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National for the Conservation
Plan of Action and Management of
Sharks in the Maldives

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Author: Khadeeja Ali (kali@mrc.gov.mv), Marine Research Centre; Hussain Sinan (hussain.sinan@fishagri.gov.mv), Ministry of Fisheries and Agriculture
Address: 7th Floor, Ameer Ahmed Magu, Malé, 20125, Republic of Maldives
Email: info@fishagri.gov.mv
Website: <http://www.fishagri.gov.mv>

Photography: Adam Abdul Raheem
Layout and Design: Ali Noorain Jaleel

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Foreword by the Minister of Fisheries and Agriculture

From ancient times, the people of the Maldives have been blessed with the bounties of the ocean. For centuries the nation has enjoyed the ocean's resources with traditional fishing skills. For decades, a traditional method for shark fishing locally known as *maa keyolhukan* was practiced, where only few species of large sharks were hunted. The traditional shark fisheries evolved with the introduction of modern fishing techniques, opening opportunities for new fisheries. Thus, a targeted commercial fishery for sharks began in earnest. For a few decades, the fishery thrived till the impending threat of unsustainable utilization of shark resources loomed over. The global decline in shark fisheries had also befallen the island nation.

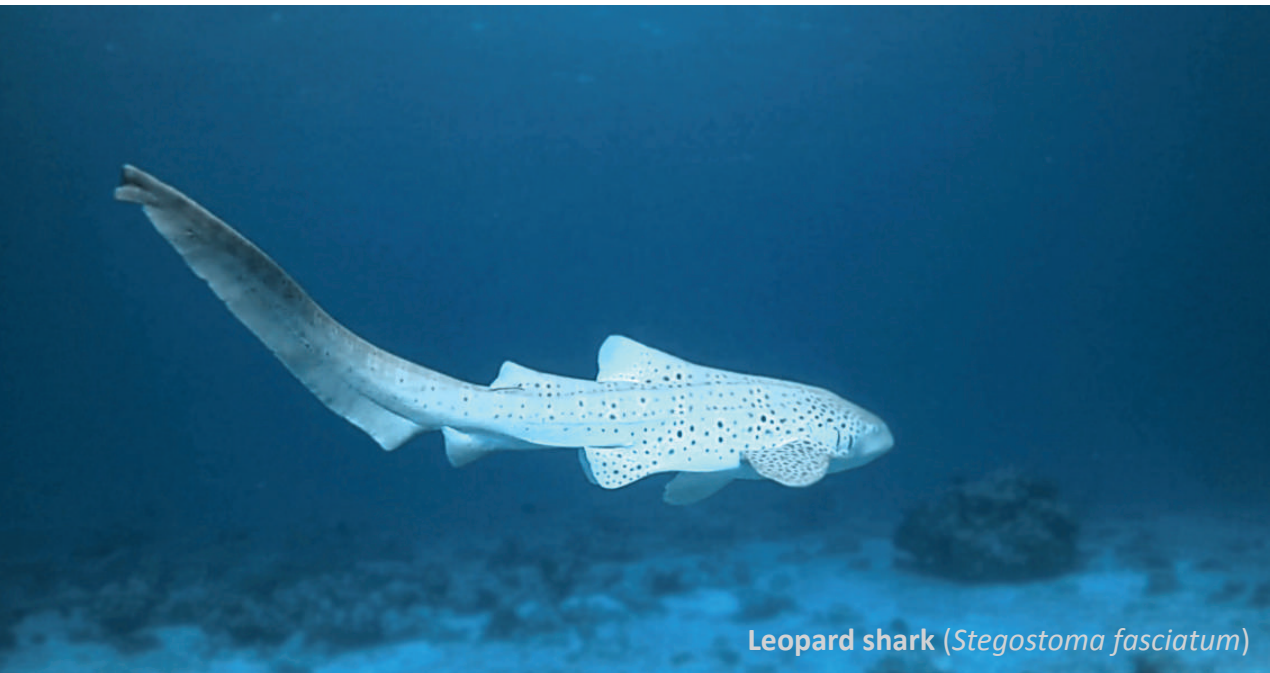
Since the early '80s, numerous management measures had been taken on shark fisheries. The first measure came in 1981, where shark fishing during day time was prohibited in tuna fishing areas. This was superseded by the decision to prohibit shark fishing with bait in the vicinity of tuna schools in the presence of tuna fishing vessels. In 1995 a ban on fishing for whale sharks was declared. In 1996 and 1997 longlining for sharks was banned around important seamounts for tuna fisheries. The most notable measure came in 1998, in hopes of replenishing the declining reef shark stocks, a ten-year moratorium on shark fishing was declared within 12 nautical miles of seven atolls. Despite the many management measures imposed, decline in shark fisheries continued, prompting new management actions. In 2009, a ban on shark fishing within the entire territorial waters was declared.

Recognizing the serious peril that the nation's valuable shark resources could face, in the face of uncertainty about the status of shark stocks in Maldivian waters, in 2010 the Government of the Maldives adopted the ultimate precautionary approach and declared a ban on shark fishing within the whole EEZ of the country. The decision also prohibits retaining of sharks in any fisheries in the entire Maldivian waters.

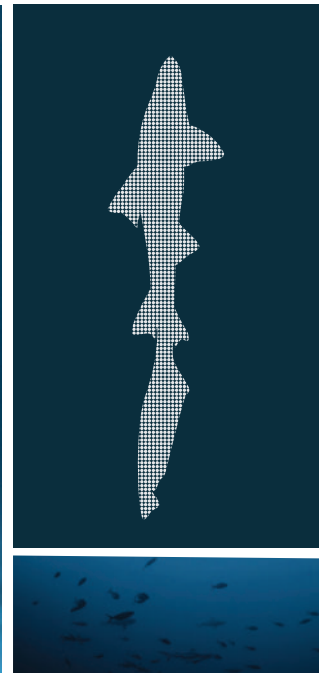
Maldives has always worked to have exemplar fisheries in the region that are sustainable and have the least impact on the ecosystem. As the nation is the first sanctuary for sharks in the Indian Ocean we demonstrate our commitment to the sustainable utilization of the ocean's resources. Thus, this National Plan of Action on the Conservation and Management of Sharks in the Maldives was developed in compliance with the World Food and Agriculture Organization's International Plan of Action on the Conservation and Management of Sharks.

I note with great satisfaction that this action plan was developed in consultations with a wide range of stakeholders from throughout the country, especially the former shark fisherfolk and the tourism industry. Our hopes are for the full commitment from all the relevant authorities and private sector parties in the implementation of this action plan to ensure the successful management of shark resources.

Mohamed Shainee, PhD
Minister of Fisheries and Agriculture



Leopard shark (*Stegostoma fasciatum*)



Acknowledgements

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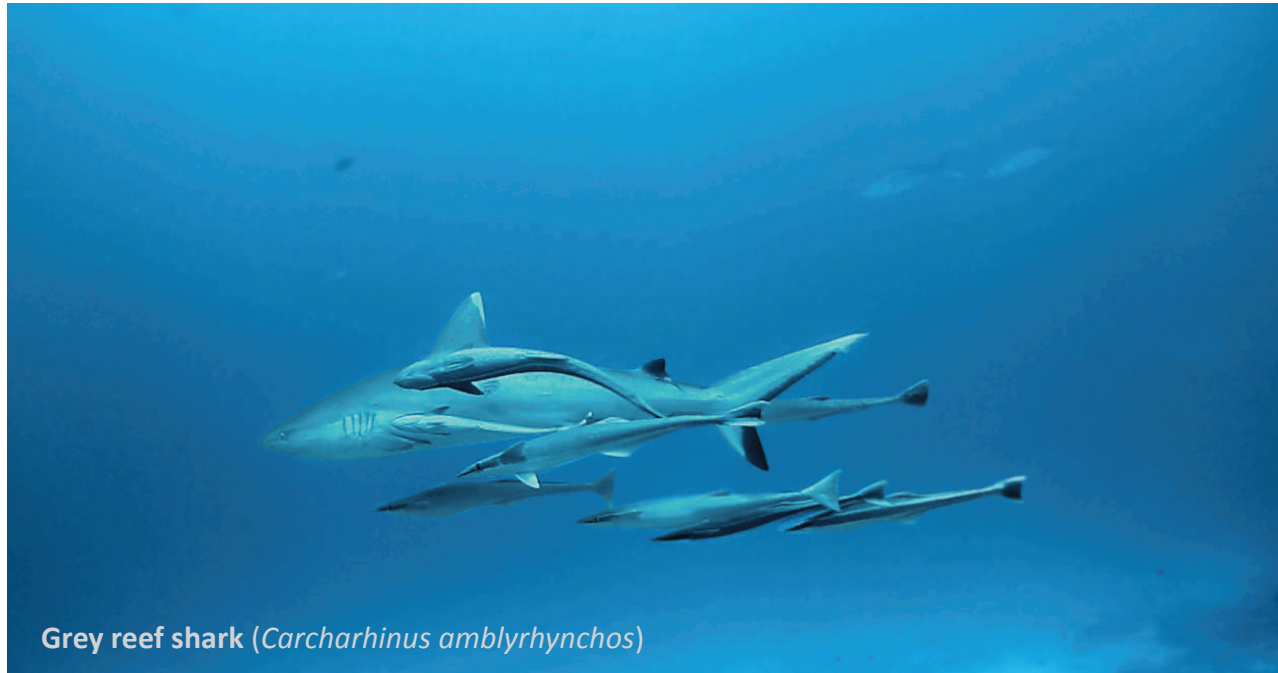
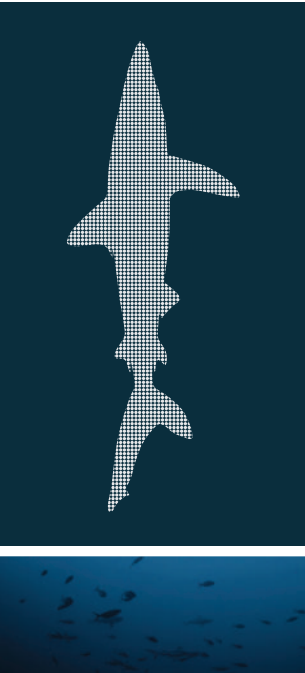
The development of the Plan was supported by the Bay of Bengal Large Marine Ecosystem Project (BoBLME Project) .

Table of Contents

Acronyms or Abbreviations	05
Executive Summary	06
1. Introduction	07
2. Threats to shark populations	09
2.1. Depleting shark populations	09
2.2. Impacts on ecosystem	10
2.3. International initiatives in management and conservation of sharks	10
3. Shark resources management in Maldives	12
3.1. Fisheries management framework	12
3.1.1. Fisheries administration	12
3.1.2. Collaborating agencies	13
3.1.3. Legislations	14
3.1.4. Conflicts with other Acts	15
3.1.5. Management measures on shark resources	15
3.1.6. Management measures on the impact of the ban	16
4. Level of compliance with IPOA-Sharks	17
4.1. IPOA-Sharks overarching goal	17
4.2. IPOA-Sharks guiding principles	18
4.2.1. Participation	18
4.2.2. Sustaining stocks	18
4.2.3. Nutritional and socio-economic considerations	18
4.3. Proposed objectives of NPOA-Sharks	19
4.3.1. Sustainability	19
4.3.2. Utilization	20
4.3.3. Environmental considerations	20
4.3.4. Additional considerations	21
5. Description of shark fisheries of the Maldives	22
5.1. Fishery baseline	22
5.2. Types of shark fisheries	24
5.3. Status of shark stocks	27
5.4. Social aspects	29
5.5. Conflicts between shark fishermen and other stakeholders	30
6. Plan of Action	32
Area 1: Socio-economic impact mitigation strategies	33
Area 2: Improve data collection and handling	34
Area 3: Research and development	35
Area 4: Education and raising awareness	36
Area 5: Improve coordination, consultation and monitoring of the ban	37
Area 6: International cooperation	38
7. Monitoring and review	39
References	40
Appendices	43
Appendix A: Endorsment memo (Dhivehi)	43
Appendix B: Unofficial translation of endorsment memo	44
Appendix C: Letter of endorsment	45

Acronyms or Abbreviations

AA	Alif Alif Atoll
AD	Alif Dhaal Atoll
BA	Baa Atoll
BoBLME	Bay of Bengal Large Marine Ecosystem Project
CBD	Convention on Biodiversity
COFI FAO	Committee on Fisheries
DA	Dhaalu Atoll
EEZ	Exclusive Economic Zone
EPA	Environmental Protection Agency of Maldives
EPPA	Environment Protection and Preservation Act of Maldives
FA	Faafu Atoll
FAB	Maldives Fisheries Advisory Board
FAD	Fish Aggregating Device
FAO	Food and Agriculture Organization
FAO-CCRF	FAO Code of Conduct for Responsible Fisheries
FMD	Maldives Fisheries Management Division
GA	Gaafu Alif Atoll
GD	Gaafu Dhaalu Atoll
HD	Haa Dhaalu Atoll
IOTC	Indian Ocean Tuna Commission
IPOA	Sharks International Plan of Action for the Conservation and Management of Sharks
ME	Meemu Atoll
MoEE	Ministry of Environment and Energy
MoED	Ministry of Economic Development
MoFA	Ministry of Fisheries and Agriculture
MoT	Ministry of Tourism
MNDF	Maldives National Defence Force
MRC	Marine Research Centre (of the Ministry of the Fisheries and Agriculture, Maldives)
MVR	Maldives Rufiyaa
NO	Noonu Atoll
NDP	National Development Plan
NBSAP	National Biodiversity Strategic Action Plan
NPOA	Sharks National Plan for Action on the Conservation and Management of Sharks
SIDS	Small Island Developing States
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
USD	US Dollars
WCED	World Commission on Environment and Development
VLD	Vessel Locating Device
VMS	Vessel Monitoring System



Grey reef shark (*Carcharhinus amblyrhynchos*)

Executive Summary

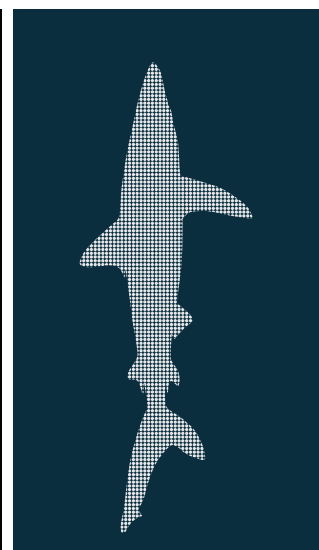
The increased exploitation of sharks has raised global concerns over the sustainability of the species. Given the life-history characteristics of sharks; their late attainment of maturity, and slow growth coupled with their low reproductive output, have made them less resilient to increased fishing pressure. Recognizing the threats to shark populations worldwide, Food and Agriculture Organization (FAO) of the United Nations developed a guideline to manage and conserve the world's shark populations. The guideline was endorsed as the International Plan of Action on Sharks (IPOA-Sharks) by FAO's Committee on Fisheries in 1999. IPOA-Sharks is voluntary and proposes countries engaged in either directed or non-directed exploitations of sharks to develop a National Plan of Action on the Conservation and Management of Sharks (NPOA-Sharks).

Maldives is committed to sustainably manage the marine resources of the country. In 2010 shark fisheries of Maldives were completely banned to address the growing concerns of depleting shark stocks. NPOA-Sharks was developed to address these concerns and to ensure the conservation of the shark fauna while safeguarding the interests of all stakeholders. NPOA-Sharks provides a history of shark fishing in Maldives, examines the level of alignment of the fisheries management system of Maldives with the objectives of the IPOA-Sharks and sets out an action plan to sustainably conserve the shark resources.

The NPOA-Sharks was developed by Ministry of Fisheries and Agriculture with assistance from the Bay of Bengal Large Marine Ecosystem Project (BoBLME).



Grey reef shark (*Carcharhinus amblyrhynchos*)



Introduction

Sharks are a group of about 1,100 species of mostly marine fishes (Compagno, 2001). Estimates on the global annual harvest of sharks vary considerably from 700,000 to 1.5 million tonnes and the only real consensus is that data on the fishery are chronically lacking (Frisk, et al., 2001; Stevens, et al., 2000). Sharks in general, are extremely vulnerable to over-fishing due to their slow growth, late maturity, long reproductive cycles and low reproductive output (Musick, et al., 2000). Increased worldwide exploitation of shark species with scientific evidence proving declining shark populations and few countries managing their shark fisheries, the Food and Agriculture Organisation (FAO) of the United Nations developed a set of guidelines to ensure the management and conservation of sharks. These guidelines became the International Plan of Action on Sharks (IPOA-Sharks). IPOA-Sharks was endorsed by the FAO Committee on Fisheries (COFI) in 1999. IPOA-Sharks is voluntary and all FAO member countries involved in directed and non-directed shark fisheries are encouraged to develop a National Plan of Action for the Conservation and Management of Sharks (NPOA-Sharks).

Maldives have had a centuries-old shark fishery, which had evolved from traditional to a more export oriented commercial fishery (Anderson & Ahmed, 1993). Compared to the tuna fishery of Maldives, the shark fishery was a minor fishery. Sharks' economic importance was not only limited to the fisheries sector, but equally significant to the dive tourism industry. Maldives is among the few countries that have declared a complete ban on shark fishing, which was announced in March 2010. Eventhough there is no longer a targeted fishery for sharks, incidental catches occur, mainly from the offshore tuna longline fishery. The longline fleet of the Maldives currently operates outside of 100nm within its Exclusive Economic Zone (EEZ) and contributes to offshore shark bycatch. With plans on extending the Maldives tuna longline fishery to high seas and the fishery already contributing to offshore shark bycatch there is a growing need for Maldives to strategically manage the incidental catches of offshore sharks. Therefore, albeit a complete ban on targeted shark fisheries, management and stringent monitoring of offshore shark bycatch is still required and hence the development of a NPOA-Sharks to address these concerns.

The overarching goal of the International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) is to “ensure the conservation and management of sharks for their long-term sustainable use”. While the objectives of the IPOA-Sharks’ largely focus on reducing the fishing mortality of sharks, in the context of Maldives, considering the complete ban on targeted shark fisheries, the main objective of Maldives NPOA-Sharks is:

“to ensure the implementation and observation of the total shark ban”

The Maldives NPOA-Sharks is a 4-year action plan comprising of actions to strengthen the current management measures and propose further actions necessary for sustainable non-extractive utilization of shark resources. NPOA-Sharks is developed by Marine Research Centre (MRC) and Fisheries Management Division (FMD) of Ministry of Fisheries and Agriculture (MoFA). NPOA-Sharks would apply to both the internal, territorial and EEZ and beyond waters of Maldives.



Whitetip Reef Sharks (*Triaenodon obesus*)



Threats to shark populations

Contrary to bony fishes, sharks in general are slow growing. They mature at a later stage in their lives and have a low reproductive output. These life history characteristics of sharks make them extremely susceptible to overfishing. As a result shark stocks can only withstand moderate levels of fishing without decline or collapse of the stock (Musick , et al., 2000)

Developments in the world economy and politics evolved the world fishing markets and fishing operations, which led to higher demand for shark fins particularly from China. With the declining traditional food fishes, the unexploited shark resources became targeted. Hence, by late 1980s, shark fisheries were rapidly expanding in all parts of the world. In the meantime, longline fisheries for tuna and pelagic swordfish were also on the rise. Although not targeted, sharks comprised a considerable part of the catches in these longline fisheries. Earlier, shark bycatch were released or discarded, but the high price fetched from shark fins resulted in retaining of the bycatch. A large proportion of fishing mortality of sharks is contributed to the incidental catches (Castro, et al., 1999).

2.1. Depleting shark populations

There is growing evidence that shark populations have undergone dramatic declines since the 1950s. Studies show that shark populations experienced very rapid declines in the early years of their exploitation (Baum et al., 2003). These declines usually occur before management and related monitoring regimes are put in place and as a result the virgin stock abundance is not accurately known for stock assessment and population modelling. Examples of shark fisheries that showed declines were the drift gillnet fishery for thresher sharks (*common thresher, Alopias vulpinus, the big eye thresher, A. superciliosus and the pelagic thresher, A. pelagicus*) on the U.S west coast of California, which started in mid 1970s, peaked in 1982 and then started to decline. Studies at that time showed that the stock was not able to

withstand the fishing pressure (Holts, 1988). Similarly, the Pacific angel shark (*Squatina californica*) fishery off the coast of California thrived for 8 years from its inception, before declining (Holts, 1988). For the shark populations of the Northwest Atlantic, Baum et al. (2003) estimated a dramatic 75% decline in the scalloped hammerheads (*Sphyrna lewini*), great white (*Carcharodon carcharias*), thresher shark stocks (*A. superciliosus*, *A. vulpinus*) and estimated a 50% decline for all other recorded species except for mako sharks (*Isurus oxyrinchus*, *I. paucus*). Since commercial pelagic fishing operations started taking place, pelagic sharks of the Gulf of Mexico have declined significantly. Baum and Myers (2004) reported a 99% decline for oceanic white tip sharks and 91% for silky sharks. In the 1950s, 60% of the shark landings were oceanic white tips, whereas in 1990s, oceanic white tips contributed a mere 2% of landings (Baum & Myers, 2004). The vulnerability of sharks to over-exploitation is heightened by the difficulties in effective management of marine resources which includes:

- Data deficiency particularly with regard to discarded bycatch from multi-species fisheries (Frisk, et al., 2001)
- Wide-ranging, transboundary or migratory species (Kohler & Turner, 2001)

2.2. Impacts on ecosystem

Predators play an important role in the maintenance of the structure and functions of marine systems (Worm, et al., 2002) and it is widely accepted that large-scale declines in predators may seriously affect marine ecosystems (Myers & Worm, 2003; Worm, et al., 2002). Serious concerns such as ecosystem phase shifts or even collapse have prompted United Nations resolutions on restoring fisheries. Shark is an apex predator in the food web, and critical in maintaining the balance of the ecosystem. Sharks keep the species lower to them in the food web at optimum levels. In Northwest Atlantic, significant reduction in shark populations stimulated the rapid increase of prey species such as rays and skates. With increase in cownose rays, there was more predation on bay scallops and this consequently led to the collapse of North Carolina's century old bay scallop fishery (Myers, et al., 2007).

2.3. International initiatives in management and conservation of sharks

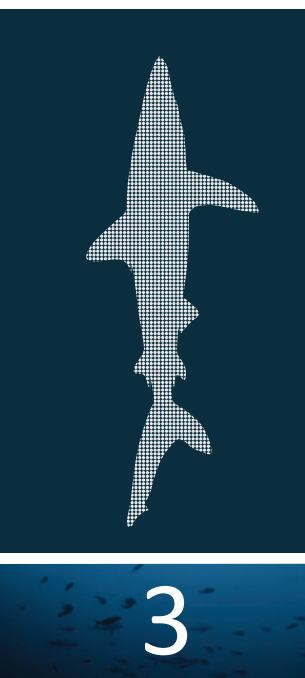
In recent decades, many initiatives were taken worldwide to ensure the sustainable utilization and conservation of marine resources. United Nations Convention on the Law of the Sea (UNCLOS) in 1982 was the basis for these initiatives (DOALOS, 2013). In 1987, the concept of 'sustainable development' came into advent where it was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" by the World Commission on Environment and Development (WCED) (DSD, 2013). The concept was further asserted at the United Nations Conference on Environment and Development (UNCED) in 1992. The most prominent outcome of UNCED was the Plan of Action for Sustainable Development, Agenda 21 (DSD, 2006).

Agenda 21 lays the foundation for sustainable development. It advocates adopting a holistic approach, where social, economic and environment needs shall be balanced. Chapter 17 sets forth obligations for sustainable utilization and conservation of marine species and (c) and (d) addresses marine resources in high seas and in waters under national jurisdiction (DSD, 2013). Another achievement of UNCED is the Convention on Biodiversity (CBD), aiming to conserve biodiversity, the sustainable use of biological resources and the fair and impartial sharing of benefits reaped from the utilization of genetic resources

(DSD, 2006). In 1995, the UN Conference on Straddling and Highly Migratory Fish Stocks adopted the United Nations Agreement for the Implementation of the Provisions of the UNCLOS 1982 relating to the Conservation and Management of Straddling and Highly Migratory Fish Stocks or, the “UN Fish Stocks Agreement” (DOALOS, 2013).

In the 1970s, fisheries sector became largely driven by the international market demands for fishery products. Consequently, coastal states developed their fishing sector with modern fishing fleets and processing factories to meet the market demands. However, in the late 1980s, it was found that such high demands on fishery products had resulted in the over-exploitation of fisheries resources. Thus it was recognized that new approaches to fisheries management, which accounted for the conservation of resources and environmental considerations were needed. In 1991, in a meeting of COFI, it was decided to develop new fisheries management concepts that would enable responsible and sustainable fisheries. In 1992, International Conference on Responsible Fisheries requested FAO to develop an International Code of Conduct for Responsible Fisheries. As a result, Code of Conduct for Responsible Fisheries (FAO-CCRF) was developed and got endorsed by FAO in 1995 and it sets out principles and standards to ensure the sustainable development of fisheries (FAO, 1995).

Rapid expansion of shark fisheries, limited management regimes for sharks and threats to the sustainability of shark stocks prompted FAO to develop the IPOA-Sharks to conserve and sustainably manage the world’s declining shark populations (FAO, 2000). The IPOA-Sharks was endorsed by COFI in 1999. It encourages all member states of FAO to voluntarily develop NPOA-Sharks if their vessels conduct target fisheries for sharks or if their vessels regularly catch sharks in non-target fisheries. (FAO, 2000).



Grey reef shark (*Carcharhinus amblyrhynchos*)

Shark resources management in Maldives

3.1. Fisheries management framework

Under the Fisheries Law of Maldives (Law no. 5/87), the Ministry of Fisheries and Agriculture (MoFA) is given the responsibility of developing and overseeing all types of fisheries undertaken in Maldives. Article 3 of the Fisheries Law, authorizes MoFA to develop and implement fisheries regulations to manage the fisheries and marine resources of the country.

3.1.1. Fisheries administration

There are several divisions within the MoFA to oversee the management and development of fisheries. The Fisheries Management Division (FMD) of MoFA is responsible for management of the fisheries, compliance and enforcement of management decisions. Within the Division, the management section deals with the formulation of fisheries management plans, development of regulations, policies and aquaculture management frameworks. The 'compliance and enforcement' section of FMD is also responsible for collection, compilation, analysis and dissemination of fisheries statistical data and also to undertake economic research. The section is responsible for enforcement of fisheries regulations, the vessel monitoring system (VMS), inspection, monitoring and observer programmes. Furthermore, FMD issues catch certificates for tuna exported from Maldives and fishing licenses for vessels that undertake tuna fishing for export.

The Fisheries Development Division of MoFA is comprised of two sub-divisions; fisheries development services and fisheries training centre. The fisheries development services, is further divided into industrialized fisheries development unit, marketing and trade relations unit, Fish Aggregating Device (FAD) unit and product development unit. The fisheries development unit works on finding strategies to further

develop the tuna fisheries, develops the master plan for fisheries development and undertakes work to establish a mariculture industry in Maldives. The marketing and trade relations unit collaborates with fish producers and facilitates marketing of their products and provides technical assistance and establishes a marketing board with individual entities working in the fisheries industry. The unit participates in international conferences and trade fairs to promote Maldives' fish products and detects changes on international fisheries and market for fisheries products and disseminates the information on a regular basis. The FAD unit designs and manages the anchored FADs and undertakes hydrographic surveys to deploy the FADs. The fisheries training centre has training and extension services unit, which conducts training programmes to develop a cadre of technical/skilled personnel for the fisheries industry, assists in setting up fisheries cooperative societies and provides technical assistance to run the cooperatives. The product development unit works on strategies for value addition, disseminates the information, improves fish production and ensures quality of products through training and awareness programmes.

MRC of MoFA, undertakes monitoring and research required for the management of fisheries of Maldives. MRC collects and disseminates fisheries related biological data. Due to limited human and technical resources at present, MRC is unable to carry out regular stock assessment work. However they provide reviews on an *ad hoc* basis and undertake general assessments of fisheries required to achieve the management goals of MoFA.

Any fisheries related regulation is passed on to the Fisheries Advisory Board (FAB) for approval. FAB is a statutory committee comprised of representatives of government departments, non-governmental organizations (NGOs) and individuals from fisheries sector, i.e. fishermen, processors and exporters having an interest in the resource to be regulated. The Minister of MoFA would chair the board and the board is responsible to provide advice to the Minister on development and management. Once a decision is endorsed by FAB, it would then be passed on to the cabinet for ratification.

3.1.2. Collaborating agencies

Ministry of Economic Development

Ministry of Economic Development (MoED) is responsible for regulating the trade of all commodities, thus imposing trade bans on all commodities, including fishery products. Under the Maldives Export and Import Law (Law no.37/79) all exports, imports, re-exports and trade of imported goods can be done only through a permit issued by or under a regulation by MoED.

Maldives National Defence Force and Maldives Police Services

As per the Fisheries Law, Ministry of Defence and National Security is given the responsibility of monitoring all infringements of the Fisheries Law. Maldives National Defence Force (MNDF) under the Ministry of Defence and National Security, is designated the responsibility of protecting the EEZ of the country. The Coastguard unit of MNDF carries out monitoring, control and surveillance of all fishing operations in the EEZ. Maldives Police Services, earlier a section of MNDF and now under Ministry of Home Affairs, has also a separate unit, called Marine Police which monitors fishing activities in the internal waters of the country.

Ministry of Environment and Energy and Environmental Protection Agency

The conservation of biological diversity of Maldives is mandated to the Ministry of Environment and Energy (MoEE) under the Environment Protection and Preservation Act (EPPA) (Law No.4/93). Both Fisheries Law and EPPA are used in formulation of regulations for the management of capture fisheries. MoEE and the Environmental Protection Agency (EPA) are consulted in formulation of fisheries management plans and fisheries policies.

Ministry of Tourism

Ministry of Tourism (MoT) is responsible for development of tourism in the Maldives. MoT approves the leasing of islands for development as tourist resorts, leasing of land for development of guesthouses or hotels and leasing of places for marinas. It is also the responsibility of MoT to manage all tourist (safari) vessels, diving centers and travel agencies. Both the fisheries and tourism sectors are dependent on the marine resources of the country. As key stakeholders of marine biodiversity, both MoFA and MoT closely collaborate on sustainable utilization of marine resources.

3.1.3. Legislations

Fisheries Law

Shark resources and shark fisheries are managed under the Fisheries Law of Maldives (Law no. 5/87). The Fisheries Law governs all capture fisheries and marine resources of Maldives. Article 10 of the Fisheries Law provides for the protection of a species or a designated area for the purpose of conservation for a specified period. Under the Fisheries Law, Ministry of Defense and National Security is given the responsibility of monitoring all infringements of the Fisheries Law. The law states that any illegal fishing operations and violations of the Fisheries Law should be regulated under the Penal Code of Maldives. A regulation on protected species has been drafted and is in the process of being implemented. Once this regulation is in place, penalties for any illegal fishing operation related to protected marine species will be given according to this regulation.

Regulation on Fisheries

The 'Regulation on Fisheries', details the catch reporting system for Maldives. Catch data from the EEZ and internal waters are recorded in logbooks for the fisheries. Reporting requirements vary depending on the type of fishery. All logbooks require the reporting of directed catch to the species level, except for reef fisheries where groupings are made. Incidental catches are usually reported as species complexes. Catch data from commercial fishing vessels in the EEZ are to be reported to MoFA, MoED and Maldives Customs Services. Catch data within the internal waters are to be reported to MoFA.

Regulation for Fishing Licensing, Fish Processing for Exports and Aquaculture

The regulation mandates for all commercial fishing vessels to obtain a fishing license. It also facilitates a fisheries inspection scheme and establishes a mechanism to impose fines on illegal and unreported fishing operations.

Regulation on Fishing and Export of Yellowfin and Bigeye Tuna

The regulation makes it mandatory for handline and longline fishing operators targeting yellowfin/bigeye tuna, to install a vessel locating device (VLD) on the vessels as part of the VMS requirements. Longlining is currently allowed from 100nm up to the limit of Maldivian EEZ. The regulation also requires the logging of all incidental catches of sharks as species complexes. Both live and dead shark bycatch shall be recorded as well as the handling of the caught sharks. Dead shark bycatch is to be brought onboard and reported to a fisheries enforcement officer or a fisheries observer. Currently Maldives has no observers or fisheries enforcement officers in place; hence dead shark are likely to be discarded.

3.1.4. Conflicts with other Acts

Fisheries and marine resources come under the jurisdiction of Fisheries Law. Fisheries Law is not provisioned to regulate or impose bans on trade, export and import of any marine resources. Regulation of trade and imposing of bans on trade of any commodity including marine products fall into the mandate of MoED, under The Maldives Export and Import Law (Law no.37/79). This conflict has resulted in the unregulated import and export of shark products as souvenirs from Maldives and potentially providing incentives for illegal exploitation of local sharks.

3.1.5. Management measures on shark resources

Historically, shark fisheries were managed by numerous measures taken under the Fisheries Law. Measures taken were primarily to reduce conflicts between shark fishermen and other stakeholders. Earlier management measures taken on shark fisheries were superseded when the ban on shark fishing came into effect in 2010. Adopting the precautionary approach, and adhering to the goals of IPOA-Sharks, and based on the advice by FAB, in March of 2010, MoFA announced an amendment to the management measure which states:

“ Shark species have slow growth rate, late maturation, low fecundities, long reproductive cycle and are among the least resilient of fish species to intense exploitation. Shark fisheries have a huge impact on the two main pillars of the Maldivian economy namely, pole and line tuna fishing industry and tourism industry. Research has shown that a single shark would reap more benefits by allowing it to live in its own habitat enabling divers to repeatedly watch it, than the single benefit earned from killing and selling it. Moreover, as sharks are top predators, they play an essential role in maintaining the balance of the ecosystem. Research by experts of Ministry of Fisheries and Agriculture showed that with the current declining status of shark fisheries, continual of the shark fisheries could seriously endanger the shark stocks, thereby affecting the two main pillars of the economy; tourism industry and pole and line tuna fishing industry. Based on these reasons, by the powers retained under article 10 of “Fisheries Law of the Maldives” (Law no: 5/87), the Ministry of Fisheries and Agriculture has decided to completely ban harvesting of any shark species from the Exclusive Economic Zone of Maldives effective from 01 March 2010. ”

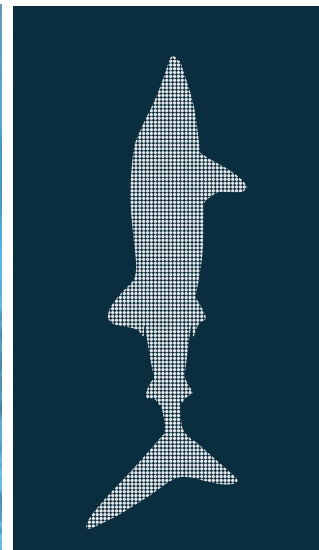
(MoFA Press release: 30-D2/29/2010/32)

3.1.6. Measures to minimize the impact of the ban

After the total ban came into effect in 2010, to minimize the impact of the ban on shark fishermen, the government of Maldives introduced a gear buy-back scheme to provide compensations in exchange of the shark fishing gear. In the MVR 5 million scheme, fishing gear were bought at depreciated values. A total of 206 former shark fishermen participated and received compensations. An additional MVR 5 million scheme, targeting the primary traders of shark products was also implemented, where they were given compensations for the shark products in their possession at the time of the ban. Further, with the purpose of assisting the shark fishermen in attaining new livelihoods, MoFA opened a Shark Trust Fund, to raise funds to provide alternative livelihood training programmes. Unfortunately due to the inadequate support for the Shark Trust Fund, MoFA was unable to conduct any livelihood training programmes.



Whale shark (*Rhincodon typus*)



4

4. Level of compliance with IPOA-Sharks

IPOA-Sharks has three levels of objectives:

1. *The overarching goal*
2. *The guiding principles*
3. *The proposed objectives of NPOA-Sharks*

This section describes the objectives of the IPOA-Sharks and discusses the extent the fisheries management system of Maldives is in line with the IPOA-Sharks.

4.1. IPOA-Sharks overarching goal

The overarching goal of the IPOA-Sharks is to ensure the conservation and management of sharks and their long-term sustainable use. Management and conservation of marine resources are given a high focus in the National Development Plans (NDP) of Maldives and the Fisheries Law itself has provisions to ensure management of all fisheries and conserve species if continued utilization could threaten the stocks. Therefore, MoFA concludes that the overarching goals of the IPOA-Sharks are in line with the fisheries management system of Maldives.

4.2. IPOA-Sharks guiding principles

IPOA-Sharks states three guiding principles to be used in the development of an NPOA-Sharks. The guiding principles aim to ensure that the overarching goal of IPOA-Sharks at national level is achieved. The three guiding principles are as follows;

- i) Participation- States that contribute to fishing mortality of a species or stock should participate in its management.*
- ii) Sustaining stocks- Management and conservation strategies should aim to keep total fishing mortality for each stock within sustainable levels by applying the precautionary approach.*
- iii) Nutritional and socio-economic considerations- Management and conservation objectives and strategies should recognize that in some low income food-deficient 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.*

4.2.1. Participation

Management of marine resources is the principal goal of Fisheries Law. Fisheries is one of the largest sectors of Maldives, thus all National Development Plans (NDP) have sustainable utilization of marine resources as one of their prime goals. Maldives has been proactive in the management of shark resources, and has management measures in place for the non-directed shark fisheries as well.

4.2.2. Sustaining stocks

Management of marine resources for their long-term sustainable use is a primary goal of NDPs of Maldives. If scientific or other studies suggest that continued utilization of a species could threaten its stock, the provisions in the Fisheries Law to protect such species can be exercised.

4.2.3. Nutritional and socio-economic considerations

Maldives has recently been graduated from a low income country to an upper middle income country (MEDS, 2013). However, in the outer atolls income generating options are still limited, and fishing continues to be the main occupation. Tuna is the principal source of protein, and the country has enjoyed a productive tuna fishery for centuries. Tuna is the main food, fish and sharks were never used for local consumption. In Maldives sharks were exploited for the sole purpose of exports.

Shark fishery was an artisanal fishery and an extremely minor one compared to the tuna fishery, but was a prominent livelihood activity in some islands of Maldives. Some shark fishermen were full-time fishermen, while others engaged in shark fishing only during a certain time of the year.

Oceanic sharks such as the silky shark (*Carcharhinus falciformis*) have an economic and ecological significance to the pole and line tuna fishermen. Adult silky sharks are known as *ainu miyaru* (school shark) in Maldives due to their association with tuna schools, while juvenile silky sharks are known as *oivaali miyaru* (*C.falciformis*, flotsam shark) as they tend to associate with drifting objects. Pole and line tuna fishermen have strong beliefs that association of silky sharks with a tuna school increases the catch level.

It is believed that tunas follow the silky sharks and catching these sharks reduces the availability of tuna (Anderson et al., 1996)

Shark watching is considered an important aspect of dive tourism. Reef sharks such as the white tip shark, black tip reef shark, grey reef shark, tawny nurse shark, silvertip shark, variegated shark, hammerhead sharks and whale sharks are frequently watched by tourists.

4.3. Proposed objectives of NPOA-Sharks

IPOA-Sharks has specifically stated objectives that NPOA-Sharks should achieve in order to achieve the overarching goal of IPOA-Sharks.

- 1) Ensure that shark catches from directed and non-directed fisheries are sustainable.*
- 2) 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.*
- 3) Identify and provide special attention, in particular to vulnerable or threatened shark stocks*
- 4) Improve and develop frameworks for establishing and co-ordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States.*
- 5) Minimise unutilised incidental catches of sharks.*
- 6) Contribute to the protection of biodiversity and ecosystem structure and function.*
- 7) Minimise 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).*
- 8) Encourage full use of dead sharks.*
- 9) Facilitate improved species-specific catch and landings data and monitoring of shark catches.*
- 10) Facilitate the identification and reporting of species-specific biological and trade data.*

The ten objectives of an NPOA-Sharks can be grouped into four broad categories; sustainability, environmental, utilization and additional. Under each category, the alignment of the objectives with the fisheries management goals of Maldives will be examined.

4.3.1. Sustainability

Three goals of the NPOA can be grouped under sustainability:

- a) Ensure that non-directed shark catches are sustainable (IPOA-Shark objective 1)*
- b) Assess threats to shark populations (IPOA-Shark objective 2)*
- c) Protect threatened shark populations (IPOA-Shark objective 3)*

Ensuring of sustainable utilization of marine resources is highly emphasized in the Maldives 7th NDP as well as the Maldives National Biodiversity Strategic Action Plan (NBSAP). Under these national plans, management plans shall be formulated in such a way that utilization is sustainable and shall use the FAO-CCRF as a basis. Maldives currently does not engage in any targeted fishery for sharks, and shark catches are now only from incidental catches in other fisheries. To ensure the incidental catches of sharks are at sustainable levels, such catches are being monitored. Regulation on Fishing and Export of Yellowfin and Bigeye Tuna has provisions to report both live and dead shark bycatch. According to the regulation, the live ones are to be released and dead ones brought onboard and declared to a fishery enforcement officer or an observer.

Sound scientific research into resource-use planning is identified in the strategies for the sustainable management of marine resources in the 7th NDP. Conservation of threatened biological diversity is also given high importance in the 7th NDP and Maldives NBSAP. The Fisheries Law also provides for the conservation of species for a special purpose. In the case of sharks, scientific information was inadequate to determine the status of shark stocks, but since there were uncertainties, and stocks seemed to be threatened, precautionary actions were taken to conserve the shark stocks.

4.3.2. Utilization

Four of the IPOA-Sharks objectives can be grouped under the utilization category:

- i) Implement harvesting strategies consistent with the principles of rational long-term use (part of IPOA-Sharks objective 2)*
- ii) Minimise unutilised incidental catches of sharks (IPOA-Sharks objective 5)*
- iii) Minimise waste and discards from shark catches in accordance with article 7.2.2 (g) of the Code of Conduct for Responsible Fisheries³² (IPOA-Sharks objective 7)*
- iv) Encourage full use of dead sharks (IPOA-Sharks objective 8)*

The utilization goals of IPOA-Sharks are identified in the 7th NDP which states to “ensure sustainable management of marine resources for the benefit of present and future generations”. For species that have a commercial or ecological importance, Maldives 7th NDP encourages the formulation of management plans. For the shark fisheries, albeit no management plan was formulated, moratoriums were declared and spatial restrictions were imposed to minimize the conflicts with other stakeholders. For the conservation and long-term sustainable use of sharks, Maldives now prohibits all types of shark fishing and permits only non-extractive use of sharks, such as shark watching through diving and snorkeling. Maldives now engages in non-directed catches of sharks only. Incidental catches of sharks are monitored under the Regulation on Fishing and Export of Yellowfin and Bigeye Tuna. The tuna longline logbooks account for the reporting of dead and live shark bycatch, and handling mechanisms for the both the dead and live sharks.

Minimization of waste, discards and incidental catches are identified in the actions of the Maldives NBSAP. For the conservation and sustainable utilization of biological diversity of Maldives, NBSAP also calls for implementation of FAO-CCRF. Maldives is a Cooperating Contracting Party of Indian Ocean Tuna Commission (IOTC). IOTC, FAO-CCRF and IPOA-Sharks advocate for the full utilization of dead sharks. With the total shark ban in place, Regulation on Fishing and Export of Yellowfin and Bigeye Tuna has provisions to release live shark bycatch and report the dead sharks to a fisheries observer for confiscation. *If the dead shark bycatch are to be utilized, MoFA considers that it could be taken as incentives for illegal shark fishing, thus the utilization of dead shark bycatch is not allowed. The decision was further supported by the stakeholders during the IPOA-Sharks consultation process. Thus, as the use of dead shark bycatch could conflict with the current fishing ban on sharks, Maldives IPOA-Sharks does not propose actions to achieve the objectives 5,6 and 7 of IPOA-Sharks.*

4.3.3. Environmental Considerations

Two objectives of IPOA-Sharks can be identified in the environment category:

- i) Determine and protect critical habitats (part of IPOA-Sharks objective 2)*
- ii) Contribute to the protection of biodiversity and ecosystem structure and function (IPOA-Sharks objective 4)*

Conservation of biodiversity and natural environment has been addressed in NDPs, the Fisheries Law, EPPA and NBSAP. Article 10 of the Fisheries Law has provisions for the protection of species for conservation or protection of habitats for defined periods. Species with high ecological importance such as the napoleon wrasse, giant clam, turtles, whales, dolphins and whale sharks have been declared as protected species. Sites known for their high biological diversity or considered important breeding grounds have been protected under the Fisheries Law. All shark species of Maldives have been given protected status under the Fisheries Law since March 2010.

4.3.4. Additional Considerations

Reporting

Two of the IPOA objectives are grouped into this category:

- i) Facilitate improved species-specific catch and landings data and monitoring of shark catches (IPOA-Sharks objective 9)*
- ii) Facilitate the identification and reporting of species-specific biological and trade data (IPOA-Sharks objective 10)*

Currently, Maldives is involved in indirect catches of sharks only. Logbooks for tuna longline, handline and pole and line operations require reporting of shark bycatch, as species-complexes. Since pole and line and handline tuna fisheries are highly selective with virtually no shark bycatch, a higher emphasis is placed on collection of shark bycatch data in the longline fishery. However, it is still obligatory for all three types of tuna fisheries to report bycatch of hammerhead sharks, thresher sharks, mako sharks, oceanic white tip sharks and all other sharks are to be reported in the 'other sharks' category. Logbooks also require the handling of incidental shark catch to be reported. Additional measures to improve data collection on bycatch of sharks will be addressed in the plan of action.

Consultation

There is one IPOA-Sharks objective that relates to consultation requirements:

- i) Improve and develop frameworks for establishing and coordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States (IPOA-Sharks objective 4)*

Incorporation of participatory approaches and involvement of all stakeholders including the public in the decision making processes, have been identified in the goals of 7th NDP. In the fisheries management framework of Maldives, fisheries management plans are formulated in conjunction with stakeholder consultations. The grouper management plan of 2012 was formulated after broad stakeholder consultations at all levels. The Sharkwatch programme of MRC, which currently monitors the shark sightings, involves the tourism sector in data collection. Maldives NPOA-Sharks was formulated with cooperation from all stakeholders including former shark fishermen.



5



Leopard shark (*Stegostoma fasciatum*)

Description of shark fisheries of the Maldives

5.1. Fishery baseline

The island nation of the Maldives is blessed with an abundance of marine resources, which form the basis of the economic development of the country. These resources can be loosely classified under two sectors; the fisheries sector and tourism sector. Despite the various challenges and threats faced by Small Island Developing States (SIDS), such as environmental disasters, international market shocks, communication and service delivery problems, the Maldives has been able to increase its economic growth in the past 20 years with a positive impact on the nation's wealth and social conditions with the limited resources that it has at hand from these two sectors.

Historical facts attest to the fact that the Maldives has enjoyed a lucrative fisheries sector for centuries. The great Arab traveler Ibn Battuta in his writings has given a clear account of the importance of the tuna fishing in the Maldives during his visits in 1343-44 and 1346 (Gray, 1887). There is also evidence that suggests fishing was an important activity in the Maldives before AD548 (AD1153-4) (Anderson & Hafiz, 1996) and consequently it can be deduced that the fisheries sector in the Maldives has been sustainably providing employment (Anderson & Ahmed, 1993) and trade for thousands of years. The traditional tuna fishery, which contributes to around 85% of the total catch, is considered as the most important fishery in the Maldives. The remaining 15% of the total catch comprises of reef associated and large pelagic species. These are reported as one category in the national statistics and the reef fisheries component in the statistics includes reef and oceanic sharks, jacks, scads, breams, jobfish, sail fish, seer-fish, rainbow runners and dolphin fish (mahi mahi) (Adam, 2006).

Shark species is one of the most important species groups in the reef fish category. Most of the shark catch was exported. There is evidence that Maldives has also had a minor shark fishery for centuries (Anderson & Ahmed, 1993). Traditionally, almost all the dhoni (Maldivian boats) were made of wood and regularly hauled up on the beach to be cleaned and painted with shark liver oil. To keep up with the demand for shark liver oil, there was a traditional shark fishery known as *maa keyolhukan* (big line fishing) targeting large tiger shark (*Galeocerdo cuvier*), whale shark (*Rhincodon typus*) and bluntnose sixgill shark (*Hexanchus griseus*) (Anderson & Ahmed, 1993).

Motorization of vessels began in the 1970s in conjunction with the introduction of gillnetting. With the development in trade during the period, there were wider market opportunities leading to better prices for the exports (Anderson & Ahmed, 1993). The market opportunities also opened doors for product diversification. The emphasis on shark liver oil changed to ‘shark fin’ as the main product and salted dried shark meat as the by-product.

In 1980s, Japanese buyers visited the Maldives looking for supply of high-value shark liver oil. A small multi-hook handline (vertical longline) fishery soon developed for the deepwater gulper shark to meet the demand. Thus by the end of 1980s, there was longline and handline fisheries for oceanic shark, gillnetting, handlining and longlining for reef shark and multihook handlining for deepwater shark (Anderson & Ahmed, 1993).

There has been 40 different species recorded in the Maldivian waters (Anderson & Ahmed, 1993); (Adam, et al., 1998); (Anderson, et al., 1998). Noticeably, half of the recorded species have been sighted for the first time in Maldivian waters in the last 25 years.

The main shark species caught in Maldives are listed below (Table 1).

Table 1 Sharks species recorded in Maldives (Source: Anderson & Ahmed, 1993; Adam, et al., 1998; Anderson et al., 1998)

English Name	Scientific Name	Maldivian Name	Deep	Reef	Ocean
Bluntnose sixgill shark	<i>Hexanchus griseus</i>	Madu mayaru	**		
Gulper shark ¹	<i>Centrophorus granulosus</i>	Kashi miyaru	***		
Leafscale gulper shark	<i>Centrophorus squamosus</i>	Kashi miyaru	***		
Mosaic gulper shark	<i>Centrophorus tessellatus</i>	Kashi miyaru	***		
Variigated shark	<i>Stegostoma fasciatum</i>	Hitha miyaru		*	
Tawny nurse shark	<i>Nebrius ferrugineus</i>	Nidhan miyaru		*	
Whale shark	<i>Rhincodon typus</i>	Fehurihi			
Smalltooth sand tiger	<i>Odontaspis ferox</i>	Daiy dhigu miyaru	*	*	
Crocodile shark	<i>Pseudocarcharias kamoharai</i>	-			*
Pelagic thresher shark	<i>Alopias pelagicus</i>	Kandi miyaru			*
Bigeye thresher shark	<i>Alopias superciliosus</i>	Kandi miyaru			*
Thresher shark	<i>Alopias vulpinus</i>	Kandi miyaru			*
Shortfin mako shark	<i>Isurus oxyrinchus</i>	Woshimas miyaru			*
Longfin mako shark	<i>Isurus paucus</i>	Woshimas miyaru			*
False catshark	<i>Pseudotriakis microdon</i>	Hikandhi thun miyaru	*		

Silvertip shark	<i>Carcharhinus albimarginatus</i>	Kattafulhi miyaru	**	*
Bignose shark	<i>Carcharhinus altimus</i>	Mendhan miyaru		**
Grey reef shark	<i>Carcharhinus amblyrhynchos</i>	Thila miyaru	**	
Silky shark	<i>Carcharhinus falciformis</i>	Ainu miyaru		***
Blacktip shark	<i>Carcharhinus limbatus</i>	-	*	
Oceanic whitetip shark	<i>Carcharhinus longimanus</i>	Feekanfaiy miyaru		**
Blacktip reef shark	<i>Carcharhinus melanopterus</i>	Falhu mathi dhon miyaru	**	
Spotail shark	<i>Carcharhinus sorrah</i>	Dhon miyaru	*	
Tiger shark	<i>Galeocerdo cuvier</i>	Femunu	*	*
Sicklefin lemon shark	<i>Negaprion acundens</i>	Olhufathi miyaru	*	
Blue shark	<i>Prionace glauca</i>	Andhun miyaru		*
Whitetip reef shark	<i>Triaenodon obesus</i>	Faana miyaru	**	
Scalloped hammerhead shark	<i>Sphyrna lewini</i>	Kaaligandu miyaru	*	*
Smooth hammerhead shark	<i>Sphyrna zygaena</i>	Kaaligandu miyaru		*
Great hammerhead shark	<i>Sphyrna mokarran</i>	Kaaligandu miyaru	*	
Snaggle tooth shark /fossil shark	<i>Hemipristis elongates</i>	-		
Bull shark	<i>Carcharhinus leucas</i>	-	*	
Sliteye shark	<i>Loxodon macrorhinus</i>	-	*	
Starspotted smoothhound	<i>Mustelus manazo</i>	-	*	
Arabian smoothhound	<i>Mustelus mosis</i>	-	*	
Pygmy false catshark	<i>Planonassus cf parini</i>	-	*	
Sharnose sevengill shark	<i>Heptranchias perlo</i>	-	*	
Kitefin shark	<i>Dalatias licha</i>	-	*	
Cookiecutter shark	<i>Isistius brasiliensis</i>	-	*	
Bramble shark	<i>Echinorhinus brucus</i>	-	*	

5.2. Types of shark fisheries

Shark fisheries in the Maldives can broadly be categorized into three main types; gulper shark fishery, the reef shark fishery and the oceanic shark fishery.

Gulper shark fishery (*Kashi miyaru masverikan*)

Since 1980, there has been a minor fishery for gulper sharks (*Centrophorus spp.*) on the outer atoll slopes using multi-hook vertical longline (Anderson & Ahmed, 1993). The sharks were caught exclusively for their liver, which forms about 25% of their body weight. The liver oil is rich in squalene and was exported to Japan (Anderson & Ahmed, 1993). In addition to gulper sharks, this fishery takes several other species of slope sharks and teleosts. Anderson and Ahmed (1993) reviewed this fishery, and provided the first records of several species of upper slope sharks. Gulper sharks are known in Dhivehi (Maldivian language) as *kashimiyaru* (spine shark) in reference to the spines on the anterior margin of the dorsal fins.

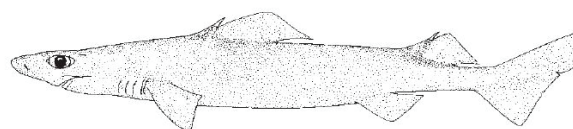
¹ Previously identified as *Centrophorus niukang*, recent studies found *C.niukang*, *C.granulosus* and *C.acus* are all same species and now is formally referred as *Centrophorus granulosus* (White, et al., 2013)

Commonly caught gulper sharks of Maldives



Centrophorus granulosus

Source: (Ebert, 2013)



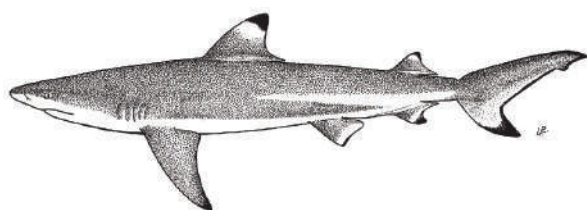
Centrophorus squamosus

Source: (Ebert, 2013)

Reef shark fishery

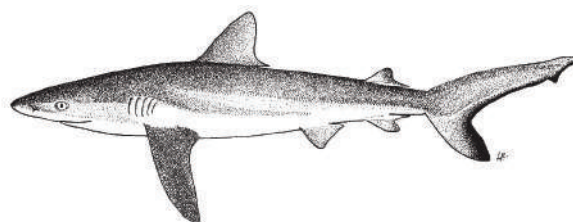
The fishery mainly targeted reef associated sharks using gill nets, handline and longline. Fins and dried shark meat were produced using the methods mentioned above. There was a huge conflict between reef shark fishermen and resort and diver operators as both industries are closely associated with the same stock. If the price of dried shark meat in the foreign markets dropped and if the fishermen were not regular shark fishermen, there was a high probability of discarding the shark after removing the fins (Anderson & Ahmed, 1993).

Commonly taken reef-associated sharks in reef shark fishery



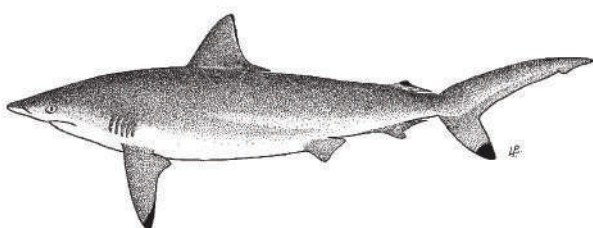
Carcharhinus melanopterus

Source: (Carpenter & Niem, 1998)



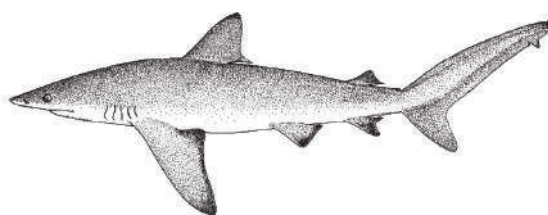
Carcharhinus amblyrhynchos

Source: (Carpenter & Niem, 1998)



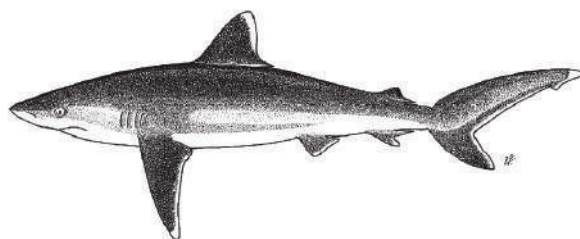
Carcharhinus sorrah

Source: (Carpenter & Niem, 1998)



Carcharhinus altimus

Source: (Carpenter & Niem, 1998)



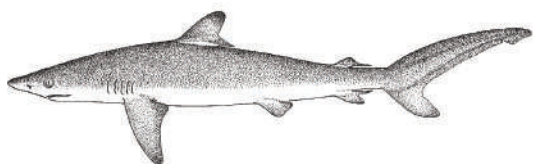
Carcharhinus albimarginatus

Source: (Carpenter & Niem, 1998)

Oceanic shark fishery

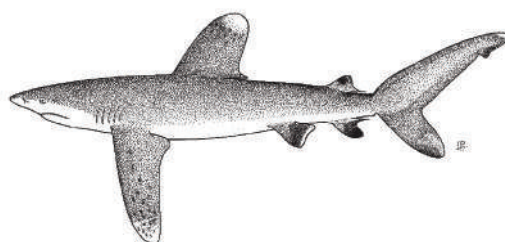
The fishermen who caught sharks in the open ocean used mainly longline and handline. Shark fishermen also targeted oceanic sharks, associated with tuna schools and floating objects. They also tend to catch the shark by holding the fins using their bare hands. The main products of this fishery are shark fins and shark meat (Anderson & Ahmed, 1993).

Some major shark species taken in oceanic shark fishery



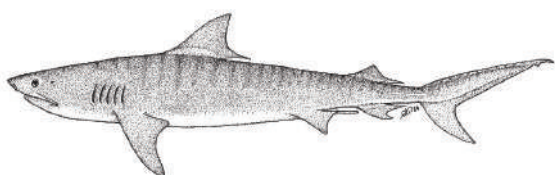
Carcharhinus falciformis

Source: (Carpenter & Niem, 1998)



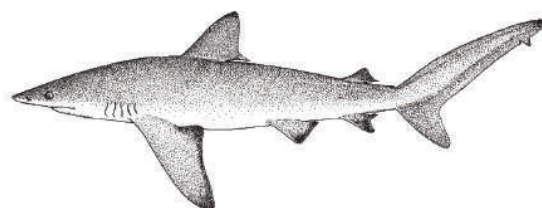
Carcharhinus longimanus

Source: (Carpenter & Niem, 1998)



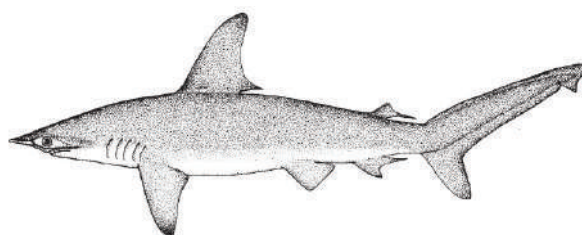
Galeocerdo cuvier

Source: (Carpenter & Niem, 1998)



Carcharhinus altimus

Source: (Carpenter & Niem, 1998)



Sphyrna lewini

Source: (Carpenter & Niem, 1998)

5.3. Status of shark stocks

It is very difficult to assess the status of the shark stocks in the Maldives. However, considering the biology of sharks, the information provided by resource users, history of shark fishing in the Maldives and export data, it could be deduced that the sharks stocks were in decline. There was a high risk for depletion of the main target species such as the reef associated sharks (MRC, 2009).

As Maldives is largely a tuna fishing nation, little emphasis was placed on collection of data from other fisheries. Shark catch data from oceanic and reef shark fisheries were grouped together into ‘Reef Fish’ category of the Basic Fisheries Statistics published annually by MoFA.

Deep water gulper shark stock

With catch information on sharks lacking, gulper shark catch was estimated from exports of squalene rich shark liver oil and from fins (Anderson & Ahmed, 1993). The gulper shark fishery began in the early 1980s. The fishery intensified and attained its highest peaks between 1982 and 1984. After 1984, catches started to decline significantly (Figure 1). From the anecdotal information from fishermen, it was deduced that catch had reduced to 50% within a few years of starting of the fishery (Anderson & Ahmed, 1993).

The rapid decline of the gulper shark fishery was attributed to the limited habitat of gulper sharks around the Maldives. Gulper sharks are deep water sharks and inhabit depths of about 500-800m. With the steeply sloping atoll slopes, the area with this depth is very small throughout the Maldives. A small habitat would imply a small stock, thus it was believed the small gulper shark stocks could not withstand the intense exploitation rates (MRC, 2009).

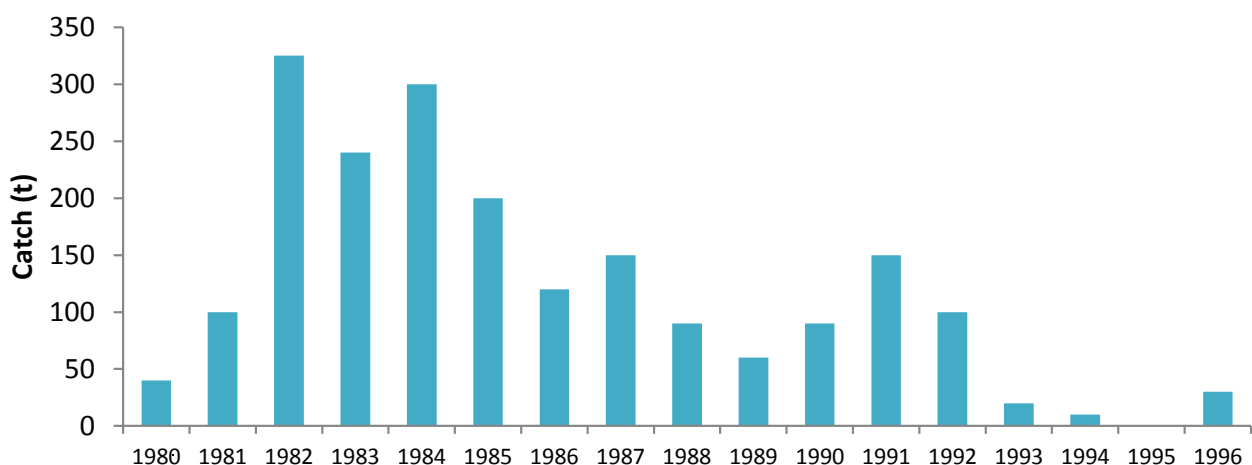


Figure1 Estimated annual catches of gulper sharks (Source: Anderson & Waheed, 1999)

Oceanic and reef shark stocks

The shark fin exports were from both oceanic and reef shark fisheries and fins were not distinguished per fishery. The estimated catch was the combined catch from both fisheries (Figure 2). From 1975, the shark catch showed a steep increase, and by 1980 shark catch reached 1900 tonnes. Anderson and Ahmed (1993) estimated that the contribution by each fishery to total catch was approximately 50% in 1992. By the early 1980s, reef shark stocks of the northern atolls of Maldives were reported to be over-fished. Anderson and Waheed (1999) reported a drop in the reef shark gillnet fleet in 1998 while the oceanic longline fleet increased in the same year. And with the moratorium on reef shark fishing in the central atolls, it was assumed that the contribution by the reef shark fishery was less than half (about one third or one quarter) of the total catch in 1998 (Anderson & Waheed, 1999). Oceanic shark fishery too started showing reduced catch. The northern longline shark fishery in Kulhudhuffushi, which primarily targeted oceanic sharks, reported declining catches after 2000. Fishermen of Kulhudhuffushi reported fewer occurrences of large silky sharks in their catch (Anderson, et al., 2011).

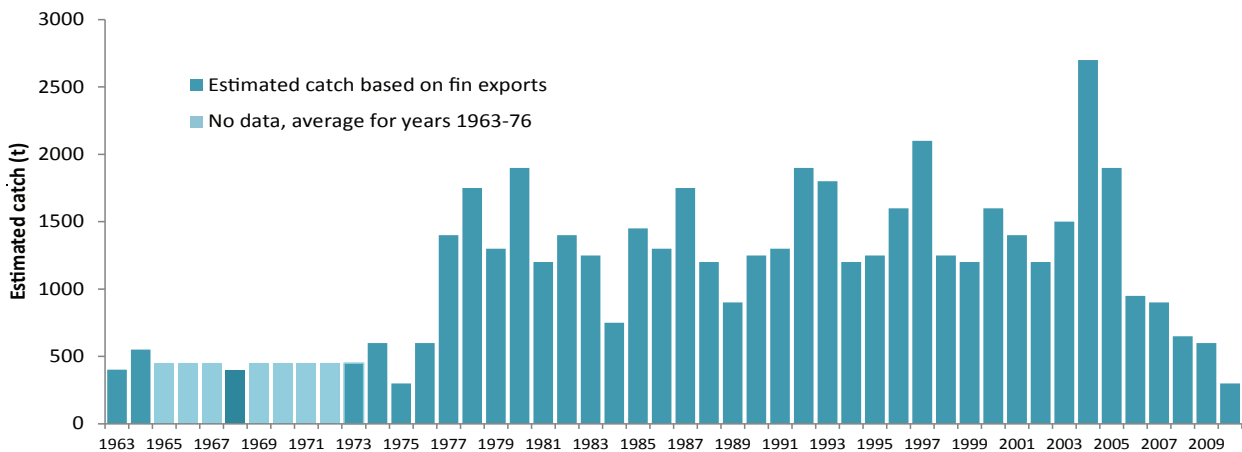


Figure 2 Estimated annual catches of reef and oceanic sharks (Source: Sinan et al., 2011)

5.4. Social aspects

Shark fishing islands, vessels and fishermen

Initially, the vessels engaged in shark fisheries were the same vessels used for tuna fisheries. However, the vessels in tuna fisheries have undergone rapid changes in size and gear from 1990s, while the shark fishing vessels remained almost the same. In 2004, there were 22 islands in 12 atolls where fishermen were engaged in shark fishing. The figure had declined by 2008, to 13 islands in 8 atolls. The 2009 estimates prevail that by the time of the ban, there were around 46 vessels and 184 fishermen engaged in shark fishery (Table 2). This is a 60% decline in vessels compared to 2004. The percentage of fishermen engaged in shark fisheries were 3.3% in 2008 (MRC, 2009).

Table 2 Number of vessels, fishermen involved in shark fishing during 2004 and 2008

Atoll	Shark fishing vessels		Shark fishermen		Total fishermen		Percentage of shark fishermen	
	2004	2008	2004	2008	2004	2008	2004	2008
HD	45	10	180	40	611	538	29.5	7.4
SH	12	4	48	16	1,014	1,017	4.7	1.6
NO	1	na	4	Na	395	Na	1.0	
RA	22	7	88	28	1,287	533	6.8	5.3
BA	6	na	24	Na	1,162	Na	2.1	
AA	9	11	36	44	730	523	4.9	8.4
AD	9	6	36	24	387	416	9.3	5.8
FA	0	1		4	na	615		0.7
ME	3	na	12	Na	457	Na	2.6	
DH	13	na	52	Na	514	Na	10.1	
TH	2	5	8	20	1,100	648	0.7	3.1
GA	6	na	24	Na	1,182	Na	2.0	
GD	4	2	16	8	1,060	1,249	1.5	0.6
Total	132	46	528	184	9,899	5,539	5.3	3.3

It was estimated that around 28% of the shark fishermen were, full-time fishers, while the remainder engages in shark fishery only during the Southeast Monsoon (*Iruvai Moosum*) (MRC, 2009). Further estimations showed that in 2004, a fishing vessel earned a total of MVR 20,000/- (USD1,556/-) per month as profit after deducting operational costs. However, in 2008, a fishing vessel earned almost twice, with a total of MVR 39,800/- (USD3,097/-) per month after deducting operational costs. The main reason behind the increase in earnings was due to the increase in price for sharks and shark associated products in the international markets (MRC, 2009).

Table 3, represents the main shark fishery islands and their fishing vessels and earnings. HDh. Kulhudhufushi and AA. Himandhoo were the main shark fishing islands in the Maldives. They contributed to around 41% of the total earnings. It is estimated that fishermen were fishing around 174 days in a year and shark fishing vessels earned an estimated MVR10 million in total per year (MRC, 2009).

Table 3 represents the main shark fishing islands, vessels and earnings

Atoll/Island	No. of shark fishing vessels	No. of fishing months	Gross profit MVR
HD.Kulhudhufushi	10	55.0	2,189,000
SH.Goidhoo	4	22.0	875,600
RA.Madduvvari	2	11.0	437,800
RA.Meedhoo	5	27.5	1,094,500
AA.Himandhoo	9	49.5	1,970,100
ADH.Dhan'gethi	6	33.0	1,313,400
AA.Thoddoo	1	5.5	218,900
AA.Bodufulhadhoo	1	5.5	218,900
FA.Feali	1	5.5	218,900
GD.Hoadedhoo	1	5.5	218,900
GD.Fares-Maathoda	1	5.5	218,900
TH.Vilufushi	3	16.5	656,700
TH.Hirilandhoo	2	11.0	437,800
Total	46	253	10,069,400

In 2007, it was estimated that the total revenue from shark product exports was MVR 3.26 million which is 0.24% of the total marine products exported by Maldives by that year (MRC, 2009).

5.5. Conflicts between shark fishermen and other stakeholders

Reef shark fishery and tourism

Tourism is the most significant industry in the Maldives and contributed 25% of Maldivian GDP in 2008 (DPND, 2009). Tourism industry in Maldives is solely dependent on the diversity and abundance of the natural resources in the country and a major attraction lies in the marine environment. Marine environment provides for over 70% of the tourists' main enjoyment during their stay (MOT, 1994). Around 38% of the tourists go snorkeling and around 18% of the tourists' main activity is diving (MOT, 1994). Anderson and Ahmed (1993) documented that shark watching alone generated USD 2.3 million while revenue from shark products for the same period was USD 1.7 million. Anderson and Ahmed (1993) implied that if assumed the annual revenue from the reef shark fishery was USD 0.5 million, then reef shark fishing only generated a quarter of the earnings compared to the shark watching of reef-associated sharks per year.

A single shark left alone in its environment could generate an estimated USD 3,300 per year (Anderson & Ahmed, 1993). While the same shark killed for its fins and meat only generated about USD 32 at that time. Hence a reef shark alive can be assumed to be 100 times more valuable than the same shark killed for export of its fin and meat. Sharks in Maldives do not have man-eating reputation that they have in some other countries, although there have been few cases reported by fishermen. As a result shark watching by divers is one of the main attractions in the dive tourism sector (Anderson & Ahmed, 1993).

The main species involved in shark watching are grey reef shark (*Carcharchinus amblyrhynchos*), whitetip reef shark (*Triaenodon obesus*), scalloped hammerhead shark (*Sphyrna lewini*), blacktip reef shark (*Carcharhinus melanopterus*), tawny nurse shark (*Nebrius ferrugineus*), variegated shark (*Stegostoma fasciatum*), silvertip shark (*Carcharhinus albimarginatus*) and whale shark (*Rhincodon typus*) (Anderson & Ahmed, 1993).

In recognition of the importance of dive tourism, 15 prominent dive sites got declared as marine protected areas in June of 1995. Of the 15 sites, nine were prominent shark watching sites. Also in the same year, whale sharks, a major charismatic species, got declared as a protected species. Even with increased awareness on the importance of reef associated sharks to the tourism industry, reef shark fishing continued in the central atolls which were important tourism zones. In 1998, to conserve the reef sharks for the tourism sector, a 10 year moratorium on reef shark fishing was declared in seven atolls.

Oceanic shark fishery and tuna fisheries

Maldives has been known as a tuna fishing nation for centuries. Maldivian fishermen's main target species; skipjack tuna and yellow fin tuna are often associated with dolphin schools. There has also been a close relation with the skipjack tuna schools and sharks, especially silky sharks (*Carcharhinus falciformis*) (Anderson & Ahmed, 1993).

Most fishermen believe harvesting of silky sharks (*C.falciformis*) and other sharks associated with tuna schools have a huge impact on availability of tuna especially from FADs deployed throughout the country (Sinan et al., 2011).

Tuna fisheries being a significant industry to the economy, several management measures on shark fisheries were taken to reduce this particular conflict. Shark fishing was banned during daytime in tuna fishing grounds and shark fishing around FADs were banned as well. Shark fishing around two seamounts were also banned as these are tuna aggregating sites (Sinan et al., 2011).



Whitetip Reef Sharks (*Triaenodon obesus*)



Plan of Action

The overarching goal of the IPOA-Sharks is to ensure the conservation and management of sharks for their long-term sustainable use. As Maldives has imposed a ban on shark fishing, the goal of the Maldives NPOA-Sharks is to **“to ensure the implementation and observation of the total shark ban”**.

There are 10 objectives stated by the IPOA-Sharks that a NPOA-Sharks should aim to achieve. The objectives are as following:

- 1) *Ensure that shark catches from directed and non-directed fisheries are sustainable.*
- 2) *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.*
- 3) *Identify and provide special attention, in particular to vulnerable or threatened shark stocks*
- 4) *Improve and develop frameworks for establishing and co-ordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States.*
- 5) *Minimise unutilised incidental catches of sharks.*
- 6) *Contribute to the protection of biodiversity and ecosystem structure and function.*
- 7) *Minimise 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).*
- 8) *Encourage full use of dead sharks.*
- 9) *Facilitate improved species-specific catch and landings data and monitoring of shark catches.*
- 10) *Facilitate the identification and reporting of species-specific biological and trade data.*

Area 1: Socio-economic impact mitigation strategies

Nutritional and socio-economic considerations are a guiding principle of IPOA-Sharks. As former shark fishermen would undoubtedly be the bearers of the main impact of the total shark fishing ban, NPOA-Sharks give special importance to reduce any socio-economic impact of the shark ban. Livelihoods of island communities are dependent on access to natural resources. With scarcity of land in the islands, the island communities are heavily dependent on fisheries, the only natural resource easily accessible. After the ban, the majority of fishermen were left to pursue other types of fishing. The gear buy back scheme and the primary trader compensation scheme were the only means of compensation. To ensure the wellbeing and livelihood security of former shark fishing communities, MoFA identified the following socio-economic impact mitigation strategies:

Consistent with the following aims of IPOA-Sharks:

6) *Contribute to the protection of biodiversity and ecosystem structure and function.*

Actions	Timeframe	Responsible Agency
1. Carry out a socio-economic study of the impact of the ban on shark fishing households and based on the results of the study, undertake a formal analysis of alternative activities and options and conduct livelihood diversification programmes for former shark fishermen	12 months	FMD, MRC
2. Devise a plan to strengthen the existing shark trust fund and ensure support from tourism sector to raise funding for livelihood diversification programmes and to raise awareness among public and resource users on shark conservation and the need for management	6 months	FMD, MRC, MoT

Area 2: Improve Data Collection and Handling

Prior to the shark ban, catch data on sharks were predominantly lacking, and was the major impediment in determining the status of shark stocks. With the total ban in place, the focus is now on minimizing shark bycatch, and regular assessments of shark bycatch is needed. Inability to identify sharks to species level is a major issue hindering the collection of species-specific data on sharks.

Consistent with the aims of IPOA-Sharks:

- 1) Ensure that shark catches from directed and non-directed fisheries are sustainable.
- 9) Facilitate improved species-specific catch and landings data and monitoring of shark catches.
- 10) Facilitate the identification and reporting of species-specific biological and trade data.

Actions	Timeframe	Responsible Agency
1. Adopt a mechanism to validate shark bycatch data from commercial longliners in EEZ before leaving the Maldivian waters by strengthening the monitoring system through an observer programme	6 months	MOFA, Customs, MNDF, Marine Police
2. Develop or adapt a shark species identification guide in both English and local language and make sure that all user groups get a	6 months	FMD, MRC
3. Train and assign fisheries observers as field samplers, for the commercial longliners, tuna handlining and pole and line vessels, to collect species-specific bycatch data on sharks, and to monitor the discards in non-directed shark fisheries	12-24 months	MoFA, MRC
4. Analyze periodical data on imports and exports for shark products	Every year	Customs, FMD, MRC
5. Carry out regular shark taxonomy trainings aimed at fishermen, Coastguard and Maldives Customs Services	Every year	FMD, MRC

Area 3: Research and Development

Species-specific information on shark stocks; their biology, distribution patterns and role in the ecosystem is largely lacking in Maldives. Lack of adequate research is preventing the determination of the true species-specific stock status of sharks. There is need to assess the impact of the shark management decisions on the ecosystem as well.

Consistent with the aims of IPOA-Sharks:

- 2) 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.
- 3) Identify and provide special attention, in particular to vulnerable or threatened shark stocks.
- 6) Contribute to the protection of biodiversity and ecosystem structure and function.

Actions	Timeframe	Responsible Agency
1. Improve the research programme and assign a dedicated team to carry out annual assessments to evaluate the effectiveness of shark management and conservation measures on reef associated shark species in the Maldivian waters	Every year	MRC
2. Promote citizen-science in the assessments of reef associated shark species in Maldivian waters	Every year	MRC
3. Disseminate the findings of the assessments under Area 3 (1) through workshops and seminars to relevant stakeholders	Every year	MRC
4. Evaluate methodologies and initiate research, where possible to assess the impact of shark management and conservation measures on ecosystem structure and function.	12 - 18 months	MRC

Area 4: Education and Raising Awareness

Information and awareness on the life history characteristics of sharks, which make them easily susceptible to overfishing and threats to sharks populations worldwide are still lacking among the public. Awareness among all the stakeholders is needed for the successful implementation of the NPOA-Sharks.

Consistent with the aims of IPOA-Sharks:

4) Improve and develop frameworks for establishing and co-ordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States.

Actions	Timeframe	Responsible Agency
1. Design and introduce educational materials aimed at all stakeholders including the general public, tourism industry and tuna fishing industry, giving emphasis to raise awareness on the vulnerability of targeted species and their role in marine ecosystems, current threats and status and the management decisions	12 months	MFD, MRC
2. Raise awareness among relevant stakeholders about the rationale for the use of shark bycatch data	Every year	FMD
3. Develop awareness among resource users on (a) penalties and provisions in the fisheries act, (b) fisheries regulations and the rationale and need for the sharks ban and (c) reporting mechanisms on illegal activities	Every year	FMD

Area 5: Improve coordination, consultation and monitoring of the ban

Albeit, MoFA has the overarching responsibility of managing the fisheries and marine resources of the Maldives, various other government departments have some level of involvement in the administration of the fisheries and marine resources. Therefore, collaboration from all relevant government agencies is needed for the effective implementation of the NPOA-Sharks.

Consistent with the aims of IPOA-Sharks:

6) Improve and develop frameworks for establishing and co-ordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States.

Actions	Timeframe	Responsible Agency
1. Identify human resource capacity gaps both in research and in management divisions of MRC, MOFA, Coastguard respectively, and identify capacity needs for the effective implementation of the NPOA-Sharks	6 months	FMD
2. Develop a regular consultation mechanism to seek advice from resource users including officials from tuna fisheries industry, tourism industry and Maldives National Defense Force on the implementation of NPOA-Sharks	6 months	FMD, MoE, MNDF, MoED
3. Actively promote the implementation of NPOA-Sharks	Every year	FMD, MRC
4. Legislate required actions against the trade, import and export of shark products	6 months	FMD, MoED, MoEE
5. Develop protocols whereby data can be shared between relevant stakeholders, (link to Wetlands Conservation and Coral Reef Monitoring for Adaptation to Climate Change (WCCM) protocols)	12 months	FMD, MRC, MoT, MoEE
6. Review on regular basis, the effectiveness of the shark ban and the implementation of the NPOA-Sharks	Every year	FMD

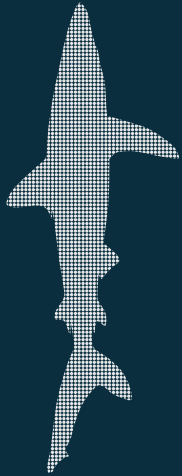
Area 6: International Cooperation

International cooperation is central to the successful implementation of IPOA-Sharks. The current bilateral and multilateral agreements and RFMOs shall be utilized to prioritize shark resources management and address the management of transboundary, highly migratory and straddling shark stocks of the high seas.

Consistent with the aims of IPOA-Sharks:

- 1) *Ensure that shark catches from directed and non-directed fisheries are sustainable.*
- 2) *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.*
- 3) *Identify and provide special attention, in particular to vulnerable or threatened shark stocks*
- 4) *Contribute to the protection of biodiversity and ecosystem structure and function.*
- 8) *Facilitate improved species-specific catch and landings data and monitoring of shark catches.*
- 9) *Facilitate the identification and reporting of species-specific biological and trade data.*
- 10) *Improve and develop frameworks for establishing and co-ordinating effective consultation involving all stakeholders in research, management and educational initiatives within and between States.*

Actions	Timeframe	Responsible Agency
1. Actively participate in the management and research of shark species by the relevant RFMOs	Every year	FMD, MRC
2. Actively participate in other international projects and forums on conservation and management of shark species	Every year	FMD, MRC
3. Actively participate in meeting the obligations of CITES	Every year	FMD, MoEE, EPA, MRC
4. Utilize international agreements and promoting the IPOA-Sharks, undertake cooperative research, stock assessments, and participate in initiatives to conserve transboundary, highly migratory and straddling shark stocks	Every year	FMD, MRC
5. Disseminate shark bycatch assessments regularly to relevant	Every year	FMD, MRC
6. Seek international assistance in capacity strengthening for the effective implementation of the NPOA-sharks	Every year	FMD, MRC



7



Grey reef shark (*Carcharhinus amblyrhynchos*)

Monitoring and Review

The lead agency in the implementation of NPOA-Sharks is the FMD of MoFA. The role of FMD includes:

- *Develop strategies to implement the plan*
- *Overseeing the implementation*
- *Disseminating information provided by the scientific research and management decisions taken in the region to stakeholders.*

The research component of NPOA-Sharks would be carried out by MRC. The monitoring and surveillance aspect has been assigned to MNDF's Coast Guard and Marine Police.

A focal point shall be appointed within MoFA, to coordinate the activities of NPOA-Sharks and oversee the implementation of NPOA-Sharks. It is the responsibility of FMD to undertake annual reviews on the progress of the NPOA-Sharks. FMD shall create a committee comprising officials from MoFA and remaining members shall be invited representatives from MoT MoED, MoEE, Maldives Customs Services and Maldives Coastguard. The committee shall meet annually to discuss the developments and review the progress of NPOA-Sharks and provide recommendations for effective coordination and implementation of NPOA-Sharks.

The implementation of each management measure focused on specific areas in this NPOA-Sharks would be an output of the NPOA-Sharks. The success of the implementation and monitoring would be evaluated based on the extent to which these outputs have been achieved. However, the main determinant point of the NPOA-Sharks would be restoring the depleted shark stocks to sustainable levels in the Maldivian waters.

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Unofficial translation

Memo: 30-A1/30-MRC/2015/7

To: Dr. Mohamed Shiham Adam, Director General of Marine Research Centre

From: Ahmed Hafiz, Deputy Minister of Fisheries and Agriculture

Title: National Plan of Action for the Conservation and Management of Sharks in the Maldives

The Ministry recognizes the above mentioned action plan (Maldives NPOA-Sharks) was developed based on FAO's International Plan of Action for the Conservation and Management of Sharks in the Maldives (IPOA-Sharks). We also believe the Maldives NPOA-Sharks has achieved the objectives outlined by the IPOA-Sharks.

We acknowledge that this action plan, formulated by the Ministry of Fisheries and Agriculture, was finalized with feedback from the stakeholders when the first draft of the plan was presented to the stakeholders during the consultation on 10th of April 2014.

Enclosed with this memo, is the documentation of endorsement of the Maldives NPOA-Sharks by the Ministry of Fisheries and Agriculture.



Ministry of Fisheries and Agriculture
Male', Republic of Maldives



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12th April 2015

To whom it may concern

Ministry of Fisheries and Agriculture endorses the National Plan of Action for the Conservation and Management of Sharks in the Maldives (Maldives NPOA-Sharks). The Maldives NPOA-Sharks was developed following the FAO's International Plan of Action for the Conservation and Management of Sharks. The development also involved a series of consultations with broad range of stakeholders.

The overarching goal of the Maldives NPOA-Sharks is *"to ensure the implementation and observation of the total shark ban"*. Maldives NPOA-Sharks is a 4-year action plan and would be implemented from 01 May 2015 through 30 April 2019.

The Maldives NPOA-Sharks was developed with assistance from the Bay of Bengal Large Marine Ecosystem Project.

Dr. Mohamed Shainee
Minister



Ministry of Fisheries and Agriculture

National Plan of Action
for the Conservation and Management
of Sharks in the Maldives