at 15,900 tonnes in 1953 and the highest production is recorded at 1,32,160 tonnes in 1996 and 103,246 tonnes in 2007. The current production level of 46,260 tonnes on an average during 2015-19 is about 45 percent of the latest peak of 2007. Parallel to this contribution of sharks to the total marine capture fisheries production has also declined indicating that growth in shark landing is falling short of growth in total landings. While decadal contribution of sharks to the total landings is declined marginally by one percentage, during the last five years, share of sharks in the total

Table 24: Average landings of sharks and their contribution to the total marine fish landing

Period	Average landings of sharks (Tonnes)	Average share of sharks in total landings (percentage)
1950-1959	24,310.00	4%
1950-1959	24,310.00	4%
1960-1969	35,280.00	4%
1970-1979	49,712.50	4%
1980-1989	55,005.80	3%
1990-1999	75,991.30	3%
2000-2009	75,221.70	3%
2010-2019	55,691.49	2%
Grand Total	**53,030.40**	**3%**

Figure 27: Annual shark landing in India (1950 - 2019)



landing is reduced to one percentage, which is historical the lowest. Overall, trend in shark landing and the trend of its share in the total landing shows stress in the shark population as well as declining importance of sharks from fishery perspective (***Table 24 and Figure 27***).

Traditionally, the bulk of the shark landings took place along the northwest coast comprising the maritime states of Gujarat and Maharashtra. Long-term regional catch composition shows that on an average, until 1990s, landings of shark on the western Indian Ocean was >50 percent. The record peak of 1996 was achieved due to a bumper catch of shark in the western Indian Ocean. 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. However, since 2000s, the trend started to change and the peak of 2007 owed to the bumper catch in eastern Indian Ocean. The trend further strengthens during 2010s as share of the western Indian Ocean falls below 30 percent for the first time. Recently, Andhra Pradesh has emerged as the major shark producer in the country. The landings mostly comprise of the larger and high-valued carcharinids. (***Figure 28***).

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 is mostly along the northwest coast. Almost all the species, which are of common and moderate occurrence, encounter hooks & line, longlines and gillnets (***Table 25***).

Figure 28: Annual shark landing in India (1950 - 2019)

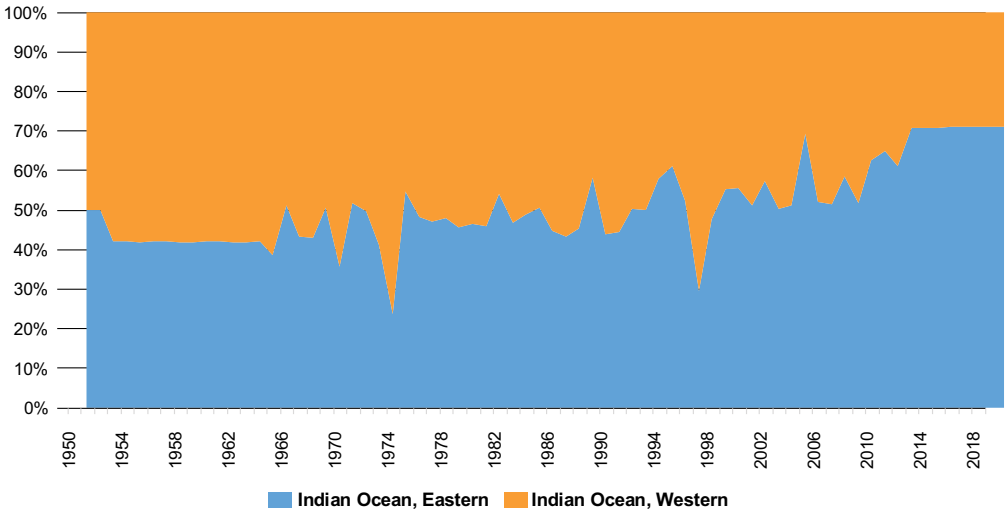


Table 25: Percentage contribution of different gears to annual shark landings in coastal States/UTs in India (1985-2013)

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 ICAR-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 29***). However, the export of shark products has increased in value terms from US$ 0.65 million in 1976 to a maximum of US$ 13.27 million in 2012 and then declining. Currently, in 2019, the total value of export of shark products stood at US$ 8.30 million. Shark fin products were the trade drivers until 2015 when they made upto 99 percent of the trade revenue. However, since ban on export of shark fins in 2015, frozen rays and skates is contributing to the export earning and made 87 percent of the earning in 2019 ***(Figure 30***).

In India, the following four shark species were 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 is 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 29: Export of shark products from India and India's share in the global shark trade

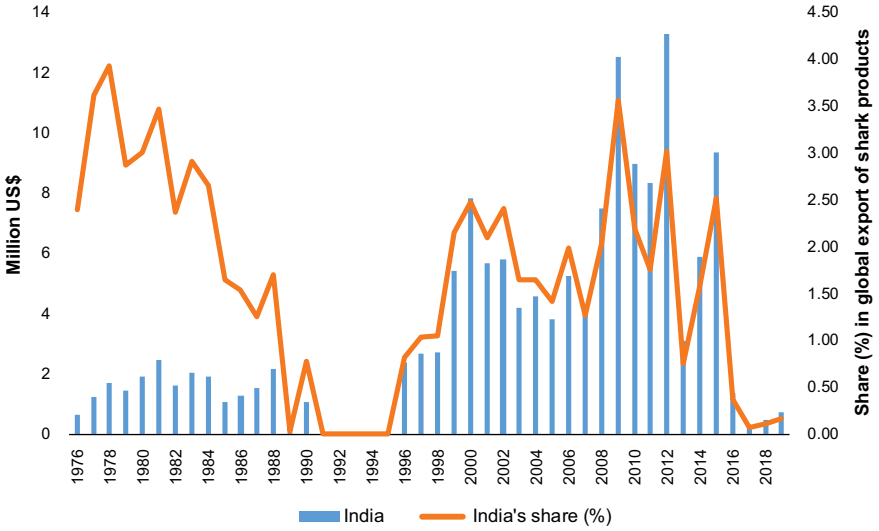


Figure 30: Contribution of different shark products in export earnings from shark trade of India

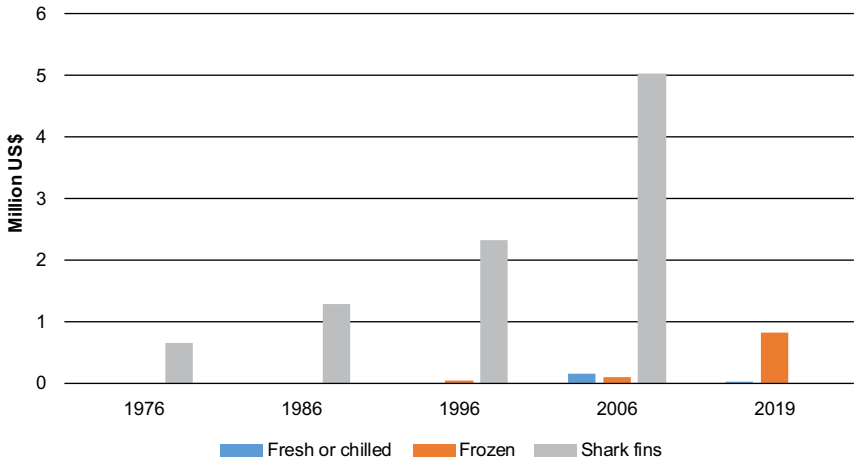
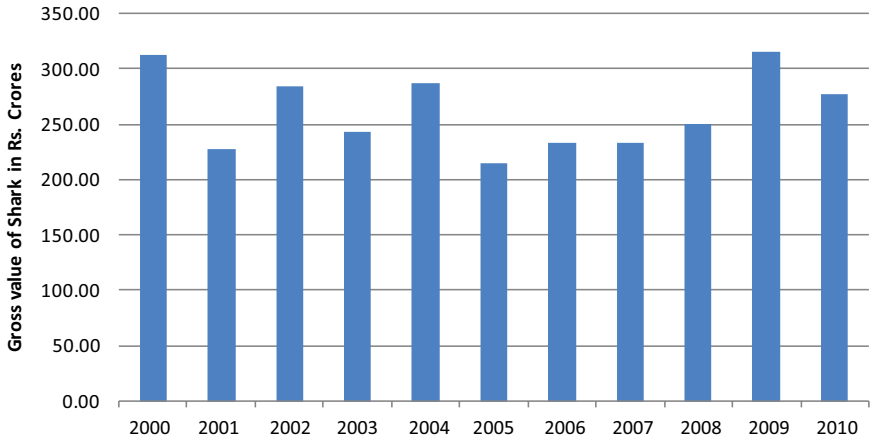


Figure 31: Estimated revenue from sharks landed in the coastal states of India



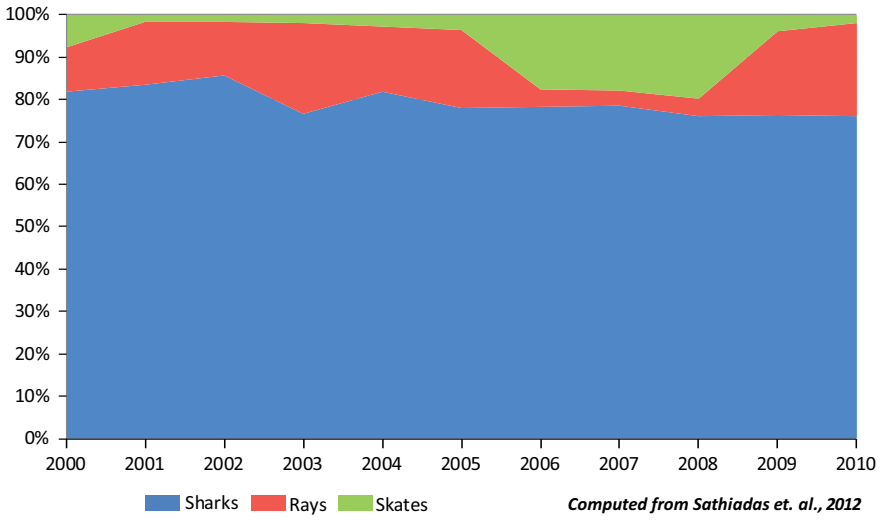
Computed from Sathiadas *et. al., 2012*

Image 9: Common hooks and lines used in shark fishing in India

However, sharks are fetching remunerative prices in the domestic market where it is mostly in demand for meat – fresh or dried. ICAR-CMFRI estimated that the gross value of sharks landed in the Indian maritime States in 2010 stood at Rs 278 crores (***Figure 31***).

In terms of individual contribution, true sharks contribute about 80 percent of the value followed by rays and skates (***Figure 32***). 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 26***)[25].

Figure 32: Individual contribution of shark, rays and skates in total value of the sharks



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

Image 10: Processing of sharks fins

Table 26: 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; ICAR-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, fisheries are 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 long-line 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 operations 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 the 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) , 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 demand 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).

Table 27: 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

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 brought 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 120-30 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[26]

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 27***).

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 1,000 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.

[26] *Based on field survey*

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 MoFAH&D 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 DoF, MoFAH&D 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 role 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 Department of Fisheries in the MoFAH&D acts as the focal point for fisheries development and management in the country. It formulates strategies for the 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 that the States/UTs receive directly from the Union Government.

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 28*** gives a brief overview of the institutional structure for marine fisheries management in India.

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, 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 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:

Image 11: Field Survey with shark fishers

Table 28: 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 Fisheries, Animal Husbandry & Dairying – Department of Fisheries, 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)[27] • Protection of coastal habitats (List III) • Focal point for Ramsar, CITES, CMS & CBD Conventions (List III)	Ministry of Environment and Forest & Climate Change (MoEF&CC) MoES
Infrastructure	MoFAH&D/ MoCI, MPEDA
Homeland Security (Lists I & II)	Ministry of Home Affairs

- *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 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)

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

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 an open access with common property rights. The multi-species fishery comprises more than 200 species of commercially important fin 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 provision 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 29***.

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 61 days during the southwest monsoon months of June to August, and the maritime States/UTs along the east coast also follow 61 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 *Rhiniodon 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

Table 29: 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

to the body of a shark would amount to hunting of a Schedule I species". The burden of proof will lie 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 notifications (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***. 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.

3.10 Views of the fishermen and traders

A series of stakeholder consultations were carried out during the preparation of the 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. Eight consultations were held, one in each of the coastal States. The last consultation due to be held in Goa could not be held. Apart from representatives of fisher community, these consultations were also attended by research organizations including ICAR-CMFRI, FSI, Central Institute of Fisheries Education (CIFE), Colleges of Fisheries, Trade Unions and Associations, NGOs and CBOs.

Image 12: Sharks and rays landed on boat

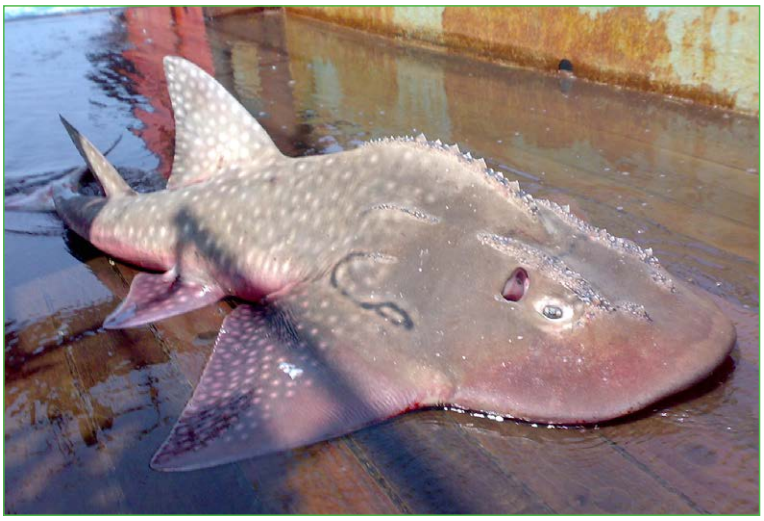


Image 13: Stakeholder Consultations on NPOA-Sharks

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-Sharks.

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

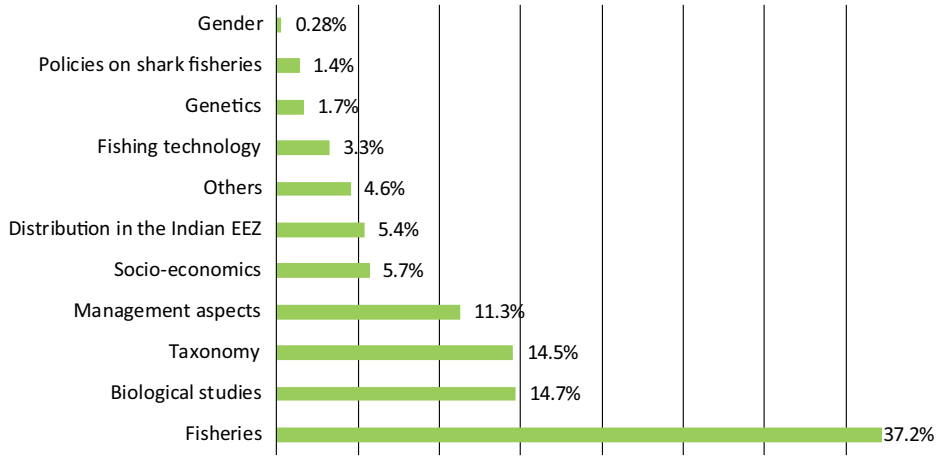
- *Participatory research and monitoring;*
- *Broad policy on sharks through consultations;*
- *Improving capacity of the fishermen and as well as officials from MoEF&CC and Indian Coast Guard to identify different species of sharks;*
- *Data and research driven conservation measures;*
- *Promotion of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

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

3.11 Review of scientific work

A web-based exercise was undertaken to list shark-related publications, including media reports until 2020 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, 702 publications were listed (***Figure 33***). The detailed bibliography is annexed to the report (***Annexure 9***). The analysis shows that bulk of the publications is centered on fisheries which prominently include trends in landings of sharks (37%), followed by studies on biological aspects (14.7%) and their taxonomy (14.5%). However, most of the other aspects such as socio-economics, management and policy aspects remain 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.

Figure 33: Dimensions of shark related publications



Further, analysis of the sources of publications shows that most of the publications appeared in the Information Bulletin and Extension Services (38%) published by ICAR-CMFRI. However, the coverage of shark-related matters in public media remained low (7%). The media coverage 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. The number of publications on sharks appeared in peer-reviewed journals is the second-most important source of information (33%) (***Figure 34***). However, there is an increase in the publications in peer-reviewed journals in the 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 34: Typology of publication on sharks

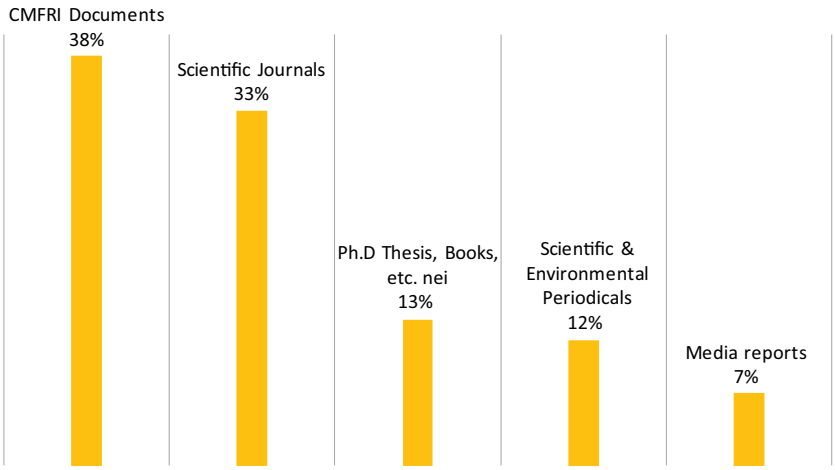


Table 30: Decade-wise pattern of publication on sharks

Period	Share of publications	Average number of publications during the decade
1831-1840	0.29%	1.0
1871-1880	0.43%	1.5
1881-1890	0.29%	2.0
1891-1900	0.29%	1.0
1901-1910	0.43%	1.0
1921-1930	0.14%	1.0
1931-1940	0.29%	1.0
1941-1950	1.87%	2.2
1951-1960	1.00%	1.8
1961-1970	1.87%	1.9
1971-1980	4.73%	4.1
1981-1990	13.49%	9.4
1991-2000	18.65%	13.0
2001-2010	24.96%	17.4
2011-2021	31.28%	19.8

Analysis of the year-wise data shows that there was a peak of interest in research/writings on sharks during 1980s, when average number of publications per year more than doubled. The trend continued in the subsequent periods with steady increase in the number of publications (**Table 30**). The 2000s were a period of the beginning of intense debate on sharks. At the national-level, the ban on whale shark generated considerable interest. This was clubbed with large-scale protest by fisher groups on inclusion of all shark species under the Wild Life (Protection) Act, 1972 leading to the subsequent removal of most but vulnerable sharks from the listing under the said Act.

In recent times, with increasing global interest on sharks, the 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.

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Section 4: National Plan of Action on Sharks-India

This section introduces the NPOA-Sharks. The purpose of the NPOA-Sharks for India is to ensure conservation and management of sharks and their long-term sustainable use and it applies to species that are found within the maritime zones of India, migratory species that frequent India's EEZ, and species taken by India-flagged vessels fishing on the High Seas. The NPOA-Sharks seek to address five issues including 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 these issues. The NPOA-Sharks follows ecosystem approach to fisheries management (EAFM), which is the corner stone of the NPMF, 2017. In this regard, the NPOA-Sharks outlines eight necessities, namely, (i) Legal, institutional and management framework requirements, comprising setting up of an effective MCS system and joint policy paper from the Fisheries and Environment Ministries; (ii) Human resources and capacity building requirements comprising, among others, improving taxonomic skills at the ground-level and improving data collection procedures; (iii) Data collection and management requirement suggesting a coordinated approach to coverage the major sources of fisheries data in the country: ICAR-CMFRI, FSI and DoF together; (iv) Scientific research, focussing on taxonomic gaps, shark socio-economics, stock assessment and reporting and moving towards EAFM; (v) Options of regulating fishing; (vi) Encouragement to full utilization of dead sharks; (vii) Biodiversity and ecological considerations - while making policy at any level, and (viii) Regional cooperation, especially, in view of the transboundary and migrating nature of sharks.

4.0 Purpose and scope of NPOA-Sharks

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

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

2. 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.

3. 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.

4. The primary focus of NPOA-Sharks, at this stage, is to (i) bridge the research and information gaps on the 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.

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

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

4.1 Issues

The NPOA-Sharks 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 the Ecosystem Approach to Fisheries (EAF)[28]. 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 the 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 the 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 the 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.

[28] *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.*

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 structure and function.	Ensure effective implementation of fisheries MCS Plan; encourage ecotourism and reef shark diving.
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 the 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 the 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 mile 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 MOFAH&D 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 Fisheries, Animal Husbandry and Dairying; 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. The Government needs to consider this to ensure stakeholder participation, with due representation from various sections, including women.
- There is a need to review the 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 building 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 (synthetic paper) 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 the 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 the need for better management measures for fisheries; develop skills for extension to fishermen.	BOBP-IGO/ ICAR-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: ICAR-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 ICAR-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 become savailable, 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 the 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 the progress of NPOA-Sharks.

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 keep into consideration while implementing NPOA-Sharks.

- To measure the full extent of dependency on sharks, an additional set of questionnaire 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 must for ensuring optimal results from national effort as many shark species are shared and straddling stocks.
- Consider contributing to development of 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 the 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 Rules of the Government of India, MOFAH&D will be the lead Government agency and assume the responsibility of implementing the NPOA-Sharks.	Joint Secretary (Marine Fisheries), MOFAH&D.	• Notification of NPOA-Sharks, including its Implementation Plan. • Nomination of Focal Point in MOFAH&D and a core team for day-to-day implementation work. • Setting up of coordination mechanism with relevant Government and Non-governmental 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.	6,00,000.00
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 an oversight of the implementation process.	Secretary (MOFAH&D); Joint Secretary (Marine Fisheries, MOFAH&D); 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

3.	Publication of the National Shark Identification kit or Guide.	Preparation of the National Shark Identification Kit or Guidelines. The document *inter alia* will contain relevant details of the species and their local names.	ICAR-CMFRI; Fishery Survey of India- FSI; DoFs; Fisher Associations/ Cooperatives	• Publication of the Guide.	Mislabeling; lack of coordination amongst different agencies; lack of information to generate details.	19,00,000.00
		From the user perspective, the document should comprise two parts: species allowed to catch and species prohibited for catching.	ICAR-CMFRI, FSI and DoF to collaborate to prepare the guide and to collect information on local names.	• Distribution of copies of the guide to all users.	Low priority by the R&D Institutions.	0
		Currently, ICAR-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.				
1. Preparatory Activities						***25,00,000.00***
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 finalized and agreed through a National-level Workshop held in New Delhi in early 2022. 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 and also the Marine Fishing Regulation Act of the coastal States/UTs.	Secretary (MOFAH&D); Joint Secretary (Fisheries, MOFAH&D); 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 MOFAH&D 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 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.	6,00,000.00
					Multi-agency coordination and networking.	

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.	30,00,00,000.00
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
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 stakeholders 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
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.	MOFAH&D;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	MOFAH&D; 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.	MOFAH&D; MHA; DoF; ICG.	• Annual MCS Reports.	Availability of satellite time for the purpose.	-Do-
11.	Implementation of the log book system.	To encourage recording of catch and self-reporting by the fishermen. This is especially essential for mechanized fishing vessels.	MOFAH&D; DoF; ICG; ICAR-CMFRI/ FSI (for designing of logbook and data processing).	• Preparation of log books and their translation in vernacular.	Cooperation of DoF; Fisher Associations/ Cooperatives in recording of catch information through use of log books.	-Do-

				• Annual MCS Reports.		
12.	Maintenance of records of all boat building yards and their operation and construction of boats.	This would help in 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.	MOFAH&D; 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	MOFAH&D; 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.	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.	15,00,000.00
				• Harmonized national policies and laws with international instruments/ arrangements.		
				• Review Reports.		
2. Setting up of MCS Frameworks						***30,21,00,000.00***

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.	MOFAH&D/ICAR-CMFRI/FSI/FAO/ Universities/National Bureau of Fish Genetic Resources (NBFGR)	• Training Plans. • Reports	--	75,00,000.00
16.	Building skill on data collection techniques for field investigators.	This is a training programme on sampling and data collection. Different agencies collecting primary data report considerably different estimates. The objectives is to develop the skill to standardize data collection system.	MOFAH&D/ICAR-CMFRI/FSI/DoF.	• Agreement between different agencies. • Reports.	--	75,00,000.00
17.	Awareness building of fishermen and leadership building for monitoring fisheries activities.	Fishermen are often not clear of the ecological importance of sharks and question the need for conserving sharks specifically. In addition, to effectively integrate them with the monitoring system, training should be provided to build leadership skills and participatory skills	BOBP-IGO/ ICAR-CMFRI/FSI/DoF/ NGO/ CBO.	• Agreement between different agencies. • Reports	--	1,00,00,000.00
18.	Training programme on the Code on Conduct for Responsible Fisheries and Ecosystem Approach to Fisheries Management	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/ ICAR-CMFRI/FSI/DoF	• Report of Training programmes; • Pre and post training evaluations		50,00,000.00
3. Human resources and capacity building requirements						***3,00,00,000.00***

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.	ICAR-CMFRI/FSI/FAO/Universities/ NBFGR.	• Reports. • Peer-reviewed papers.	Balancing scientific rigor with available resources.	20,00,000.00
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	ICAR-CMFRI/FSI/ Universities	• Reports. • Peer-reviewed papers.	On-going activity of ICAR-CMFRI.	0
21.	Developing DNA sequences of all species and establish DNA referral library.	To resolve taxonomic ambiguities	ICAR-CMFRI/FSI/FAO/ Universities/ NBFGR	• Reports. • Peer-reviewed papers.	On-going activity of NBFGR.	60,00,000.00
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.	ICAR-CMFRI/FSI/FAO/ Universities	• Reports	--	10,00,000.00
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. ICAR-CMFRI has in the past carried out a similar exercise.	ICAR-CMFRI/FSI/ Universities/ MOFAH&D/MPEDA/Fishermen Associations	• Reports. • Peer-reviewed papers.	--	10,00,000.00

24.	Developing effective shark by-catch reduction measures.	Since majority of the 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 the use of 'J' hooks versus 'O' hooks	ICAR-CMFRI/FSI/ Universities/ MOFAH&D/MPEDA/Fishermen Associations	• Reports. • Peer-reviewed papers.	Acceptance by fishermen	20,00,000.00
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.	ICAR-CMFRI/FSI/ Universities/ MOFAH&D/MPEDA/Fishermen Associations /Merchants/ BOBP-IGO	• Reports. • Peer-reviewed papers.	--	10,00,000.00
26.	Research on value addition from sharks.	The IPOA-Shark emphasis on full-utilization of sharks.	NIFPHTT/Universities	• Reports • Field trials	--	15,00,000.00
27.	Creation of awareness material.	Creation of awareness material for fishermen and policy makers	ICAR-CMFRI/FSI/Universities/ MOFAH&D/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-Sharks and revise the Plan accordingly	FAO/IOTC/BOBP-IGO	• Report	--	0
4. Management, research, ecological and biodiversity related requirements						***1,65,00,000.00***

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 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	MOFAH&D; 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.	10,00,000.00

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 MOFAH&D 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.	MOFAH&D; 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; examples 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.	20,00,000.00
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 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.	MOFAH&D; FSI; ICAR-CMFRI; MPEDA; MOEF&CC; BOBP-IGO.	• Participation in international events and presentation of reports in appropriate forums.	--	10,00,000.00

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-Sharks. 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; MOFAH&D; BOBP-IGO (Advocacy); IUCN (Advocacy); WWF (Advocacy).	• Adoption of regional resolutions.	--	
5. Building regional cooperation						***40,00,000.00***
Total (1 – 5)						**35,51,00,000.00**
In US$						**47,32,142.86**

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
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)*																																			
11.	*Implementation of log book system*																																			
12.	*Maintenance of records of all boat building yards*																																			
13.	*Record of fishing vessels*																																			
14.	*Review of policies and Acts and preparation of a Joint Policy Paper*																																			
15.	*Building better taxonomic skill of field investigators; scientists*																																			
16.	*Building skill on data collection techniques for field investigators*																																			
17.	*Awareness building and leadership building for monitoring fisheries activities*																																			
18.	*Developing methodology and indicators for rapid assessment*																																			
19.	*Identification of shark hotspots and congression zones*																																			
20.	*Developing DNA sequences of all species and establish DNA referral library*																																			
21.	*Evaluating the methodologies for risk assessment*																																			
22.	*Revalidating species listing under different vulnerability categories*																																			
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27.	*Assessment of NPOA-Sharks*																																			
28.	*Contribution towards development of RPOA-Sharks*																																			
29.	*Development of regional collaborative research and information exchange protocols*																																			
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*																																			

Attachment 1

Establishment of an MCS Division at the Ministry of Fisheries, Animal Husbandry and Dairying (Department of Fisheries - DoF) 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
Fieldmen	-	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 database on fishermen, fishing craft, fishing gear and fisheries infrastructure and service providers.	• Capacity-building; • Funding for development and maintenance of database.
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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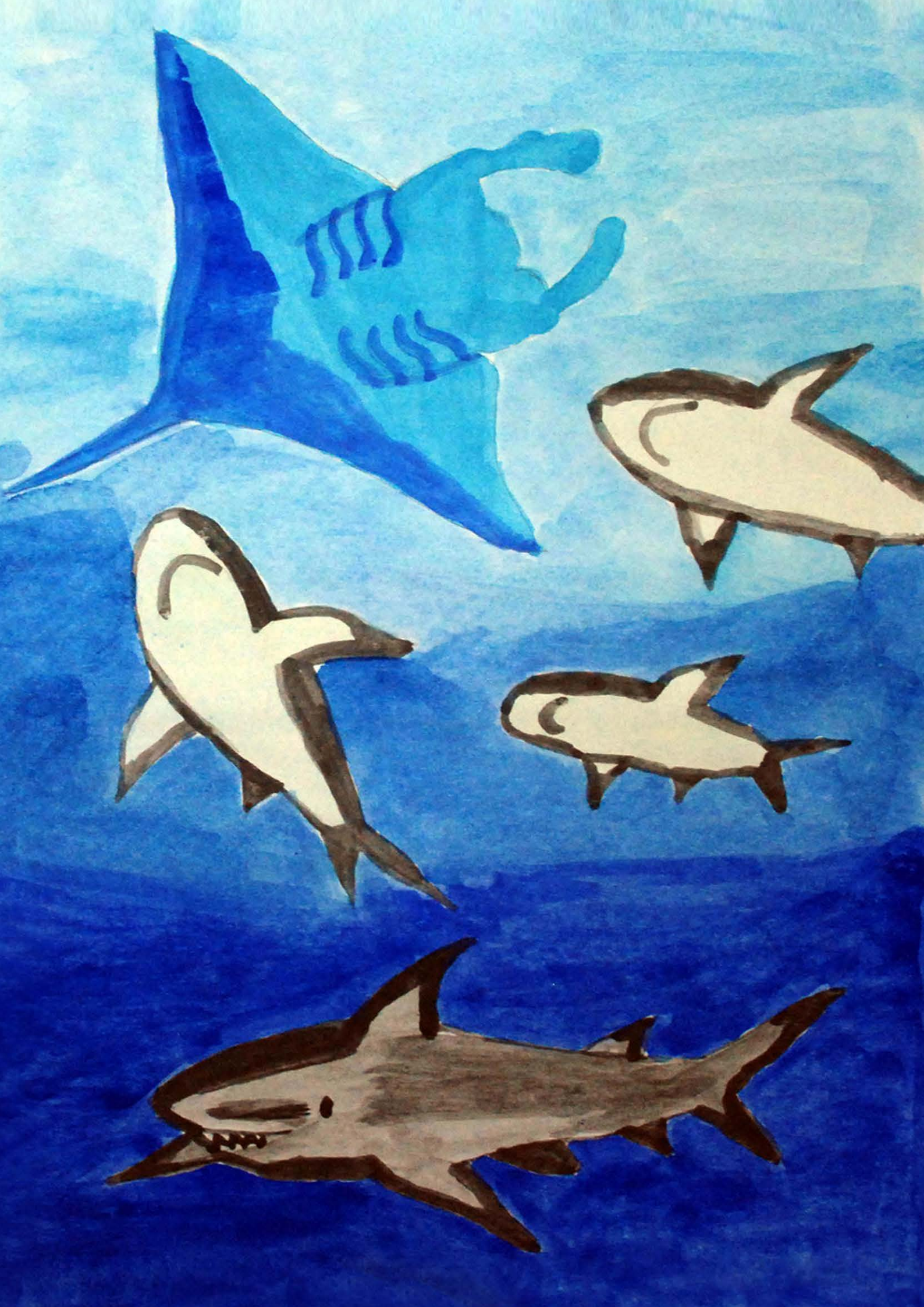

Annexure 1: Socio-economic Assessment of Shark Targeted Fisheries and Preparing a Draft National Plan of Action (NPOA) on Sharks in India (LOA/RAP/2012/70)

1.0 Background and context

Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project (GCP/RAS/236/GFF) towards a coordinated programme of action designed to improve the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries. Subcomponent 2.3 of the Project, "Collaborative Regional Fishery Assessments and Management Plans", supports the introduction and promotion of collaborative fisheries management approaches for selected key trans-boundary species through the development of regional and sub-regional management plans and harmonization of data collection and standardization. The BOBLME Project Work Plan for 2012, adopted by the Project Steering Committee (PSC) in March 2012, includes the following activities:

Sharks: Targeted research (studies) are undertaken to address knowledge gaps (taxonomy, life cycle and reproduction information, information from small-scale fisheries, monitoring of effectiveness of conservation measures (MDV, MYA), and alternative livelihoods). Work is undertaken in support of strengthening NPOA's and a regional synthesis to produce a framework for a Regional Plan of Action. Partnerships developed with BOBP-IGO and SEAFDEC for the development of the RPOA.

The Bay of Bengal Programme Inter-Governmental Organisation (BOBP-IGO), being the regional organisation involved in promoting the development of a sub-regional action plan of sharks in Maldives, Sri Lanka, India and Bangladesh and because of its presence in India and experience in Indian Fisheries, the BOBP-IGO has been entrusted the work of facilitating development of a National Plan of Action (NPOA) for sharks in India. For sustainable management of shark fisheries, a comprehensive plan needs to be developed taking into consideration the livelihoods of dependent fishers. Also, given the wide-ranging distribution of sharks and long distance migration of many species, it is increasingly important to have international cooperation on shark management plans.

2.0 Proposed activities under the Terms of Reference

- 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.
- The GNATT Chart of the Project is given in Annex 1.

3.0 Detailed plan of action for data collection

For the purpose of the study, two sets of data are to be collected. The first set of data contains published research works/reports on shark fishery and the second set of data contains primary data collected through field-level survey. The third set of data will be generated during the project through stakeholder consultations.

A consultant has been appointed for the purpose of data collection. The literature review is under progress and a detailed bibliography on shark fishery is being created.

To understand the shark trade scenario, data on export of sharks and shark products (such as shark fins) is being collected from records maintained by the Marine Product Export Development Authority, Kochi. So far product-wise and port-wise export data of shark and shark products for the period 2000-10 has been collected.

Apart from collecting trade data from published sources, consultations will be carried out with shark traders in Chennai. Chennai is the major hub of shark trade. While shark landing takes place all along the coastline, after meeting the local demand, in most cases, shark products are transported to Chennai, where they are stored and later exported.

For collection of primary data on status of shark fishery, a questionnaire has been developed. The questionnaire was finalized after pilot testing and comments received from experts and the same is placed as Annex 2.

4.0 Plan for Field visits

Preliminary field visits were undertaken to Thoothoor, Tamil Nadu and Veraval in Gujarat, the proposed project sites. The BOBP-IGO team during the visit met fishermen associations and government officials and informed them about the study. Necessary contacts were made to facilitate the data collection.

To ensure collection of field data in Veraval, Gujarat, a local NGO has been engaged. A one-day training programme was also organized to familiarize the investigators with the requirements of the Project. In case of Thoothoor, students from the College of Fisheries, Thoothukodi (Tamil Nadu) will be drafted for collection of data. They will be assisted by the Association of Deep Sea Going Artisanal Fishermen (ADSGAF) for local logistics. A meeting with the Chief Executive of ADSGAF was also held to familiarize him of the Project's requirements and finalize the field-level arrangements. The teams will work under the supervision of the Project consultant and the BOBP-IGO.

The shark fishing season starts in India during mid-October and continues till onset of monsoon or seasonal ban. The fishing reaches its peak during January. Considering this calendar, it is proposed that the data collection will be carried out in Veraval during November and in Thoothoor in December.

The timeline showing the plan of action for data collection and analysis is presented below:

Work plan and Timeframe (LOA/RAP/2012/70 Dated 26 August 2013)													
#	**Activity/Month**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1.0	Compilation of secondary references and preparation of review report												
2.0	Preparations for field study												
3.0	Field level study												
4.0	Procuring and distributing ICAR-CMFRI shark species identification manual to BOBLME countries												
5.0	Field study analysis and preparation of detailed case studies on two groups												
6.0	One day post-harvest and trader consultation in Chennai												
7.0	Three days national consultation on developing the National Plan of action on Sharks												
8.0	Developing draft National Plan of Action on Sharks and circulation												

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

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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 ot "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.

***

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
E-mail: dgft@nic.in

(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
E-mail: dgft@nic.in

[Issued from File No.01/89/180/118/AM-02/PC-2 (A)]

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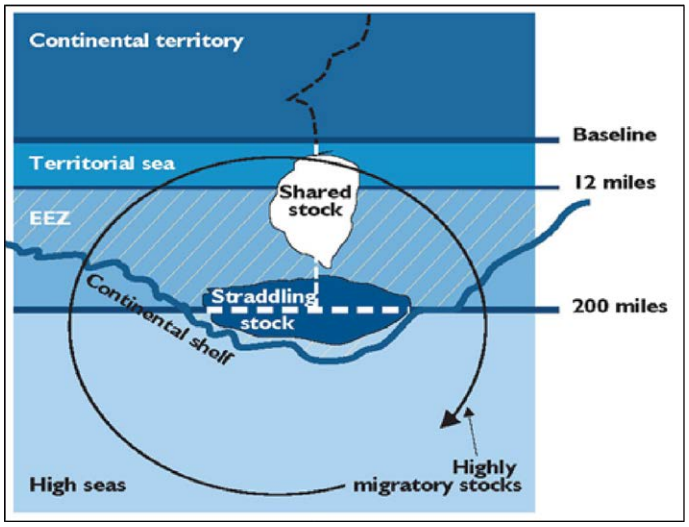
Annexure 5: International Instruments (Binding and Non-binding) Concerning Conservation and Management of Shark Fisheries

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[29].

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."

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



[29] *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*

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 exempt 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 consent 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[30]), supplying information on the operations of a vessel, and the imposition of sufficiently grave sanctions as to be effective in securing compliance with the 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 sets 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.

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 the use of precautionary reference points in conservation and management of straddling fish stocks and highly migratory 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 the use of precautionary limits and regional cooperation. The Agreement also sets the conditions for maintaining the ecosystem and establishing a mechanism for monitoring it.

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30 *The UN Fish Stocks Agreement, in Article 18.3 (d), includes the marking of fishing gear.*

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, subspecies, 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-specie 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 non-compliance, 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 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[31] 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 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 have 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.

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[31] *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.*

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 are 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 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 significance for conservation of migratory species and the only dedicated international instrument for that. Being a binding agreement, countries are bound to work towards 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 of a species or stock should participate in its management.*
- *Participation: States that contribute to fishing mortality of 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 binding 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 to shark fisheries:

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 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.

Resolution 13/06: *On a scientific and management framework on the conservation of shark 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 15/02: *Mandatory statistical requirements for IOTC Members and Cooperating Non-Contracting Parties (CPC's)*. This Resolution aims mandatory submission of annual catch, effort, size and discards data, of elasmobranch species in addition to tuna-like species to the IOTC by the CPC's.

RESOLUTION 17/05: *On the conservation of sharks caught in association with fisheries managed by IOTC*. This resolution lists minimum reporting requirements for sharks, calls for full utilisation of sharks; prohibit the removal of shark fins on board vessels and encourages the release of live sharks.

RESOLUTION 18/02: *On Management Measures for the Conservation of Blue Shark Caught in Association with IOTC Fisheries*. This Resolution aims to ensure that effective management measures are in place to support the sustainable exploitation of blue sharks; reporting of accurate blue shark catch, effort, size and discard data to IOTC; to undertake scientific research on blue shark.

RESOLUTION 19/03: *On the Conservation of Mobulid Rays Caught in Association with Fisheries in the IOTC Area of Competence*. This Resolution aims to prohibit targeted fishing mobulid rays and retaining onboard, transhipping, landing, storing, any part or whole carcass of mobulid rays by the vessels in IOTC record or authorized to fish for tuna and tuna like species managed by the IOTC except those carrying out subsistence fishery.

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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*	shortfinmako 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	CU
	Squalus mitsukurii	shortspine spurdog	***	marine, benthopelagic, EC & WC	trawl net	DD
	Chaenogaleus macrostoma	hooktooth shark	****	marine, demersal, EC & WC	gill nets and longlines	VU
Hemigaleidae	*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.		****			NE
				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
Proscyllidae	*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
	Chiloscyllium arabicum	Arabian carpetshark	****	marine, demersal, WC	no information	NT

Hemiscyllidae	*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	***	marine, reef-associated, EC	gillnet,bottom trawls, beach seine and hook and line	VU
Ginglymo stomatidae	*Nebrius ferrugineus*	bambooshark	***	marine, reef-associated, EC & WC	longlines, gillnets, fixed bottom nets and bottom trawls	VU
Pseudocar charhiidae	*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
	Cephaloscyllium 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
	Centrophorus atromarginatus	dwarf gulper shark	***	marine, benthopelagic WC & EC	bottom trawls, fixed bottom nets and line gear	DD

Centrophoridae	*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
	Aetobatus flagellum	longheated 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
Myliobatidae	*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	smoothtailmobula	**	marine, pelagic-oceanic, WC & EC	gill net	NT
	Mobula japanica	spinetailmobula	***	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 eregoodonteke	longhornedmobula	**	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		***	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	whitenosewhipray	****	marine, demersal, EC	bottom trawl	VU
	Himantura uarnak	honeycompwhipray	*****	marine/brackish, reef associated, WC & EC	bottom trawl	VU
	Himantura undulata	leopard 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 Pastinachus sephen	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	DD
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	longcomp 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, EC	bottom trawl and gillnet	DD
	Dipturus sp.		**	marine; bathydemersal, EC	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: ICAR-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

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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[32];*
- *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 (MMD) administers implementation of MS Act, 1958 under guidance and directives of the 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 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.

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

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.

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	

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.

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 the 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)[33].

5.0 The Coast Guard Act, 1978

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.

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[33] *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).

Fisheries management provisions: This Act provides the basic framework 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 the maritime zones of India.*
- *The Central Government reserves the right to suspend or cancel the license if it finds 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 range 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, 2002 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 ecosystems. The biological resources in the Act includes plants, animals and microorganisms or parts thereof, their genetic material and byproducts (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 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 is 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 late 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 thereunder. 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 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 the 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 status 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; (iii) 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 was also willing to participate in the 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 to 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 the Indian waters 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. ICAR-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. ICAR-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 BE 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 the 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 ICAR-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 the 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 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 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 the 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 present 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 empowerment of the DoF and its staff to meet the increasing challenges of maintaining balance between fishery resource exploitation and conservation is highly essential and need to be addressed on priority basis.
- 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 consider initiating suitable mechanisms for the purpose.

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