Bay of Bengal Large Marine Ecosystem Project

Report of the BOBLME Sharks Working Group

5-7 July 2011 • Male Maldives

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Executive summary

The Bay of Bengal (BOB) Region is one of the most heavily fished regions in the world for sharks (taken here to include sharks, rays and chimaeras). The two countries which rank highest in FAO statistics for shark landings (Indonesia and India) border the BOB. Five of the top 14 shark fishing nations are Bay of Bengal Large Marine Ecosystem (BOBLME) project members. Millions of people around the shores of the BOB rely on fisheries, including shark fisheries, for their incomes and food security. But shark resources are particularly easy to overfish. In addition, many exploited shark species are migratory or transboundary, and are being exploited by several BOBLME countries. The need for appropriate management of the shark fishery resources in the BOBLME is urgent.

Work on co-ordinated national and regional management of shark populations in the region was initiated through the Bay of Bengal Programme Intergovernmental Organisation (BOBP-IGO) in 2008, but setbacks have delayed the process. The BOBLME, which is the sister organization of BOBP-IGO, and its member countries (Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand) have now initiated work to manage the shark populations within the region through National and Regional Plans of Action (NPOA-sharks and RPOA-sharks).

The first workshop of the BOBLME Working Group on Sharks was held in the Maldives, from 5 to 7 July 2011, with participation from six of the eight member countries of the BOBLME project, plus shark specialists and facilitators. Objectives of the workshop included validation of available information on shark fisheries of member countries, drafting work plans and proposals to develop and implement NPOAs, including identification of targeted research and other studies and identification of support required, plus recommendations towards the formulation of an RPOA-sharks.

The workshop was conducted through a series of presentations and targeted plenary sessions. These sessions identified common issues and problems faced by member countries in management of shark fisheries, as well as recommendations for solutions at national and regional level.

Key findings from the workshop included identification of issues which were common to all member countries such as lack of human resources and trained personnel, poor stakeholder awareness, poor communication skills (e.g. scientists to politicians) and shortage of funding. Of the eight member countries, two have already adopted (but not fully implemented) their NPOA-sharks, three have draft NPOA-sharks which require updating and adoption, and three did not have an NPOA-sharks as yet.

One management measure which could be worked towards immediately is the protection of Whale Shark (*Rhincodon typus*) on a regional level. Four member countries have already given this species a protected status, and there was strong support for introduction of national protection in the remaining four member countries. Since this iconic species is long-lived and wide-ranging, it requires regional not just national protection, so protection throughout the BOBLME is required.

Development of short, capsule proposals for activities (with which countries would like to request BOBLME assistance) to address key issues were started during the workshop and completed by participants as a follow-up activity.

Background

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

The BOBLME Project is mandated, under its **Subcomponent 2.3 (Collaborative Regional Fishery Assessments and Management Plans)** to develop, introduce and promote collaborative fisheries management approaches for selected key transboundary species through the development of regional and sub-regional management plans and harmonization of data collection and standardization. To achieve these objectives, the subcomponent will support several activities on Hilsa shad, Indian mackerel and sharks. For sharks, the main objective is the development of a regional management plan for sharks (taken here to include not only the sharks themselves but also their close relatives, rays, skates and chimaeras).

The Bay of Bengal is one of the most heavily fished areas for sharks and rays in the world ocean. The top two shark fishing nations in the world are Indonesia and India. Five of the top 14 shark fishing countries are members of the Bay of Bengal Large Marine Ecosystem Project and several other top shark fishing countries have distant water fleets that operate in the Bay of Bengal. Table 1 shows summary statistics for the shark fisheries of the eight member countries of BOBLME project

Table1. Summary of shark fishery status in BOBLME countries (Sources: FAO Statistics, Lack and Sant, 2011)

	World Ranking	% of World Catch	2008 catch	NPOA status
Bangladesh	N/A	N/A	4,085t (2005 data)	Under development
India	2	9.0%	81,237t	Under development
Indonesia	1	13.3%	107,290t	Adopted 2010
Malaysia	10	2.9%	22,988t	Adopted 2006
Maldives	N/A	N/A	?	Draft 2009
Myanmar	N/A	N/A	?	Draft 2005
Sri Lanka	14	2.4%	4,410t	Under development
Thailand	11	2.8%	15,121t	Draft 2005

Through the Committee on Fisheries (COFI) of FAO, all BOBLME countries agreed to better manage shark populations in their EEZs by endorsing the International Plan of Action – Sharks (IPOA-Sharks). One important action under this IPOA was for countries to develop and implement individual National Plans of Action – Sharks (NPOA–Sharks). BOBLME is committed to assisting its member countries develop and implement NPOA-Sharks.

Similar work was initiated by another regional organisation with a fisheries mandate, the Bay of Bengal Intergovernmental Organisation (BOBP-IGO), in 2008 at a consultative meeting held in Sri Lanka. The second consultative meeting of the BOBP-IGO shark working group was held in 2009 in the Maldives, culminating with the formulation of draft NPOA-Sharks for the four member countries

(Bangladesh, India, Maldives and Sri Lanka) and an outline RPOA-Sharks for the BOB region. However, difficulties in implementing these plans at both national and regional level had stalled that process.

As a result, the BOBLME has taken the lead in assisting with the development and implementation of NPOA-Sharks and an RPOA-Sharks. Activities foreseen in the BOBLME 2010 Annual Work Plan (to review existing NPOAs, and identify gaps and work required) have not yet been undertaken. In line with the 2011 Annual Regional Work Plan, adopted by the Project Steering Committee (PSC) in March 2011, the following activities are to be undertaken:

- Review the status of NPOA-Sharks formulation and implementation
- Develop a workplan to address remaining gaps and issues
- Develop capacity within the countries to address these issues
- Support implementation of NPOA-Sharks
- Constitute a Shark Working Group to validate/consolidate the work plan and identify/formulate measures to raise awareness and improve compliance
- Undertake targeted research (studies) to address knowledge gaps (e.g. life cycle and reproduction information, information from small-scale fisheries, monitoring of effectiveness of conservation measures (MDV, MYA), alternative livelihoods)
- Implement measures to improve knowledge on shark taxonomy (training and support to shark taxonomy at national and regional level)
- Initiate work towards regional synthesis of NPOAs (framework RPOA)
- BOBLME participates in BOBP-IGO sub-regional shark management consultation

Meeting Inauguration

The first meeting of the BOBLME Shark Working Group was held at the Marine Research Centre of the Ministry of Fisheries and Agriculture, Maldives from 5-7 July 2011. The meeting was attended by participants from six of the eight BOBLME countries (India and Bangladesh were not represented), as well as representatives of BOBLME and experts in the field. A list of participants is attached in Appendix 1.

The objectives of the meeting were to:

- Discuss and validate available information
- Draft a work plan towards the implementation of the plans of actions
- Draft proposals for targeted research and studies
- Identify support needs towards the finalization of draft NPOAs
- Identify recommendations towards the formulation of draft RPOA-sharks

The expected outputs of the workshop included:

- Overview and synthesis of information on the BOBLME member countries' shark fisheries, and progress towards developing and implementing their NPOA-sharks;
- Recommendations for next steps in developing and implementing NPOA-sharks, and for drafting an RPOA-sharks;
- Proposals for targeted research (studies) and identification of measures to raise awareness and improve compliance;
- Meeting report containing a work plan to implement proposals and recommendations.

The workshop started with a short inaugural session attended by the Permanent Secretary of the Maldivian Ministry of Fisheries and Agriculture, Dr. Abdulla Naseer, and all the participants. In his inaugural speech Dr. Naseer stressed the importance of sharks to the ecosystem, especially in the Maldives, where the two main income generating industries, fisheries and tourism, are both reliant on sharks in different ways. He noted that shark fisheries were very difficult to sustain, but that shark diving tourism generated millions of dollars for the Maldivian economy. These considerations played a key part in the implementation of a total ban on shark fishing in the Maldives in 2010.

The participants were then addressed by Dr. Mohamed Shiham Adam, Director General of the Maldivian Marine Research Centre, in his capacity as host, and by Dr. Rudolf Hermes, Chief Technical Advisor of the BOBLME Project. Both speakers stressed the importance of regional cooperation for proper management of migratory and transboundary shark and ray populations. Dr. Hermes also outlined the aims of the Shark Working Group and in particular its potential role in the development and implementation of NPOA-sharks and RPOA-sharks.

The workshop itself started with the election of Mr. Ahmad Bin Ali, from the Department of Fisheries Malaysia, as the Chairperson for the meeting.

Meeting Activities and Outcomes

Most of the first day consisted of presentations by the country delegates, the BOBLME project and invited specialists. Presentations included:

- Introduction to the BOBLME project and its work with sharks (Dr. Rudolf Hermes, BOBLME project)
- Conservation status of sharks and rays – overview of current issues (Dr. Charles Anderson, Shark Specialist)
- Country status presentations for Indonesia, Malaysia, Thailand, Myanmar, India, Sri Lanka and Maldives (delegates from the countries; India presented by Dr. Hermes)
- Shark bycatch during tuna longline surveys in the Bay of Bengal (Isara Chanrachkij, SEAFDEC)

- IUCN Shark Specialist Group (SSG) – Network and Activities (Dr. Charles Anderson, Shark Specialist)
- FAO Sharks Review 2011 highlights (Dr. Rudolf Hermes, BOBLME project)

Plenary sessions started on the first day and continued into the second and third days. The plenary session themes were:

- Plenary 1: Commonalities and experiences from South East Asia
- Plenary 2: Commonalities and experiences from South Asia: status of South Asia sub-regional 'road map' process
- Plenary 3: Identification of key issues, limitations and hindrances to draft/implement NPOA-sharks
- Plenary 4: What works, what doesn't; are there any 'best practices' or 'lessons learnt'?
- Plenary 5: Identification and prioritization of recommendations
- Plenary 6 & 7: Recommendations for priority actions at country level
- Plenary 8: Key recommendations for actions on regional level including harmonized approaches
- Plenary 9: Identification and drafting of capsule proposals for targeted research and for measures to raise awareness and improve compliance (deadline 14th July)

The workshop achieved all of its objectives. Summaries of presentations, discussion points and recommendations are given in the Appendices. Some of the key findings and recommendations of the workshop were:

- The Whale Shark (*Rhincodon typus*) is already protected in four of the eight BOBLME countries (Maldives, India, Thailand and Malaysia). There was an urgent need and strong support for introduction of national protection in the remaining four member countries. In addition, the workshop decided that the project should investigate means to introduce regional protection for whale sharks.

- Marine Protected Areas were noted as a potentially invaluable tool for shark conservation and fisheries management.

- NPOA-sharks have already been published by Indonesia and Malaysia, although issues with implementing these plans were noted.

- Draft NPOA-sharks have been prepared by Myanmar, Thailand and Maldives, and these need to be finalized, endorsed and adopted.

- Sri Lanka, India and Bangladesh have still to formulate their NPOA-sharks, although some preparatory work was done at the 2nd Regional Consultation of the BOBP-IGO in 2009.

- Key constraints on the development and implementation of NPOA-sharks included lack of funding and human resource capacity. This also applied to management-oriented research on sharks as well as enforcement of shark fishery management and conservation measures.

- Key issues which need to be addressed when developing and implementing NPOA-sharks include awareness and communications.

Development of short, capsule proposals for activities to address key issues were started during the workshop and completed by participants as a follow-up activity. They are to be lodged with the BOBLME Secretariat.

References

Lack, M. and Sant, G. (2011). *The future of Sharks: a review of action and inaction.* TRAFFIC International.

Appendices

Appendix 1

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Appendix 2

Agenda of the workshop

Tuesday 05 July, 2011 – Introduction and Country / Thematic Presentations	
0830-0900	Meeting at Maldives Marine Research Centre (MRC), Moonlight Hingun, Malé; Registration
0900-0945	Opening of the Workshop Welcome remarks by Permanent Secretary MOFA, Dr. Abdulla Naseer Welcome remarks by DG MRC, Dr. Shiham Adam Welcome remarks by BOBLME CTA, Dr. Rudolf Hermes
0945-1000	Purpose and Process of the Workshop, Adoption of Agenda, Group Photo
1000-1030	Tea Break
1030-1055	Introduction to BOBLME Project and BOBLME sharks related work (Dr. Rudolf Hermes)
1055-1120	Conservation status of sharks and rays – overview of current issues (Dr. R. C. Anderson)
1120-1140	Sharks Fisheries Country Overviews – Status of NPOA drafting and implementation; issues, gaps and recommendations Country Presentation Indonesia (Mr. Dharmadi)
1140-1210	Country Presentation Malaysia (Mr. Ahmad Bin Ali)
1210-1230	Country Presentation Thailand (Mr. K. Tassapon)
1230-1250	Country Presentation Myanmar (Dr. Toe Nandar Tin)
1250-1400	Lunch Break
1400-1420	Presentation by SEAFDEC: Shark Bycatch of Tuna Longline Fisheries in the Bay of Bengal (Mr. Isara Chanrachkij)
1420-1450	Plenary discussion: Communalities and experiences from Southeast Asia
1450-1510	Country Presentation India (Dr. R. Hermes on behalf of Dr. E. Vivekanandan)
1510-1530	Tea Break
1530-1550	Country Presentation Sri Lanka (Mrs. H. L. N. S. Herath)
1550-1610	Country Presentation Maldives (Ms. Shahaama A. Sattar)
1610-1730	Plenary discussion: Communalities and experiences from South Asia; Status of South Asia sub-regional 'road map' process
1630-1730	Meet the Press
1900-2100	Group Dinner
	End of Day 1
Wednesday 06 July, 2011 – Status and Progress of the NPOA Sharks	
0900-0910	Recapitulation of Day 1 (Mr. Ahmad Bin Ali and Dr. R. C. Anderson)
0920-0930	IUCN Shark Specialist Group (SSG) – Network and Activities (Dr. R. C. Anderson)
0930-0940	FAO Sharks review 2011 – highlights (Hermes)
0940-1040	Plenary discussion: Identification of key issues, limitations, and hindrances to draft/implement NPOA Sharks
1040-1100	Tea Break
1100-1245	Plenary discussion (cont'd): what works, what doesn't; are there any 'best practices' or 'lessons learned'?
1245-1400	Lunch Break
1400-1530	Plenary discussion: Identification of recommendations
1530-1550	Tea Break
1550-1720	Sub-regional Breakout Groups: Clustering and prioritization of recommendations
1720-1745	Plenary: Brief update on status of Group Work

	End of Day 2
Thursday 07 July, 2011 – From Recommendations to Work Plan	
0900-0910	Recapitulation of Day 2
0910-1030	Sub-regional Group Work (cont'd): Drafting of work plans
1030-1045	Tea Break
1045-1130	Plenary: Recommendations for priority actions on country level
1130-1230	Plenary: Validation of 'road map' towards RPOA: Key recommendations for actions on regional level/harmonized approaches
1230-1400	Lunch
1400-1500	Plenary: Identification and drafting of capsule proposals for targeted research (studies) and for measures to raise awareness and improve compliance
1500-1530	Tea Break
1530-1630	Drafting of key recommendations and conclusions
1630-1645	Workshop closure

Appendix 3

Abstracts of Country Status Presentations

INDIA

About 60 species of sharks occur in Indian seas, of which six species contribute significantly to major fisheries. During 1985-2010, the annual average shark landings in India were 33,280t. The contribution of sharks to the total fish landings declined from 2.2% in 1985 to 0.9% in 2010. Catches on the northwest coast, which contributed 57% to Indian shark landings, consisted mostly of small-sized Spadenose shark, *Scoliodon laticaudus*. On the southeast coast, which contributed 25% to shark landings, catches consisted of larger and higher-value carcharhinids. In the last few years, the fishery is shifting from artisanal coastal fishery towards oceanic fishery, employing drift gillnets, hooks and line, and longlines operated from mechanized crafts. It is estimated that 15,000 – 20, 000 fishers are engaged exclusively in shark fishing in India. Decades ago, artisanal fishermen in India conducted shark fishing in a sustainable way. In recent years, increase in demand for sharks in international markets, especially for the fins, has encouraged increased numbers and efficiency of fishing boats, more directed fishing and expansion of fishing areas.

Four species of sharks (*Carcharhinus hemiodon*, *Glyphis gangeticus*, *G. glyphis* and *Rhincodon typus*) and six species of sawfishes and rays are protected under Schedule 1 of the Wildlife (Protection) Act of India, 1972. However, strategies to avoid capture of protected species in directed or multispecies fisheries do not exist. Existing measure for multispecies fisheries management include: seasonal and spatial closures for mechanized fishing vessels; Marine Protected Areas; and minimum codend mesh size for trawls. These measures may help reduce shark bycatch, but there is no assessment on this.

For sustainable management of shark fisheries, a comprehensive plan needs to be developed taking into consideration the livelihoods of dependent fishers. Given the wide-ranging distribution of sharks, including on the high seas, and long distance migration of many species, it is increasingly important to have international cooperation of shark management plans. A shark management plan for India should take into consideration the following six broad themes:

- Improve data collection and handling;
- Undertake targeted research and development;
- Review existing conservation and management measures;
- Improve existing conservation and management measures;
- Initiate focused education/awareness programs; and
- Improve coordination and consultation.

The following specific activities will be required:

- Assessment of distribution, abundance and biological characteristics for each species from commercial fisheries and exploratory surveys
- Developing mechanism for reporting catch by shark fishing groups
- Revalidation of potential yield estimates
- Assessment of fisheries impacts and evaluation of risk
- Revision of Red-list status for each species
- Identification of resident and transboundary stocks
- Establishment of Project Shark at national level
- Development of Shark Plan at regional level
- Regulation of entry, and of mesh and hook size
- Closure of seasons, areas and declaration of MPAs
- Quota system for shark fishing groups
- Legal minimum and maximum at capture
- Participatory research, management and conservation with shark fishing groups
- Establishment of molecular referral library for sharks
- Product certification and ecolabelling

INDONESIA

Indonesia has the highest reported annual landings of sharks and rays worldwide, with an estimated annual catch of over 109,000t during 2000 to 2008   (13% of the world total), and export value of shark $13 million. In 2004 Indonesia caught 15% of the world's total shark catch. A major problem faced in monitoring the shark fisheries in Indonesia is the lack of species information and catch composition data. Most fishing ports do not report shark landings by species. They usually lump together data on all shark species and/or elasmobranchs into a single category.

Sharks dominate the bycatch in five main types of fishing gear: drift longline, drift gillnet, tuna longline, bottom-set longline and set longline. The numbers of these fishing gears have increased during 16 years (1993-2008), although there was a decrease in number of drift gillnets and drift longlines after 2003.

Based on available statistics, there are five groups of sharks which are recorded seperately: thresher sharks, hammerhead sharks, dogfish sharks, mackerel sharks and Requiem sharks. Recorded catches of all these groups showed a decline during the past fifteen years (1995-2009), while total shark and ray production has declined from a peak in 2003.

Shark fin exports have declined since 2005. No shark fin exports were recorded in 2008, due to the Fisheries Ministry regulation concerning fisheries conservation in 2007.

Indonesia has developed an NPOA-sharks, and began its implementation on 1 January 2011 in some provinces. Implementation in other provinces will follow later. Some activities supporting the NPOA-shark implementation are workshops on provincial management for shark fisheries, enumerator training for shark identification, and publication of two field guides on sharks and rays. Key shark fisheries issues include:

- Although sharks are generally considered to be bycatch, at several fishing port sharks are actually a main target for some fishing gears.
- Shark data collection is poor due to lack of enumerator knowledge in identification of shark species; available data are not accurate.
- Implementation of the NPOA-sharks is not optimum.
- Research, publication and information on shark fisheries is limited.

In order to address these issues, a number of actions are recommended:

- Further training of fishery extension staff in shark data collection, and specifically in the use of the standard format for shark fishery data collection and evaluation.
- Training on shark species identification for enumerators throughout Indonesia.
- Monitoring of shark capture activity by observers.
- Review of data collection method and development of shark fisheries database, including fishing logbook implementation (specifically Ministry regulation Per men No. 18, Year 2010, for the observer programme).
- Further research of shark fisheries.
- Dissemination of information in order to raise awareness among stakeholders on the importance of shark fisheries management and to promote implementation of the NPOA-sharks.

MALAYSIA

A total of 153 species of chondrichthyans (65 sharks, 86 rays and 2 chimaeras) belonging to 17 families of sharks, 12 families of rays, and one family of chimaeras inhabit Malaysian waters. The most diverse shark family is the Carcharhinidae with 29 species, and as for rays it is the family Dasyatidae with 37 species. Freshwater elasmobranch species are rarely found, are restricted to localised areas and most are probably threatened. The Whale Shark and all sawfishes (family Pristidae) are now listed as endangered species. New species are continually being discovered, especially from deep water.

Sharks and ray landings contribute less than 2% of total marine landings, and not more than 1% of the total value of marine fish landings. Regarding eco-tourism activities, diving with sharks and rays is a big attraction and could provide a good economic return. Feeding juvenile blacktip reef sharks (*Carcharhinus melanopterus*) at Pulau Payar Marine Park (MPA) has now become a unique source of delight for tourists.

Sharks and rays are fully utilised as fresh meat, processed as salted fish and eaten raw (a local delicacy called 'umai'), while shark jaws and teeth are sold as souvenirs. Other parts are used as bait for fish and crab traps, while non-edible species such as electric rays are sold to fish meal factories. Shark fins are consumed locally and exported, mostly to Singapore. A small amount of dried shark cartilage is also exported.

Malaysia implemented its National Plan of Action for Sharks (NPOA-sharks) since 2006. The overall objective of the Plan is to ensure the conservation and management of sharks and rays and their long-term sustainable use. The plan aims:

- to ensure shark and ray catches are sustainable;
- to assess threats to sharks and rays population, to determine and protect critical habitats, and implement harvesting strategies consistent with the principal of biological sustainability and rational long-term economic use;
- to identify and provide special attention to vulnerable or threatened shark and ray stocks;
- to improve and develop a framework for establishing and coordinating effective consultation involving stakeholders in research, management and educational initiatives within and between states;
- to encourage fishers to minimise incidental catches of sharks and rays;
- to contribute to the protection of biodiversity and ecosystem structure and functions;
- to encourage full use of dead sharks;
- to improved species-specific catch and landings data and monitoring of sharks and rays catches;
- to facilitate the identification and reporting of species-specific biological and trade data.

The main issues and challenges include:

- how to manage 2% sharks and rays resources separately from 98% bony fishes since they share the same habitat;
- lack of funding from government for elasmobranch research;
- shortage of man power (especially taxonomists);

- limited knowledge on the biology and taxonomy of deep water species;
- limited coordination on shark and ray research among research institutions, universities and non-governmental organisations;
- the increasing demand for elasmobranch products due to change in feeding habits and since most people are willing to pay high price for meat and fins;
- difficulties in enforcing law and regulations effectively due to very high cost and limited man power.

MALDIVES

In the Maldives, sharks were historically exploited for their liver oil, which was used in boat maintenance. However, with the development of an export market in the late 1970s, the fishery soon expanded due to the demand for high valued shark fins, salted shark meat and also shark liver oil from gulper sharks.

Three types of shark fishery were carried out in the Maldives: the reef shark, oceanic shark and deep water gulper shark fisheries. Both the reef shark and deep water gulper shark fisheries were rapidly overexploited.

There has been competition between reef shark fishermen and the tourism sector (which benefits financially from shark watching by tourist divers) and between oceanic shark fishermen and the tuna fishing industry. As a result, conflicts have arisen between these resource user groups. Several spatial management measures were taken over the years to address these conflicts, such as ban on shark fishing from areas of importance to both tourism and tuna fishing. However, these measures proved ineffective due to inadequate monitoring and enforcement.

A review of the fishery and the socioeconomic status of the shark fishermen in 2008 showed that shark fishing was then carried out in 13 islands of 8 atolls by a total of 46 vessels and 184 fishermen. Averages of between MRf 15 to 20 million were earned per year from total shark exports in the 1990s; this subsequently decreased to MRf 0.9 million in 2010. Shark fins fetch the highest prices in the export market although unit price paid for shark fins is now seen to be on a decline. Contribution to income from all marine exports, by export of shark products has decreased from a high of 15% in the 1980s to 0.1% in 2010. Furthermore, a study in 1992 demonstrated that a live reef shark was worth much more than a dead shark, with shark watching by tourist divers generating USD 2.3 million in 1992, versus the USD 0.7 million generated from shark product exports in the same year.

Decreased shark stocks and reef shark sightings by divers, together with continued conflicts between shark fishing interests and the tourism industry, led the government to consider other forms of management. A complete ban on reef shark fishing was introduced, effective from 1 March 2009. A media announcement on the same day revealed an impending ban on total shark fishing from all Maldivian waters, as well as a ban on trade of shark products. The need for a ban on fishing of oceanic species and a total ban on exports arose due to the difficulty in implementing a ban only on reef shark species. The ban on all shark fishing within Maldivian waters was implemented on 15 March 2010, following a cabinet directive. A cabinet directive was also made to announce a ban on trade of all shark products from the 1 July 2010; this is, however, still pending.

Work on developing an NPOA-sharks started in 2008 through the regional workshops organized by the BOBP-IGO. An NPOA-sharks for Maldives was drafted in 2009 and addressed key issues of stakeholder consultations, shark bycatch regulations, gear buyback schemes, research and assessment of shark populations and shark sightings data and identified the capacity building needs for proper implementation of the NPOA. Having identified these issues, it was unfortunate that the ban on shark fishing came about without proper stake holder consultations, especially with fishermen and exporters. This resulted in a large group of people who were left angry and upset with the sudden end to their livelihoods. To compensate these fishermen, the Ministry of Fisheries and Agriculture started a gear buyback scheme, with the aid of government funding of MRF 7 million

(approx. USD 0.5 million). A Shark Trust fund was also initiated in 2010 and to date has obtained contributions amounting to USD 3000.

Subsequently, MOFA has introduced a regulation on bycatch on tuna longlines, which also addresses the issue of bycatch of sharks. The Marine Research Centre has initiated a sharkwatch programme through collaboration with the tourism industry, which records shark sighting data, in numbers and species, by divers, at specific sites.

In preparation for the trade ban, Ministry of Economic Development has also started a compensation programme for 'producers' or people who make products and handicrafts from shark organs, such as jaws. MoED has identified a list of these producers, though this list needs to be verified. It is estimated that a total of MRf 2.1 million (approx. USD 0.14 million) will be needed to compensate these producers, though the Ministry yet has to obtain this funding.

Issues faced in implementing the shark fishing and trade ban or various aspects of the NPOA-sharks include:

- Lack of preparation for ban including stake holder consultations and awareness programmes
- Lack of catch data / species specific data
- Lack of a baseline study, needed to study effectiveness of ban
- Lack of trained research/management staff at MRC and MOFA; at landing sites to monitor bycatch; at Customs check points
- Lack of enforcement and proper implementation
- Delayed trade ban
- Unclear mandates of various government. bodies
- Penalties undefined

Next steps identified to combat these issues are:

- Redraft and endorse NPOA-sharks
- Immediate implementation of Trade Ban
- Strengthened monitoring of sightings and bycatch
- Clearly define penalties and mandates of various bodies involved
- Prepare updated shark species identification guides/posters and shark conservation awareness materials
- Support formulation of a RPOA for shark fishery management

MYANMAR

In Myanmar, marine living resources including sharks and rays have not yet been studied in detail. Most Myanmar sharks and rays are small, demersal species found in a wide variety of habitats from open oceans to brackish water including both inshore estuaries and bays. Sharks and rays are caught as bycatch, and there are no targeted fisheries.

All marine fisheries in Myanmar are under the responsibility of the Department of Fisheries, which is under the Ministry of Livestock and Fisheries, as regulated in the Fisheries Law.

As an ASEAN and SEAFDEC member country, Myanmar drafted a National Plan of Action on Shark Fisheries (NPOA-sharks) in 2005 to support the ASEAN common position on shark fisheries.

Although Myanmar has not yet approved its NPOA-sharks, the Director-General of the DoF using 'Myanmar Marine Fisheries Law' issued order number 2/2004, regarding shark resources conservation on 5 May 2004.

Moreover, Myanmar had already designated a Marine Protected Area, where shark fishing cannot be conducted, between Ross Island (12°13'N, 98°05'E) and Lampi Island (10°48'N, 98°16'E).

It was confirmed by a regional study that shark catches in the ASEAN region are mostly from small-scale fisheries, and are a supplementary cash-catch. Lack of scientific data has been noted especially on shark production and identification of shark species.

Myanmar still needs to identify the shark and ray species found in both Bay of Bengal and Andaman Sea, so there is a need to promote taxonomic skills in concerned Institutes, Universities and Colleges. References and other necessary books will be needed and taxonomic training need to be implemented to upgrade the skills of taxonomists in Myanmar.

SRI LANKA

Sri Lanka has a Territorial Sea of 21,000sq.km and an EEZ of 517,000sq.km. Marine fisheries play an important role in the Sri Lankan economy. The sector contributes around 70% of the animal protein consumed in the country. This is largely supplied by the local fishing industry, which in 2009 produced 293,170t. Fisheries management arrangements are implemented under the provisions of Fisheries and Aquatic Resources Act No.2 of 1996. The main objectives of this act are the management, conservation, regulation, and development of the fisheries and aquatic resources of Sri Lanka.

Sharks are exploited by offshore fisheries as well as coastal fisheries in both pelagic and benthic habitats. In 2009, the annual shark catch was 2,059t, with most coming as bycatch from the drift gillnet and tuna longline fisheries. A decline in shark catches can be observed for the last few years. Sri Lanka contributed 3.1% of the global catch of sharks during 1990-2004, being tenth in shark fishery world rankings. In 2004 the contribution reduced to 2.4% of global catch.

There is no NPOA-sharks, although Sri Lanka has started initiatives to prepare one. At present the legislation pertaining directly to the shark and shark related fisheries is very limited. The only regulation gazetted under the Fisheries Act is the Regulation of the Landings of Fish (Species of Shark and Skates) Regulations, 2001 which states: 'A license holder (License holder means a person who is in possession of a valid license issued under the Fishing Operations Regulations of 1996 published in gazette Extraordinary No 948/25 of November 07, 1996) may land fish belonging to the species of Sharks or Skates, so long as the fins of such species of fish are attached to such fish. And no license holder shall land only the fins which have been removed from any fish belonging to the species of shark or skate.'

Other initiatives include awareness programmes for stake holders regarding the importance of shark conservation and the need for an NPOA-sharks. In addition, Sri Lanka is a member of the Indian Ocean Tuna Commission (IOTC) which took the initiative in 2005 to manage Indian Ocean sharks under IOTC Resolution 05/05. The main objective is to ensure the sustainability of oceanic shark stocks exploited by the tuna fisheries. As a member of IOTC, Sri Lanka has the responsibility of providing required data to implement conservation and management measures. Sri Lanka provides catch and effort data of shark fisheries to IOTC annually.

As with outer BOBLME countries, the taxonomy and biology of Sri Lankan sharks are poorly studied.

THAILAND

The Department of Fisheries, Thailand recognises the importance of the conservation and management of sharks and rays, in a long term system harmonized with the International Plan of Action for the Conservation and Management of Shark (IPOA-shark). Although there is no targeted fishery for sharks in Thailand, large quantities of sharks are caught as bycatch in other fisheries and widely utilized as shark fins, meat and skin. The Department of Fisheries drafted a National Plan of Action for the Conservation and Management of Shark (NPOA-sharks) to conserve shark sustainability in 2005. This has not yet been implemented.

Catch statistics for sharks are classed into a single grouping of 'sharks', due to difficulties in species identification and absence of a directed fishery. The majority of shark production is taken as bycatch by trawlers. Shark bycatch data from 1985 to 2007 showed an increase to 2003, when it reached a peak of approximately 14,400t. After this there was a steep decline, with shark catches in 2008 reported to be approximately 4,000t. Major issues include:

- Lack of data on shark biology e.g. species, breeding season, maturity size, distribution and abundance
- Lack of species-wise shark statistics e.g. catch and effort, fishing grounds and types of fishing gear
- Lack of trade data e.g. shark production and value, import and export quantities, processing products (shark fin, fish ball, leather, accessories, souvenirs)
- Lack of cooperation between stakeholders and government officials, with many stakeholders unwilling to give data/information
- Lack of training and capacity in good/precise data collection methodology for the purpose of management
- Absence of a baseline assessment on the status of shark populations in the country for systematic monitoring and control
- Absence of an NPOA-sharks which has been harmonized with the IPOA-sharks

The key objectives and issues addressed by the draft NPOA-sharks (and recent activities) include:

- Formulate standard format for data collection and analysis on shark biology, fishery and utilization. Data will be collected from primary and secondary sources. (Data collection initiated in May 2011 for duration of 1 year from all coastal provinces of Thailand).
- Study on heavy metal contamination in shark flesh and fin for food safety.
- Exchange information and conduct stakeholder consultations on a national, regional and international level, through seminars, workshops, consultation meetings, mass media, posters etc.
- Capacity building, including provision of training in species identification and production of field guides for shark identification. (Training programme for government officials, conducted at Ranong Marine Fisheries Station, 10-11 March 2011, provided training on shark species identification and data collection).
- Study and revise the conservation status of shark species which are endangered or at risk of becoming endangered

· Data collection, analysis and monitoring in a continuous and systematic manner

At present, the only shark management measure in place in Thailand relates to whale sharks (*Rhincodon typus*). This species is protected in Thailand with a ban on whale shark fishing within Thai waters (Ministerial Proclamation, 28 March 2000). There are no further management measures targeted specifically at sharks

A project conducted in 2004, with the financial assistance of SEAFDEC, collected data on shark biology, fisheries and utilization in the Gulf of Thailand and the Andaman Sea. Summary results are as follows:

· Biology: 45 species of sharks were found in the Thai Waters, with 41 in the Andaman Sea. Revisions made to the checklist of shark species in Thai waters, in light of these results brought the total number of shark species in Thai Waters to 59 species
· Fishery: There is no targeted fishery for sharks, but sharks are caught as bycatch in a variety of fisheries, the majority being from otter board trawlers. In the Andaman Sea, 97% of sharks were taken as bycatch in otter board trawls.
· Utilization: various parts of the shark were used for different purposes. Shark meat was consumed fresh or processed into products such as fish ball and salted fish; jaws and teeth were used to make souvenirs.

One of the major outcomes of this project was the promotion of conservation and sustainable utilization of sharks. Results of this study have also been presented in other symposia.

Appendix 4

Presentations by Resource Persons

The Bay of Bengal Large Marine Ecosystem (BOBLME) Project – an Overview

Dr. Rudolf Hermes, Chief Technical Adviser, BOBLME project

The Bay of Bengal Large Marine Ecosystem (BOBLME) Project is a five year (2009-2014), $31 million collaboration involving Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand. These eight countries are working together to develop 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. The major implementation partners are the Fisheries and Environment Departments of each country. The BOBLME Project is funded principally by the Global Environment Facility (GEF), Norway, Sweden, the Food and Agriculture Organization of the United Nations (FAO), and the National Oceanic and Atmospheric Administration (NOAA) of the USA. FAO is the executing agency.

Rapid population growth and high dependence on aquatic resources for food, trade and livelihoods, as well as increased land use are having major impacts on the marine ecosystem of the BOB. The Bay of Bengal is experiencing overexploitation of fish stocks, habitat degradation, and land-based pollution, resulting in uncertainty as to whether the ecosystem will be able to support livelihoods in the future.

The BOBLME Project has two major expected outputs. The first is a Transboundary Diagnostic Analysis (TDA). The TDA identifies and ranks or prioritizes water-related environmental transboundary issues, and their causes, according to the severity of environmental and/or socio-economic impacts. It provides the scientific basis for the development of the Strategic Action Programme (SAP) that will formulate nationally and regionally coordinated activities to address the issues and their causes. The SAP, the second major output, is the prerequisite for a second phase of the Project, beyond 2014 and towards 2020, which will be tasked with implementing the SAP. More information on the BOBLME Project can be found on www.boblme.org

Additional outcomes of the BOBLME Project will be the results of its numerous thematic studies, including those in Integrated Coastal Management (ICM), Policy Harmonization, Critical Habitat Management, Ocean Dynamics, Productivity and Climate Change, Marine Protected Areas, Ecosystem Health Indicators, Land-Based Sources of Pollution, and Fisheries. For the latter, the promotion of collaborative regional fishery assessments and management plans (for hilsa shads, Indian mackerel, and sharks) is the theme of BOBLME sub-component 2.3, and the envisaged work, as contained in the 2011 project work plan, includes for sharks:

- *Review the status of NPOA design and implementation*

- *Develop a work plan to address remaining gaps, to develop capacity and to support implementation*

- *Form and convene a Shark Working Group to identify measures to raise awareness and improve compliance*

- *Support targeted research to address knowledge gaps (e.g. life cycle and reproduction information, information from small-scale fisheries, monitoring effectiveness of conservation measures (MDV, MYA), alternative livelihoods)*

- *Implement measures to improve knowledge on shark taxonomy (training and support to shark taxonomy at national and regional level)*

- *Work towards regional synthesis of NPOAs (framework RPOA-sharks).*

In the two years since it became operational, the BOBLME Project has initiated an extensive programme of studies, reviews, workshops and trainings that have established baseline information in the Project's theme areas of fisheries, pollution and critical habitats. The Project will assist countries implement an Ecosystem Approach to Fisheries Management (EAF) for the transboundary or shared stocks of hilsa shad and Indian mackerel, and strengthen their natural resource management and policy development capabilities in general. The BOBLME will also contribute to regional knowledge of the Project's focus species (hilsa, Indian mackerel and sharks), the large-scale processes affecting the Bay and its ecology, and the likely effects of climate change.

To date the Project has completed several major reviews that identify the priority water–related issues affecting the Bay of Bengal and their causes (TDA); ICM best practices; the synergies and gaps in resource management policies in the BOBLME countries; and the status of MPAs. It has also undertaken a major assessment of the status and management of small pelagic fisheries. The BOBLME has played a key role in reaching an agreement for the formation of a joint Myanmar and Thailand body to manage the Mergui / Myeik Archipelago in the Andaman Sea; and formed working groups to assist it in the areas of ecosystem indicators, oceanography and pollution.

Conservations status of sharks and rays: an overview of current issues

Dr. Charles Anderson

World fisheries are in crisis. It is predicted that nearly all fish stocks will have collapsed by about 2050 if current trends continue. Underlying these trends are the inconvenient truths summarised in two well-understood but frequently ignored axioms:

Graham's Great Law of Fisheries (1943): Fisheries that are unlimited become unprofitable.

Hardin's Tragedy of the Commons (1968): Under conditions of scarcity, where the number of players is not small, an unmanaged commons inevitably ends in ruin.

While these apply to all inadequately managed fisheries, for sharks and rays the situation is even worse. They are long-lived with late maturity, they produce relatively small numbers of young, and as a result they have very low population replacement rates. In consequence, many shark fisheries have collapsed, with considerable loss of food and income, loss of livelihoods and adverse ecosystem impacts. Exacerbating issues include:

High prices. While prices paid for shark meat are often quite low, the prices paid for shark fins can be very high indeed (typically several hundred US$ per kilo, and in excess of US$1000 per kilo for exceptional specimens). Recently strong demand has developed for Manta gillrakers, which can now fetch over US$200 per kilo. Such high prices encourage continued fishing even when stocks are reduced to low levels. The driving force behind these high prices is strong consumer demand, particularly in Chinese markets. Solving the problems of shark fisheries will require addressing this issue, as well as more standard fisheries management problems, such as:

Bycatch. Because sharks often constitute a relatively small proportion of mixed catches, they are frequently classified as bycatch, despite the fact that they typically contribute a substantially larger proportion of catch value. In most case sharks should be considered as an integral part of the catch. By relegating them to 'bycatch' fisheries managers may effectively abrogate responsibility for these species. This is one factor contributing to:

Lack of monitoring. There is an acute lack of data on shark catches. Many shark stocks have collapsed in recent years, but the lack of even basic catch data prevents recognition of such collapses and greatly reduces the possibility of managed recovery. Even where there is some monitoring, sharks and rays are rarely identified to species, and may be recorded simply as 'sharks' or 'rays'. Such crude categorization undoubtedly conceals the collapse of some shark stocks. This issue is partly the result of:

Taxonomic problems. Despite being such large and apparently recognisable animals, sharks and rays are often difficult to identify. Many shark species look similar, and even common and well-known species are frequently misidentified. At the same time there are many species that are still to be scientifically described. Accurate specific identification is perhaps the first requirement for meaningful management, and there remains much room for improvement within the BOBLME.

Overcapacity. A general problem of many fisheries, including shark fisheries, is that there are too many fishermen and fishing boats chasing too few fish.

Several of these issues are symptoms of *poor governance*, with effective fisheries management in general and shark fisheries in particular receiving low priority from many fisheries departments. There are, however, some positive issues, including:

Tourism. In many areas, including Maldives, the development of diving tourism has provided strong financial incentives for the protection of coastal sharks and rays.

Marine Protected Areas. MPAs are proving to be effective tool for fisheries management and shark conservation, provided sufficient operational resources are made available.

Iconic Species. Increasing public awareness of and concern for charismatic megafauna such as the Whale Shark can promote conservation not only of these species, but also associate species and ecosystems.

Report on shark as bycatch in tuna longline fishing operations by SEAFDEC research vessels in the Bay of Bengal and Andaman Sea

Isara Chanrachkij and Sayan Promjinda (Southeast Asian Fisheries Development Center)

Catch data from the logbooks of three SEAFDEC research vessels (*M.V. Paknam*, *M.V.SEAFDEC* and *M.V. SEAFDEC2*) recorded during 1978 to 2011 were reviewed. 78 tuna longline operations were carried out, during which a total of 38,254 hooks were deployed. Numbers of hooks deployed ranged from 90 to 682 hooks per operation with an average of 490 hooks per operation.

Total numbers of sharks caught as bycatch on these longlines over this period were 161, giving a mean catch rate of 31.7 sharks/1,000 hooks. CPUE in terms of weight was 192 kg/1000 hooks. Three species of sharks dominated the catch: *Alopias superciliosus* (Bigeye Thresher Shark), *Alopias pelagicus* (Pelagic Thresher Shark) and *Carcharhinus falciformis* (Silky Shark). Recommendations for management, based on results of this study include:

- Research activities which study patterns of migrations of highly migratory, transboundary and straddling species are needed for effective collaboration among regional member countries
- Develop human resources (Fisheries Officers), particularly in taxonomy and shark species identification at all levels
- Develop fishing technologies to reduce incidental catch of shark
- Strengthen Port State Measures to monitor shark landing by high seas fishing vessels
- Strengthen collaboration with RFMOs
- Initiate appropriate data collection programs, e.g. observer program, fishing log etc.

The IUCN Shark Specialist Group: network and activities

Dr. Charles Anderson

The International Union for the Conservation of Nature (IUCN) is the first and largest global conservation network. It has 1,000+ member organizations in 140 countries, including over 200 government and 800 non-governmental organisations. It has a staff of more than 1000, and an elected governing Council, with headquarters in Switzerland and other offices worldwide. The IUCN brings together almost 11,000 voluntary scientists and experts, grouped in six Commissions, which deal with e.g. Communication and Education, Environmental Law and Protected Areas. The largest of the Commissions is the Species Survival Commission (SSC).

The SSC advises the IUCN on the technical aspects of species conservation and mobilizes action for those species that are threatened with extinction. Most of its 7500 members are deployed in more than 100 Specialist Groups, including the Shark Specialist Group (SSG).

The goals of the SSG are to promote the long-term conservation of the world's sharks and related species (the skates, rays and chimaeras), effective management of their fisheries and habitats, and, where necessary, the recovery of their populations. The SSG was established in 1991 and currently has nearly 200 members worldwide. It is overseen by a Chair (or, as currently, two Co-Chairs), assisted by a single programme officer. The SSG is organized on a regional basis, with each region overseen by a Vice-chair. Within the BOBLME there are two SSG regions: SE Asia and Indian Ocean.

The work of the SSG is currently concentrating on production of a Strategic Plan. In addition it organises and runs regional and themed workshops; produces shark status reports and Red List assessments; and conducts advisory and advocacy work. Status and workshop reports, most of which are available online, are a major source of relevant information, as are the Red List assessments. These also provide a standardised assessment of species status, many of which are further assessed by region (although there are as yet few assessments for BOBLME populations). Current Red List global assessments for species of relevance to the BOBLME shark working group include:

Silvertip Shark	*Carcharhinus albimarginatus*	Near Threatened
Bignose Shark	*Carcharhinus altimus*	Data Deficient
Spinner Shark	*Carcharhinus brevipinna*	Near Threatened
Silky Shark	*Carcharhinus falciformis*	Near Threatened
Galapagos Shark	*Carcharhinus galapagenis*	Near Threatened
Blacktip Shark	*Carcharhinus limbatus*	Near Threatened
Oceanic Whitetip Shark	*Carcharhinus longimanus*	Vulnerable
Australian Blacktip Shark	*Carcharhinus tilstoni*	Least Concern
Tiger Shark	*Galeocerdo cuvier*	Near Threatened
Blue Shark	*Prionace glauca*	Near Threatened
Whale Shark	*Rhincodon typus*	Vulnerable
Pelagic Thresher Shark	*Alopias pelagicus*	Vulnerable
Bigeye Thresher	*Alopias superciliosus*	Vulnerable
Common Thresher	*Alopias vulpinus*	Vulnerable
Crocodile Shark	*Pseudocarcharias kamoharai*	Near Threatened

Scalloped Hammerhead	*Sphyrna lewini*	Endangered
Great Hammerhead	*Sphyrna mokarran*	Endangered
Smooth Hammerhead	*Sphyrna zygaena*	Vulnerable
Spotted Eagle Ray	*Aetobatus narinari*	Near Threatened
Ornate Eagle Ray	*Aetomylaeus vespertilio*	Endangered
Manta Ray	*Manta birostris*	Near Threatened
Mobula Ray	*Mobula tarapacana*	Data Deficient
Smoothtail Mobula	*Mobula thurstoni*	Near Threatened

Relevant websites are: www.iucnssg.org & www.iucnredlist.org

Summary of presentation on FAO Review on Sharks – 2011

Dr. Rudolf Hermes, CTA, BOBLME project

Based on the paper: Musick, J. A. and Musick, S. (2011) FAO Fisheries and Aquaculture Reviews and Studies – Sharks, Rome, FAO

Sharks and their relatives comprise the chondrichthyan fishes, a group of more than 1,100 species, of which more than 400 are sharks. Reference made to sharks in the paper includes both sharks and batoids (elasmobranches) as the fishery statistics for many countries report the two groups together as one category. However, examples were mostly taken from sharks.

The life history characteristics of most elasmobranches (i.e. slow growth rates, late age-at-maturity and low fecundity) result in low intrinsic rates of population growth and a limited ability to withstand fishing pressure. The history of most directed shark fisheries around the world has been one of overharvest, rapid stock decline, collapse, and limited recovery. However, management measures exist, which enable sustainable fisheries for sharks, such as size-selective fishing gear regulations and small yields relative to standing stocks, particularly the reproductive portion of the stock. The paper shows evidence of overexploited shark fisheries where curtailing of fishing mortality has aided in recovery of the stocks (spiny dogfish populations in the Northeast Pacific and Northwest Atlantic).

Sharks are harvested primarily for their meat, fins, skin, cartilage and liver. Shark fins are the most valuable of shark products. Shark meat may be consumed fresh, salted, dried, smoked or processed into *surimi.* While the greatest use for shark skin has been for leather, it is also eaten in some countries. Shark cartilage is used for food in China and Japan and may include any part of the cartilaginous skeleton. However, the biggest market for shark cartilage is the pharmaceutical industry. Shark liver oil has been used in a variety of industries, again including the pharmaceutical industry.

Nominal catches of sharks and rays by species in the Food and Agriculture Organization of the United Nations (FAO) FISHSTAT database are difficult to interpret due to the uneven categorization of catches among landing countries. While some countries provide species-specific catch data, several of the most important countries with the highest catches, provide shark data in general groupings. Global trends from 1990 to 2008 in nominal shark and ray catches show landings to have increased to just less than 900,000t in 2003 and then declined. The top five countries contributing to these landings were Indonesia, India, Taiwan Province of China, Spain and Mexico. The global values of shark landings from the FAO Fisheries Commodities database, for this period showed a peak in 2000 (over US$1 billion), with declining trend thereafter.

Shark and ray fisheries in the world may be classified into four main categories: high seas pelagic, coastal cold-temperate, coastal tropical and deep sea.

High seas: Blue shark (*Prionace glauca)* is by far the most important in these fisheries, and it also has the largest global landings of any shark in the FAO database.

Coastal cold-temperate: shark and ray fisheries in both hemispheres are dominated by the piked or spiny dogfish, smooth hounds (Triakidae) and several species of rajid skates. Piked dogfish catches are second only to blue shark in the FAO database. Spiny dogfish in the NE Atlantic was so heavily exploited that catches were at almost negligible levels in 2008. A stock assessment conducted by ICES in 2006 showed that this stock was 94% depleted. The fisheries for this species have come

under stricter management controls in several areas, and in some areas stocks are showing signs of recovery.

Coastal tropical: requiem sharks and their relatives (Carcharhiniformes) are particularly important in these fisheries. Indonesia has been the top global shark and ray capture producer in recent years and at least 105 species were observed in landings there in a recent study.

Directed deep-sea: these fisheries for sharks have been conducted locally over continental and insular slopes (200 to 2,000 m) for several decades. These demersal fisheries typically target deep-water dogfishes (Squaliformes) of several genera, for their livers which are high in squalene. Four case studies of different deep-sea shark fisheries for which data were available were reviewed in the paper.

The global status of shark and ray populations is poor. Species-specific catch statistics are lacking from most shark fishing countries, although data may be available for aggregations of species in some higher groups (orders or families). For many elasmobranch species the question is no longer about fishery sustainability, but rather extinction risk. The IUCN Shark Specialist Group recently completed assessments of the conservation status of all recognized chondrichthyans (over 1,000 species). Of these, almost half did not have sufficient data to make an assessment. Of the remainder, 37% were assessed in threatened categories: 23% as Vulnerable; 9% as Endangered; and 5% as Critically Endangered. Fisheries mortality (both direct and indirect) was identified as the major cause of decline in virtually all of the threatened species.

In 1999, FAO adopted the International Plan of Action for the Conservation and Management of Sharks (IPOA-sharks) which also requested that all UN member countries that catch sharks and their relatives voluntarily prepare national 'Shark-plans' (NPOA-sharks). Although the deadline for submission of NPOA-sharks was in 2001, as of June 2010 only 12 of some 37 shark-fishing countries had submitted NPOA-sharks.

Recently several Regional Fisheries Management Organisations (RFMOs) have adopted regulations and measures that aid conservation of shark populations. These include finning restrictions, retention restrictions on some species, stock assessments and collection of more complete shark catch data. Furthermore conventions to conserve biodiversity have included sharks in their listings. CITES has listed three sharks and one sawfish under Appendix II (restricted trade) and six sawfishes under Appendix I (prohibited trade).

Appendix 5

Plenary 1 & 2: Commonalities and experiences from South East and South Asia: Status of South Asia sub-regional 'road map' process

Chaired by: Dr. Mohamed Shiham Adam (Director General, MRC, Maldives)

In this session participants identified their respective country's experiences, and particularly constraints, as well as commonalities within the region, in drafting/formulating and/or implementing their NPOA-sharks. Although two sessions were held (for South East Asian and South Asian countries separately), the outcomes have been merged here since most issues and experiences were quite similar across the BOBLME.

Capacity building

- All countries agreed that the lack of human capacity and trained personnel impedes progress in shark research, conservation and fisheries management
- All countries agreed that there is a need for capacity building at all levels

Data and information availability

- Lack of basic shark fishery catch and effort data was a serious constraint throughout most of the BOBLME.
- Where catch data are available they are often aggregated as 'sharks' or 'rays'. There is an almost complete absence of shark species specific catch data, which has serious implications for fisheries management.
- There is little biological information available on the species living within the national waters of the BOBLME countries

Taxonomy

- There are real problems with species identification within the BOBLME. This is of two sorts. First, a lack of basic field guides, and trained personnel, make identification of even common and relatively well-known species problematic. Secondly, the lack of comprehensive taxonomic studies of the region, with many species remaining undescribed particularly in SE Asia, is also a constraint.
- The lack of a good taxonomy for the region, of competent taxonomists, and of comprehensive user-friendly field guides, were highlighted as specific constraints.

Communication and awareness

- Participants agreed that there was a lack of awareness of shark fishery issues at all levels. There was concern that the right messages were not being communicated to stakeholders and policy makers.
- It was recognized that although this was a very important issue, effective communication was very difficult, especially for countries such as the Maldives and Indonesia with populations spread out in small isolated island communities over wide areas. The effective use of mass media was therefore essential.
- It was also recognised that NGOs could play a vital role in communicating ideas and raising awareness.

- In the Maldives the absence of stakeholder consultations prior to the introduction of the national shark fishing ban made implementation and enforcement of the ban more difficult due to minimal cooperation.
- In Myanmar video shows in villages have proved an effective means of communication and awareness building.
- Also in Myanmar, weekly meetings are held with MFF, Dept. of Fisheries and the media, to address issues which need to be publicized.
- In Malaysia an awareness raising campaign on shark conservation had been conducted through the public aquarium, providing information of shark biology, ecology and conservation issues to the visiting public
- In Sri Lanka the BOBP-IGO held two stake holder consultations and awareness campaigns to educate fisherfolk and other stakeholders about the status of the shark fishery and the importance of implementation of NPOA-sharks. Fishermen agreed to fill in logbooks for the fishery and provide accurate data.

Management/Conservation of sharks using spatial measures

- In the Maldives, prior to the implementation of its total ban on shark fishing, various spatial management measures including specific 'no shark fishing' areas were introduced. These measures proved ineffective due to lack of monitoring and enforcement.
- Myanmar currently has an area between Ross Island and Lampi Island designated as a 'no take' area for shark species
- Participants agreed that MPAs were a potentially valuable tool for shark fisheries management, but would require appropriate development, monitoring and enforcement.

Alternative livelihoods

- It was recognised that there was a problem of overcapacity in many fisheries, but finding alternative livelihoods for fishermen was a major difficulty.
- In the Maldives studies have shown that fishermen were willing to turn towards alternative livelihoods and other forms of income generation. The government has implemented a gear buy-back scheme, which enables fishermen to invest in other livelihoods.

Funding

- Most shark research in the BOBLME has been done through short projects and not long-term government funding. This is a serious constraint, since when projects end lack of funding impedes any further research or actions towards shark fisheries management.
- All participants agreed that until governments acknowledged the importance of sharks and their fisheries management, these issues could not be addressed effectively.

Appendix 6

Plenary 3: Identification of key issues, limitations and hindrances to drafting and implementation of NPOA-sharks

In this plenary session, participants identified the key issues, limitations and/or hindrances faced in formulating or implementing NPOA-sharks in their respective countries. This was organised under the four broad categories of *Information, Governance, Capacity Building, Communication and Management.*

Category	Issues/limitations/hindrances
Information	Ø **Taxonomy** · Some species still not described · Many problems with classification and issues of uncertainty · Confusion amongst researchers on homonyms and synonyms · Absence of good field guides · Various local names in different parts of each country, leading to confusion in reported data · Absence of bar-coded genome database for the region Ø **General information and data collection** · Absence of good, reliable reference sources is a hindrance to research · Unreported catches are thought to be high, for example fishermen sometimes sell directly to buyers at sea prior to landing remaining catch · Absence of data of sufficient quantity and quality to make well advised management decisions · Absence of species-specific catch data · Poor understanding of socioeconomic factors affecting the shark fishery, contributing to inappropriate management decisions · Uncooperative fishermen, unwilling to provide data or information · Absence of complete bycatch data from tuna longline vessels · Absence of sufficient information on critical habitats for sharks and rays; although some information available for reef shark species, no information available for oceanic species which are typically migratory · Absence of information on fishing grounds · Absence of information on general environmental variables important for shark populations
Capacity	Ø Limited capacity in terms of trained researchers Ø Absence of capacity in scientific writing and scientific communication Ø Trained staff not being utilized properly and being given other unrelated positions, often to meet a political agenda Ø Limited funding for training programs to build capacity Ø Absence of funding and commitment for research, especially at national levels Ø Government policies are not conducive to retaining capacity in technical posts
Governance	Ø Unclear mandates amongst state authorities in implementing NPOA-sharks

	Ø Barrier between politicians and technical staff: politicians fail to understand the important role played by technical staff and the importance of retaining specialist knowledge Ø Low compliance with management measures Ø Absence of proper enforcement and implementation of existing management measures Ø Absence of penalties for offenders
Communication	Ø Stakeholders, especially fishermen, have limited understanding of sharks: their biology and reproduction, ecology and their importance in the ecosystem Ø Stakeholders unaware of the concept and importance of NPOA-sharks Ø Little communication/coordination between various government agencies involved in implementation of NPOA-sharks, resulting in lack of clarity in roles Ø Ineffective communication between politicians and technical staff
Management	Ø Extremely high market demand for some shark and ray products such as fins, liver oil, manta gillrakers Ø Limited shark catch (typically only 1-2% of total production of each country) making it difficult to give priority and importance Ø Multi-species nature of fisheries Ø Large amount of shark bycatch in tuna longlining Ø Absence of regional data on shark stocks and regional mechanism for conservation of shared stocks Ø Absence of regional network for sharks

Appendix 7

Plenary 4: What works, what doesn't; are there any 'best practices' or 'lessons learnt'?

In this session, participants discussed case studies of formulation/implementation of NPOA-sharks and identified best practices or lessons learnt. The aim was to identify areas to which attention should be paid by those countries still in the process of drafting/implementing their NPOA-sharks.

Case study 1: Economics of shark watching

In the experience of **Maldives**, assessing the **economic value of reef shark and ray watching** and in particular putting a value to this activity can be used to attract the attention of politicians and decision makers. It is now well established that reef sharks can be worth more alive than dead, but this fact is useless in terms of convincing politicians, without an actual economic valuation. Such valuations can be used to leverage political pressure for shark conservation.

Also in the **Maldives**, a **'Sharkwatch' programme** was started in June 2009 and has been very useful for monitoring shark sightings and shark population numbers. Divers report the number of sharks (by species) they see at their regular shark watching dive sites. Analysis of such data over several years should enable the monitoring of population trends.

In **Myanmar** there is potential to reproduce this concept and combine the shark MPA with ecotourism (especially around Lampi Island).

In **Malaysia,** reports of shark numbers from Sipadan and other areas show a decreasing trend. Malaysia would like to introduce a ban on shark fishing in this area but no decision has been reached yet from the Dept. of Fisheries. The people in the area would like to introduce **ecotourism based shark watching** (similar to 'Sharkwatch' in the Maldives), involving the Bajao people as dive guides. Currently **shark feeding** (especially juveniles of *C. melanopterus*) in the Marine Park in Pulau Padang, Malacca Strait in **Malaysia** generates much interest.

Thailand has **marine parks for whale shark watching** in the Similan Islands. This area is well known and generates much interest, however recent data show a decline in sightings.

Case study 2: Artificial reefs

Malaysia has installed hundreds of concrete structures (**artificial reefs**) in Terangganu waters to prevent trawlers from working in the area. These have also enhanced resources with two species of sharks and four species of stingrays having been found to inhabit the artificial reefs. Apart from this, many species of reef fish species are also using the structures.

Case Study 3: Conservation of whale sharks

Whale sharks are currently protected in India, Malaysia, Maldives and Thailand, i.e. four out of the eight BOBLME countries. This management measure appears to have been quite effective in all the countries. In order to harmonize the management of this migratory species, it is important that this species be conserved in all countries of the region. The countries which have not yet protected this iconic species are encouraged to do so immediately.

Case study 4: Gear buyback schemes / alternative livelihoods

In the **Maldives**, the government implemented a **gear buy back scheme** using its own funds, without conducting a planned study of potential livelihood alternatives and costs. A total of 223 fishermen from 31 islands were identified as shark fishermen and to date 191 fishermen on 19 islands have been compensated. Although this compensation scheme is proving successful, it is not without problems. In particular, there were issues with verification: some inactive shark fishermen claimed compensation simply because they had fishing gear which they had previously, although they were now earning their income through other means.

Malaysia has had a similar experience with **gear buy back** of the trawlers in Kedah State. More than 50 trawlers were bought and the fishermen encouraged to switch to aquaculture. A survey conducted one year after buy back showed that catches were still low and stocks were not regenerating. Catch quantities were high only around the area of an MPA. Although results were inconclusive as a result of the survey being conducted during the off-season, it was concluded that MPAs are a better option than capacity reduction by buy-back, since effort remained high.

Case study 5: Data collection

In **Indonesia** a special data form was drafted under the ACIAR-funded project which collected information including reproduction and maturity data of sharks. Information was collected at the landing sites by **employed enumerators** and district officers, and was then validated at the provincial level. The enumerators were paid a basic salary plus an additional fee by the Fish Landing Office. This method of information collection was quite successful.

Maldives does not collect catch data for sharks, so it has always been difficult to identify abundance trends. In order to make a crude assessment of the status of silky sharks (*C. falciformis*), which are associated with tuna schools, a **fishermen's perception survey** was conducted. Fishermen were asked their opinions on changes in silky shark catches and sizes over recent decades. This survey proved to be a quick and cheap means of identifying major changes in the silky shark population as perceived by fishermen. In the absence of long term data or funds for more detailed research, such methods could be employed more widely.

Also in the **Maldives**, the original national study of the shark fisheries in 1992 was completed within just five months. Despite such a short study period it managed to look at all aspects of the fishery, and the information obtained then is still in use today.

Case study 6: SEAFDEC project 2003 – 2004

This regional shark fishery project resulted from an ASEAN-SEAFDEC conference supported by the Japan Trust Fund. As part of this project various studies on sharks were conducted throughout the ASEAN region. Initially, due to limited funds, a study on the biology and fisheries of sharks was conducted in Malaysia and Brunei. SEAFDEC also assisted member countries to formulate their NPOA-sharks but this process was hindered by the dearth of data.

A regional ad-hoc study on sharks in the region was conducted from August 2003 to October 2004. Data were collected using various means:

- Size, maturity and species composition data from selected landing sites, with the aid of government-employed enumerators.
- Shark trade data collected by a shark trade specialist based in Hong Kong (Dr. Clarke). She identified Singapore as the regional trade hub, and also pointed out the option of using denticles for species identification.
- During a taxonomy study which provided on site training for enumerators, using field guides and posters

All the information collected was published, and a consultation on implementation of NPOA-sharks followed this process. However to-date only Malaysia and Indonesia have completed and published their NPOA-sharks.

SEAFDEC also now plans to provide assistance to the member countries for capacity building to address trade and related issues of sharks and turtles. There is also a new initiative to improve data collection and statistics, including that for sharks. This could be used by the BOBLME project as a basis for the harmonization of the data collection system for the region.

Appendix 8

Plenary 5: Identification and prioritization of recommendations for regional action

In this session participants prioritized recommendations to address the issues listed in Appendix 5. Priorities were scored as: **** VERY HIGH, *** HIGH, ** MEDIUM and *LOW

Category	Subcategory	Recommendation	Priority level
1. Biology/Ecology	1.1 Taxonomy	ü Preparation of regional field guides: compile existing information on sharks and rays; verify and publish this information through a regional workshop and consultation	****
		ü Preparation of national field guides: adapt existing field guides in the countries which have these guides and prepare new ones for the countries that do not have ones; Fisheries Inspectors need small field guides - country specific and in local languages	***
		ü Provision of assistance to develop taxonomic capability in countries: provision of library material; development of specimen reference collections; and provision of taxonomic training through regional organization such as SAARC, ASEAN, SEAFDEC, BOBP-IGO with BOBLME support	***
	1.2 Data collection	ü Review shark and ray catch data in the countries (this would form a background document for the NPOA-sharks)	****
		ü Improve catch data collection: commercial (e.g. logbooks and observers), recreational (e.g. SharkWatch) and artisanal (e.g. field officers and inspectors); countries with tuna fisheries should improve collection of shark data as required for reporting to IOTC; countries should collect and report disaggregated data by species, to the extent possible and/or major/minor groups.	****
		ü Regional catch data harmonization: BOBLME should launch a review of data collection systems in the region; strive to harmonize following examples of ASEAN and SEAFDEC reporting systems	**
		ü Improve trade data collection: assess present reporting levels and to the extent possible strive to harmonize the trade data	***
	1.3. Targeted Shark/Ray Research	ü Improve collection of size and species data on sharks; particularly from landings of artisanal fisheries	****
		ü Undertake an environmental risk assessment (ERA)	**

		ü Analysis of extent of heavy metal contamination in sharks/rays	***
		ü Revise Conversion factors, to enable use of dry fin weight and other trade data to estimate size of shark catches etc	****
		ü BOBLME Regional Coordination Unit to identify one or more labs in the region willing to take a lead on the genetic studies, bar-coding and establishing a reference collection	***
		ü Commission a study to identify the experiences of captive husbandry of elasmobranchs (mostly oviparous species), in the context of BOBLME, focusing on the region in particular	***
		ü Improve availability and accessibility of environment related information on sharks/rays, in particular critical habitats and nursery areas	***
		ü Research on improved understanding of and/or mitigating shark by-catch (commercial catch)	**
2. Commercial Fisheries		ü Prepare and package targeted information to fishing operators to help them understand the importance of sharing shark data in particular and fisheries management in general	****
		ü Improve reporting of catches in both quantity and quality, including improved log-book reporting for commercial fisheries, e.g. through stakeholder consultations	***
		ü Encourage countries with tuna fisheries to report shark bycatch data as required in IOTC Resolution	***
		ü Consider having port based enumerators or observers on board covering 2-5% of all shark fishing trips	**
3. Socioeconomics	3.1 Socio-economics	ü BOBLME countries recognize the vital importance of reducing market demand: help disseminating NGO-produced materials relating to shark fisheries management and demand reduction to fishing communities	***
		ü Help countries to collect and collate traditional fishermen's knowledge including identification of traditional shark fishing grounds; facilitate publication of a SHARK FISHING LORE OF THE BOBLME REGION	**

	3.2 Ecotourism	ü Regional review of the extent, value and potential of shark and ray watching. Support selected potential ecotourism sites with case studies, including information dissemination	****
4. Education & Public awareness		ü Prepare a common regional sharks/rays conservation poster; prepare country specific posters with Red List Status information	****
		ü Communicate about shark biology/ecology to fishermen in a practical way, using mass media and in collaboration with NGOs	****
		ü Produce and disseminate educational material for schools, e.g. via school camps	****
		ü Address general public through mass media and in collaboration with public aquaria	***
5. Governance	5.1 MPAs	ü Establish and/or improve monitoring on the abundance of sharks in MPAs	****
		ü Help to promote shark conservation in MPAs through impact studies of existing ones and support establishment of other potential sites	***
		ü Review of lessons learnt from Shark MPAs in other regions	***
	5.2 Institutional Constraints	ü Improve effective communications between scientists and managers: workshop for senior technical staff, including representatives from related trade departments and human resource officials	****
		ü Training in writing funding proposals to improve shark research in the region	****
		ü Collaborate effectively with NGOs in lobbying for conservation of shark/ray resources in the region	****
	5.3 Charismatic megafauna	ü Compilation of existing regulations and protective measures for *Rhincodon typus* (whale shark)	****
		ü Encourage / facilitate BOBLME member countries which have not yet taken action to protect whale sharks to consider this measure	****
		ü Encourage monitoring and research on whale sharks (e.g. satellite tracking with pop-up tags, photo ID)	***

		ü Compilation of existing regulation and protective measures on Pristidae (sawfishes)	****
	5.4 BOBLME Networking	ü Develop the working group on sharks into a shark communication network (creation of BOBLME shark portal)	****
		ü Encourage participation of relevant NGOs in this shark portal	****

Appendix 9

Plenary 6 & 7: Recommendations for priority actions at country level

Recommendations for next steps (points for which BOBLME assistance are requested are marked with an asterisk *)

MALAYSIA

NPOA status: published but not fully implemented

- ü Conduct pilot project in major ports to collect species level data on shark and ray catches*
- ü Train enumerators from DOF in taxonomy and biology of elasmobranchs by end of 2011*
- ü Publish conservation poster targeted at both fishermen and general public*
- ü Improve effective communications between scientists and stakeholders, on the conservation and management of sharks and rays*
- ü Roadshow for public awareness on shark conservation

MYANMAR

NPOA status: Drafted but not finalized or published

- ü Consult with Dept. of Fisheries to expedite finalizing and implementing the NPOA-sharks
- ü Develop a background document to implement Lampi Island as an MPA
- ü Improve data collection and conservation on Lampi Island

INDONESIA

NPOA status: published but not implemented

- ü Conduct consultation workshops in remaining provinces to make people aware of the NPOA-sharks and its implementation*
- ü Help with reprinting of identification posters and guides which were products of ACIAR-funded project*
- ü Train enumerators in data recording and species identification*

SRI LANKA

NPOA status: Not yet drafted. Roadmap produced in 2009 at BOBP-IGO consultation.

- ü Conduct basic research on the shark fishery
- ü Train researchers
- ü Convene existing task force to expedite NPOA-sharks
- ü Prepare posters and other awareness materials*
- ü Hold stake holder consultations in more regions*

MALDIVES

NPOA status: Drafted but not finalized. Roadmap produced in 2009 at BOBP-IGO consultation.

- ü Redraft NPOA-sharks in light of recent ban on all shark fishing within Maldivian waters*
- ü Gazette and implement redrafted NPOA-sharks
- ü Formulate management plan to monitor ban
- ü Promote and publicise shark watch*
- ü Organise training workshops for observers on tuna long lining vessels*
- ü Produce awareness poster on shark conservation*

THAILAND

NPOA status: Drafted in 2005, but not implemented.

- ü Conduct research on contamination of sharks – study mercury content*
- ü Collect data on ray and shark catches and biology*
- ü Improve shark identification and methodology for data collection*
- ü Improve compliance/cooperation from stakeholders, especially commercial fishermen*

INDIA AND BANGLADESH

NPOA status: Not yet formulated