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Report of the

FAO/CITES WORKSHOP TO REVIEW THE APPLICATION AND EFFECTIVENESS OF INTERNATIONAL REGULATORY MEASURES FOR THE CONSERVATION AND SUSTAINABLE USE OF ELASMOBRANCHS

Genazzano (Rome), Italy, 19–23 July 2010

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The workshop venue: Castello Colonna (11th century) in Genazzano (copyright Comune di Genazzano)

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PREPARATION OF THIS DOCUMENT

This is the report of the Food and Agriculture Organization of the United Nations (FAO)/Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) "Workshop to Review the Application and Effectiveness of International Regulatory Measures for the Conservation and Sustainable Use of Elasmobranchs" held in Genazzano (Rome), Italy, from 19 to 23 July 2010. The workshop report was elaborated by the rapporteur David Ebert in close cooperation with Johanne Fischer (FAO), David Morgan (CITES) and Marceil Yeater (CITES). It is based on the notes from the subgroups, opinions expressed by experts during the plenary sessions and correspondence exchanged after the workshop; it was circulated to all participants for comments and subsequently revised several times to incorporate them. It was adopted by consensus of all participants.

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ABSTRACT

Concerns about the status of sharks and their often unregulated exploitation have led to a number of international initiatives to improve shark conservation, among them the Food and Agriculture Organization of the United Nations International Plan of Action for the Conservation and Management of Sharks (FAO IPOA Sharks), as well as the regulation of international trade through CITES of several elasmobranchs currently listed on one of the CITES Appendices. Progress in the implementation of the IPOA has been slow and the status of a number of shark species remains a concern, which makes it plausible that sharks will continue to be proposed for inclusion in one of the CITES Appendices. The status of many sharks is unknown or poor, but there are different views on the best course of action to improve the conservation of sharks. Some countries hold the view that regulation of international trade is necessary to ensure their use is sustainable, while other countries have expressed doubts that regulation of international trade – through CITES – is a suitable instrument for the management, conservation and sustainable use of commercially-exploited marine species including sharks. With these considerations in mind, this workshop, jointly convened by FAO and CITES, was held in Genazzano (Rome) from 19 to 23 July 2010, and attended by experts from different geographic areas and sectors, including scientific assessment, fisheries management, fishing industry, fish trade, monitoring and control, and government administration. The workshop report describes various types of fishery and trade regulations, and discusses their effectiveness with regard to implementation and stock recovery as well as their impact on fisheries, livelihood, food security, markets and trade, and government administrations. A key output of the workshop consists of a tabular summary of the discussed effects of different measures on various sectors. This table and the descriptions in the narrative part of the report are designed to assist resource managers in various regions and countries and under different fisheries development and shark management situations in their decision-making regarding their own most appropriate management regulations for the conservation and sustainable use of sharks that concern them.

CONTENTS

ABBREVIATIONS AND ACRONYMS

CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CCRF	Code of Conduct for Responsible Fisheries
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna and Flora
CMS	Convention on the Conservation of Migratory Species of Wild Animals
COFI	Committee on Fisheries (FAO)
CoP	Conference of the Parties (CITES)
EEZ	exclusive economic zone
FAO	Food and Agriculture Organization of the United Nations
GFCM	General Fisheries Commission for the Mediterranean
HS	high seas
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IOC	Indian Ocean Commission
IOTC	Indian Ocean Tuna Commission
IPOA	International Plan of Action
IUCN	International Union for Conservation of Nature
IUU	illegal, unreported and unregulated
MCS	monitoring, control and surveillance
MSY	maximum sustainable yield
NAFO	Northwest Atlantic Fisheries Organization
NDF	non-detriment finding
NEAFC	North-East Atlantic Fisheries Commission
NPOA	National Plan of Action
RFB	regional fishery body
RFMO	regional fisheries management organization
SEAFO	Southeast Atlantic Fisheries Organization
SWIOC	South-West Indian Ocean Fisheries Commission
TAC	total allowable catch
TCM	technical conservation measures
UNCLOS	United Nations Convention on the Law of the Sea
UNFSA	United Nations Fish Stocks Agreement
VMS	vessel monitoring system
WCPFC	Western and Central Pacific Fisheries Commission
WTO	World Trade Organization

1. BACKGROUND AND OBJECTIVES OF THE WORKSHOP

Sharks[1] are one of the most ecologically successful fish groups and are found in most marine ecosystems and several freshwater river systems. Currently, there are nearly 1 200 species of sharks recognized globally.[2] Of this total, most shark species (55 percent) occur on continental shelves from the intertidal zone down to 200 m depth and to a lesser extent on insular shelves,[3] while a much smaller proportion (2 percent) occur in the high seas.[4] However, the life histories and population status of a number of shark species have become an area of concern owing to their life history characteristics of slow growth, late attainment of sexual maturity, long life span, and low fecundity that may make them vulnerable to overexploitation.[5,6]

Over the past nearly 60 years, the captures of sharks reported to the Food and Agriculture Organization of the United Nations (FAO) have increased from less than 300 000 tonnes (live weight) in 1950 to a high of nearly 900 000 tonnes in 2003. Since then, landings have declined to just over 700 000 tonnes in 2008. However, these reported shark landings are most likely incomplete, particularly with regard to the sizeable bycatches and discards occurring in some fisheries. Given the combined life history characteristics of sharks and the increased fishing pressure on them, concern was raised about the possible negative impact on their populations. In 1999, FAO developed an International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks) with the objective to ensure the conservation, management, and long-term sustainable use of sharks, including those species that are the subject of target and non-target fisheries.

Concerns about the status of sharks and their often unregulated exploitation over the past decade have led to a number of international initiatives to improve shark conservation. Among these initiatives, resulting from the FAO-IPOA-Sharks, was the development of National Plans of Action (NPOA-Sharks[7] and other shark-related regulations by individual countries as well as a number of regulations on shark fisheries by regional fisheries management organizations/agreements (RFMOs/As), and the regulation of international trade through the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) for several shark species currently listed by CITES.[8] In February 2010, a non-binding *Memorandum of Understanding on the conservation of migratory sharks* between range states of several shark species was concluded under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals (CMS).[9] To date, progress in the implementation of the IPOA-Sharks has been slow, and while workshop participants recognized that many states have developed national shark conservation and management measures, concerns were

[1] The term shark as used in this document includes all species of cartilaginous fishes including the batoids and chimaeras.

[2] Ebert, D.A. & Winton, M.V. 2010. Chondrichthyans of high latitude seas. *In* Carrier, J.C., Musick, J.A. & Heithaus, M.R., eds. *The Biology of Sharks and their Relatives*. Volume 2. Chapter 3: 115-158. CRC Press.

[3] Ibid.

[4] Stevens, J.D. 2010. Epipelagic oceanic elasmobranchs. *In* Carrier, J.C., Musick, J.A. & Heithaus, M.R., eds. *The Biology of Sharks and their Relatives*. Volume 2, Chapter 1: 3-35. CRC Press.

[5] Cailliet, G.M & Goldman, K.J. 2004. Age determination and validation in chondrichthyan fishes. *In* Carrier, J.C., Musick, J.A., Heithaus, M.R., eds. *The Biology of Sharks and their Relatives.* Volume 2, Chapter 14: 399-447. CRC Press.

[6] Stevens, J.D. 2010. Epipelagic oceanic elasmobranchs. *In* Carrier, J.C., Musick, J.A. & Heithaus, M.R., eds. *The Biology of Sharks and their Relatives*. Volume 2, Chapter 1: 3-35. CRC Press.

[7] In 2011, according to information accessible to FAO the following shark fishing nations had developed a National Plan of Action for the conservation of sharks (NPOA): Argentina, Australia, Canada, Chile, Colombia, Costa Rica, Ecuador, European Union, Guatemala, Guinee-Bissau, Japan, Malaysia, Mexico, New Zealand, Senegal, Seychelles, Taiwan, United Kingdom, Uruguay, United States of America, Venezuela.

[8] On Appendix II: basking shark (*Cetorhinus maximus*), great white shark (*Carcharodon carcharhias*), whale shark (*Rhincodon typus*) and, exclusively for the purpose of allowing international trade in live animals to appropriate and acceptable aquaria for primarily conservation purposes, freshwater sawfish (*Pristis microdon*). On Appendix I: All other sawfishes (Family Pristidae).

[9] Signed to date by Congo, Costa Rica, Ghana, Guinea, Kenya, Liberia, Palau, The Philippines, Senegal, Togo, United States of America, Nauru and Tuvalu, Australia, Chile, South Africa.
See www.cms.int/pdf/en/summary_sheets/sharks.pdf

voiced that they might not always be effective and, quoting from a FAO workshop on sharks in 2008[10], that "many countries were unable to fully meet all requirements in the IPOA at the same time". The status of a number of shark species remains a concern, and in 2010 additional species were proposed for the listing within Appendix II of CITES (*Sphyrna lewini*, *S. mokarran*, *S. zygaena*, *Carcharhinus longimanus*, *C. plumbeus*, *C. obscurus*, *Lamna nasus* and *Squalus acanthias*); however, these proposals were not adopted as they were either withdrawn[11] or failed to achieve the required two-thirds majority of the parties present and voting.

It is not disputed that the status of many sharks is unknown or poor. Nonetheless, countries have not agreed on the best course of action to improve the conservation of sharks; for example, some hold the view that regulation of international trade is necessary to ensure their use is sustainable, while other countries have expressed doubts that regulation of international trade through CITES is required for the management, conservation and sustainable use of commercially-exploited marine species including sharks. With these considerations in mind, the joint FAO-CITES workshop was convened with the specific objective to outline the strength and weaknesses of various types of regulatory measures, in particular harvest-related measures in comparison with trade-related measures, and to discuss their effectiveness with regard to implementation and stock recovery as their impact on fisheries, livelihood, food security, markets and trade, and government administrations.

2. PARTICIPATING EXPERTS

The workshop was attended by experts from different countries and sectors, including scientific assessment, fisheries management, fishing industry, fish trade, monitoring and control, and government administration. The countries were chosen based on their interest in shark fisheries and/or trade, the level of development of NPOA-Sharks and balanced geographical representation. Participants came from Argentina, Australia, China, Hong Kong Special Administrative Region (China), Ghana, Japan, Namibia, Nigeria, the United Kingdom of Great Britain and Horthern Ireland, the United States of America and Uruguay.[12] In addition, experts from the European Commission and the Secretariats of FAO, CITES and the CMS contributed to the workshop. All participants were advised that they had been invited in their individual capacity as an expert and not as a representative of a country or organization.

3. WORKSHOP STRUCTURE AND REPORT

The FAO/CITES Workshop to Review the Application and Effectiveness of International Regulatory Measures for the Conservation and Sustainable Use of Elasmobranchs was held in Genazzano (Rome) from 19 to 23 July 2010. It was chaired by Ramiro Sanchez.

The workshop endeavoured to outline the strengths and weaknesses of various regulatory measures and to discuss their effectiveness with regard to implementation and stock recovery, as well as their impact on fisheries, livelihood, food security, markets and trade and government administrations. In doing this, workshop participants were asked to consider a "generic" shark species rather than any particular shark species. They were also asked to consider generic harvest- and trade-related measures rather than regulatory measures under particular organizations such as an RFMO or CITES. This said, workshop discussions were not entirely abstract and the use of examples from real experience was not discouraged. At the last plenary session a majority of participants proposed to have a brief discussion

[10] FAO. 2009. *Report of the Technical Workshop on the Status, Limitations and Opportunities for Improving the Monitoring of Shark Fisheries and Trade*. Rome, 3–6 November 2008. FAO Fisheries and Aquaculture Report. No. 897. Rome. 152 pp.

[11] *Carcharhinus plumbeus* and *C. obscurus* were originally included within the proposal to list *Sphyrna lewini*, but the proposal was amended to remove these two species prior to a vote.

[12] Participants regretted that it had not been possible to ensure the participation of an expert from Southeast Asia which is one of main regions of shark production and consumption.

that focused on the nature and potential impacts of CITES provisions for the regulation of international trade in Appendix I and II specimens.

The first day of the workshop was devoted to plenary presentations on different aspects of shark utilization and management. The second and third days were dedicated to working in three interdisciplinary subgroups to consider the impacts of various conservation measures on different biological and socio-economic sectors for different types of sharks represented by various scenarios (described below). These interdisciplinary subgroups were replaced on the final two days by four subgroups each composed of participants with similar expertise to address and work on the four major topics of the workshop (harvest-related measures, trade-related measures, scientific assessment and data collection, and compliance, monitoring, control and surveillance), and to provide text for the workshop report.

A key output of the workshop consists of a tabular summary of the discussed effects of different measures on various sectors. This table and the descriptions in the narrative part of the report are designed to assist resource managers in various regions and countries and under different fisheries development and shark management situations in their decision-making regarding their own most appropriate management regulations for the conservation and sustainable use of sharks that concern them.

The workshop report is based on the notes from the subgroups, opinions expressed by experts during the plenary sessions and correspondence exchanged after the workshop; it was circulated to all participants for comments and subsequently revised to incorporate them. It was adopted by consensus of all participants.

4. WELCOME AND PRESENTATIONS

Participants were welcomed to Genazzano by the town councillors Elena Antonelli and Augusto Milana. The meeting was then opened by John Scanlon, Secretary-General of CITES and Kevern Cochrane, Director, Fisheries and Aquaculture Resources Use and Conservation Division at FAO.

Mr Scanlon warmly welcomed this joint initiative of FAO and CITES. He stressed their common interest in the conservation and sustainable use of marine species and the critical importance of the relationship between FAO and CITES. He noted that 97 percent of CITES-listed species are included in Appendix II or III where international commercial trade is regulated, not prohibited, and that 10 000 000 trade transactions have been recorded under the Convention since 1975. He highlighted several examples of CITES being a catalyst for effective action, noting that CITES is not necessarily the answer, but could be part of the answer for addressing the overexploitation of various shark species. Mr Scanlon noted the advantages of CITES, including its global reach, with existing infrastructure across 175 countries, its close links to customs officials and others, and its existing compliance mechanisms, which are open and transparent. He stressed that it is not a question of selecting CITES or an RFMO to regulate the harvest of, and trade in, sharks or of CITES replacing an RFMO. Rather CITES is a complementary tool that can be used in support of achieving agreed objectives – and the challenge is to make best use of CITES, where appropriate, in order to bring about this complementarity. With regard to sharks found on the high seas, Mr Scanlon noted that the practical meaning of the term ‘introduction from the sea’ in the CITES context still needed to be resolved, and that related capacity-building was critical. He also raised the idea that when dealing with commercially harvested marine species, the value of time bound-listings in the CITES Appendices could be explored. A listing might be reviewed at agreed intervals, and then reaffirmed, or not, at that time by a two-thirds majority. The timing would be linked to the appropriate cycle of assessing the state of the particular species, and best use could be made of the CITES Standing Committee between Conference of the Parties (CoPs). Mr Scanlon concluded by again stressing the complementary nature of CITES and the advantages to the Parties of identifying common ground.

Mr Cochrane cordially welcomed participants to the workshop. He stressed that the conservation and management of sharks is a matter of high priority to FAO and CITES, as reflected in the adoption of the FAO IPOA Sharks from 1999. Although the implementation of the IPOA–Sharks has been slower than desirable, more and more countries are making progress in fulfilling the requirements of this IPOA. Many other activities undertaken by FAO also have direct and indirect benefits to the conservation and sustainable use of elasmobranchs, including efforts to reduce illegal, unreported and unregulated (IUU) fishing, implementation of ecosystem approaches to fisheries, reduction of fishing capacity, and others. Mr Cochrane noted that CITES Parties too are concerned about current impacts of fisheries on some species of elasmobranchs, and that three sharks and seven sawfishes are currently listed on one of the CITES Appendices. CITES Parties are monitoring the impact of trade on other elasmobranch species and continually considering a potential role for CITES for species for which international trade is considered to be having a significant negative impact. Mr Cochrane stated that this joint workshop is one example of many areas in which FAO and CITES are striving to cooperate to achieve their common goals. He acknowledged that the CMS is also working actively towards the same ends within its own mandate and welcomed the representative from CMS to this meeting. Mr Cochrane underlined that the aim of this workshop is to consider the nature and mechanisms of the different international instruments and regulatory measures and to review their application and effectiveness under different conditions. The outputs from the workshop should help to inform countries and regional bodies on the costs and benefits of different measures under different circumstances, thereby helping them to ensure selection of the most effective measures to address specific circumstances. Finally, on behalf of the two convenors and all participants, Mr Cochrane thanked the city of Genazzano for generously hosting the workshop and the Government of Japan for its financial contribution through the FAO Trust Fund Project "*CITES and Commercially-exploited Aquatic Species, including the Evaluation of Listing Proposals*," which made this workshop possible.

John Carlson led off the presentations by providing an overview on the global status of sharks and their ecological role describing some important biological characteristics that make them susceptible to overfishing. This was followed by Marceil Yeater who summarized international law as it relates to the management and conservation of sharks. Glenn Sant presented an overview of the major catch and trading countries of shark products and how these products can be tracked within the trade market. Charlie Lim introduced the workshop to the Asian shark trading industry; David Morgan provided an overview of CITES and its activities as related to sharks, while David Ebert gave an overview of the FAO IPOA-Sharks status and its implementation to date. These general overviews were followed by a series of more regional presentations by speakers from various countries. Ramiro Sanchez gave an overview of shark fisheries, management and trade in Latin America, which was followed by Antonio Fernandez-Aguirre who presented an overview of the European Union Plan of Action for sharks. Two presentations were then given on the African shark fishery and trade, the first by Paul Bannerman who gave an overview of the West, Central and Northern African regions, and Moses Maurihungirire who summarized shark exploitation in the Benguela Current Large Marine Ecosystem. The final two presentations were from the Asian region, the first by Xiaojie Dai on shark fisheries and conservation in China and the second by Yasuko Semba on shark fisheries, management and trade in the South and Eastern Asian regions. Cheri McCarty concluded the presentations by summarizing the conservation and management of sharks by RMFOs and other relevant bodies. The final presentation on the first day was by Johanne Fischer who introduced the scenario approach of the workshop.

5. EXPLANATION OF SCENARIO VARIABLES

Sharks occur across a wide range of habitats and at different scales of geographic distribution (e.g. local versus regional or global). Pelagic sharks with a wide range are highly migratory and move globally across the high seas and exclusive economic zones (EEZs) of many countries. Accordingly, their distribution may be considered transboundary, straddling, or as high seas stocks. Demersal fishing for sharks occurs mostly within EEZs, except in some areas with broad continental shelves (straddling stocks) or where high seas fisheries exploit sharks on or near seamounts. Freshwater species, especially stingrays, are caught and traded internationally mainly for ornamental purposes but also for their meat and fins.

There is a vast range of physico-chemical and biological factors (e.g. currents, temperature, habitat, predator-prey interactions, reproduction, etc.) that influence the distribution, aggregation and stock status of sharks. Although some populations are targeted directly and explicitly by fisheries, others are caught as incidental catch (retained or discarded) by a variety of fleets and gears. The demand for shark products can be high locally and/or internationally depending on the community and kinds of products. Demand will also be influenced by the stability of shark product supply, which depends on various factors such as the catchability, productivity levels of the exploited populations relative to the level of exploitation and others.

The workshop was envisioned as an opportunity to undertake a broad and general review of existing conservation measures and their likely effects on stock status and marine habitats as well as on fisheries, livelihoods, markets and administrations under different circumstances (scenarios). Therefore, the workshop generally avoided discussing particular species or legal instruments, and participants drew their conclusions for a number of "generic" sharks with different typical characteristics, which would fall into 1 of the 13 scenarios.

Workshop participants used a combination of eight variables in a four-by-two table to create up to 16 potential scenarios (Table 1), each representing a group of "virtual" sharks. Of the 16 potential scenarios, 3 were dropped as they were not realistic, leaving 13 scenarios, each characterized by a different expression of the following four variables: geographic distribution (global/regional and subregional/local); jurisdiction (EEZ and high seas [HS]); fishery type (target and bycatch), and market demand (high and low).

Table 1. **Variables used to produce scenarios. Three scenarios were considered to be unrealistic (indicated by a hyphen)**

Distribution	**Global/regional**								**Subregional/local**							
Jurisdiction	**EEZ**				**High seas**				**EEZ**				**High seas**			
Fisheries	**Target**		**Bycatch**		**Target**		**Bycatch**		**Target**		**Bycatch**		**Target**		**Bycatch**	
Demand	High	Low	High	Low	High	-	High	Low	High	Low	High	Low	High	-	-	Low

Workshop participants then considered the likely effects of various measures in the context of the 13 different scenarios. To facilitate and focus the discussions, it was agreed that the likely effects of each scenario should be based on two fundamental assumptions:

1. Firstly, that the biological status of the species for which the conservation measures were devised was affected by fisheries to a degree that it was severely declining or in poor status.

2. Secondly, that the relevant conservation measures were put into operation in an appropriate manner and that the supporting measures, i.e. scientific assessments and monitoring, control and surveillance (MCS), were properly in place and functioning.

5.1 Geographic distribution

The distribution of sharks was considered to be either global/regional or subregional/local. Species considered to fall under the global/regional category were those with a worldwide or large ocean-wide distribution including highly migratory species. Species with this type of distribution could be fished in either the EEZ or high seas. Those species whose distribution fell under the subregional/local category were considered to be restricted in distribution to a single country or a few neighbouring countries or isolated high-sea areas, e.g. around seamounts or other topographic features (typically endemics).

Implications of the type of distribution of a species for this exercise relates mainly to:

- the type of jurisdiction to which the fishery is subjected and the relative importance of concerted harvest, and trade-related measures;
- the size and nature (local versus international) of the market for the shark products;
- the importance for livelihoods/jobs and food security; and
- the inherent resilience of the populations to fishing pressure, as indicated by certain life history parameters[13] including population size and fecundity.

5.2 Type of jurisdiction

Two jurisdictions were considered, EEZ and high seas; the primary difference between them being the source of governance. Management of sharks in the EEZ is the sole responsibility of national States while management of sharks in the high seas is pursued in cooperation with other States under international agreements. These can be global and provide a framework for the conservation and management of living marine resources and the marine environment, such as the United Nations Convention on the Law of the Sea (UNCLOS) and the resulting United Nations Fish Stocks Agreement [14](UNFSA) and the FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas. In addition, there are a number of regional conventions with the authority to devise conservation and management measures for the areas under their responsibility, i.e. RFMOs/As, whose establishment is highly encouraged by UNCLOS and other international instruments or resolutions. The efficiency of RFMOs/As depends not only on the presence and the quality of scientific stock assessment and advice, but also on the implementation of an effective MCS scheme to ensure the compliance of fishing vessels with the conservation measures agreed by the Parties.

[13] For example, age, fecundity and size structure of the population.
[14] Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks. Among other things, the Fish Stock Agreement requires coastal States and States fishing on the high seas to ensure sustainable fishing practices by their fleets.

The UNFSA establishes the rights and obligations of States to conserve and manage targeted highly migratory and straddling fish stocks on the high seas, species belonging to the same or associated with, or dependent on, the target stocks, and to protect biodiversity. Article 6 of the UNFSA provides that measures must be based on the precautionary approach and on the best available science. It also addresses the responsibilities of coastal States managing straddling fish stocks occurring in fisheries in waters under national jurisdiction.

Table 2. Regional (including bilateral) fisheries management bodies

IPHC	International Pacific Halibut Commission	1923
IATTC	Inter-American Tropical Tuna Commission	1950
GFCM	General Fisheries Council for the Mediterranean (now Commission)	1952
ICCAT	International Commission for the Conservation of Atlantic Tunas	1969
CTMFM	Joint Technical Commission for the ArgentinaUruguay Maritime Front	1974
NAFO	Northwest Atlantic Fisheries Organization	1979
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources	1982
NEAFC	North-East Atlantic Fisheries Commission	1982
NASCO	North Atlantic Salmon Conservation Organization	1983
PSC	Pacific Salmon Commission	1985
NPAFC	North Pacific Anadromous Fish Commission	1993
CCSBT	Commission for the Conservation of Southern Bluefin Tuna	1994
CCBSP	Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea	1996
IOTC	Indian Ocean Tuna Commission	1996
RECOFI	Regional Commission for Fisheries	2001
SEAFO	Southeast Atlantic Fisheries Organization	2003
WCPFC	Western and Central Pacific Fisheries Commission	2004
SPRFMO	South Pacific Regional Fisheries Management Organisation	Interim
SIOFA	South Indian Ocean Fisheries Agreement	Interim

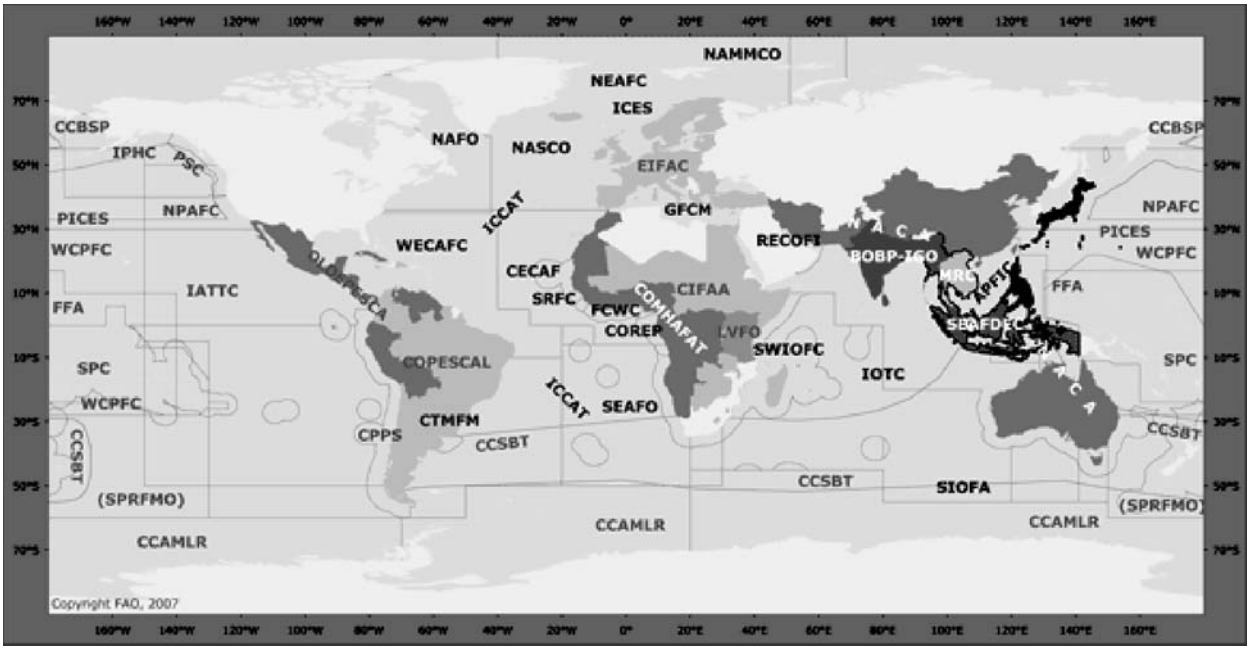

Figure 1. Geographic coverage by regional fisheries bodies. Not all of those shown have a management mandate. (From FAO, http://firms.fao.org/firms/topic/2940/en)

On the high seas, a number of RFMOs/As have management authority for shark species, and the following have adopted measures specifically for sharks[15]: CCAMLR, CCSBT, GFCM, IATTC, ICCAT, IOTC, NAFO, NEAFC, SEAFO and WCPFC.[16] The most common shark conservation measures encountered in these bodies is a ban on shark finning, i.e. prohibition to discard the carcass after harvesting the fins.

CITES is a legally-binding treaty that has global jurisdiction and a membership of 175 countries, including most of the major trading States of the world. CITES works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export and introduction from the sea of shark species covered by the Convention has to be authorized through a permit and certification system. For species included in Appendix I of the Convention (3 percent), international trade in specimens of these species is authorized only in exceptional circumstances for non-commercial purposes. For species included in Appendix II (97 percent), commercial and non-commercial trade is authorized if the specimen was legally obtained and if, in the view of the exporting State's scientific authority, the export can be demonstrated to be not detrimental to the survival of the species concerned.[17]

Workshop participants discussed how the jurisdictional context could influence the impact of harvest-related and trade-related measures, scientific assessment, data collection and compliance schemes on the different sectors considered in general and specifically for sharks falling into one of the different scenarios.

5.3 Kind of fisheries

Participants distinguished between sharks that are targeted and those that are caught as bycatch. For the purpose of this workshop, it was agreed that bycatch would be defined as being composed of incidental catches and include retained and discarded fish. Multispecies fisheries are very complex and it is often difficult to distinguish between targeted and retained bycatch species. Workshop participants decided that in such situations all species that are caught by fishers and that contribute to the profitability of a fishery will be considered as target species, even though they might be treated as bycatch species by fishery managers.

5.4 Market demand

A shark product was considered to be either in high or low demand. The suitability and efficiency of regulatory measures (harvest- or trade-related) can be influenced by the demand for shark products, e.g. meat, fins, skin, liver oil, medicines and cosmetics, curios, trophies and live specimens for aquaria or ecotourism. Demand for these products is specific for species and markets and can be for subsistence or for commercial uses and either local (within the territory of the States undertaking the harvest) or international in nature. It was noted that the demand for shark products is formed by complex factors such as the species-specific price (depending on locality and fishery), the stability of the supply and the interaction with other alternative products. Nonetheless, for the purposes of the workshop the simple "high" or "low" demand distinction was deemed sufficient and more practical. The workshop assumed that "high" demand was given when a product was widely and consistently targeted and traded at sizeable or profitable quantities and/or for high prices whereas "low" demand

[15] The fact that shark conservation measures have been adopted does not automatically mean that these are always effective. The shark measures adopted by RFMOs vary in scope and sometimes are of a voluntary nature.

[16] There are also bilateral fisheries organizations managing straddling stocks in their EEZs that have devised particular measures for sharks, e.g. CTMF (Joint Technical Commission for the Argentina/Uruguay Maritime Front).

[17] The CITES Animals and Plants Committees exercise a general peer-review role with respect to these non-detriment findings (NDFs), and where they are clearly not being made effectively, will provide recommendations, advice and guidance to the Party concerned.

meant that the trade would be mainly restricted to local markets and low prices, which would include products from artisanal subsistence fisheries.

5.5 The different sectors on which effects were considered

Participants discussed the likely effects or outcomes of shark conservation measures (described in Chapter 7) on a number of different sectors, namely; (a) stock status and biology of the species; (b) the natural environment (e.g. trophic structure and community structure) ; (c) the fishing industry; (d) livelihoods and food security; (e) small local/national markets; (f) international markets; (g) administrations and (h) the public opinion.

5.6 Measures

Workshop participants considered four groups of measures: scientific data collection and assessment, compliance measures, harvest-related measures and trade-related measures. Participants recognized that scientific data and compliance measures are prerequisites for the effective implementation of harvest- and trade-related regulations and that their effect on the biological status of the resource, fisheries sector and markets is indirect. However, it was stressed that the supporting measures are crucial in this regard and that the effectiveness of the harvest and trade regulations largely depends on the implementation of these supporting measures. Therefore, the workshop, in its conclusions, included the costs of continuous and effective scientific and compliance regimes in the summary of effects of harvest- or trade-related regulations on government administrations and fishing industries, where appropriate.

Harvest-related or trade-related measures in this report are called conservation measures to distinguish them from the supporting measures. Harvest-related measures included typical fisheries management regulations such as the setting of total allowable catch (TAC), quotas, access control, technical conservation measures (TCM, which include gear regulations, bycatch reduction measures, minimum fish size, etc.), area and seasonal closures, as well as health and safety regulations (addressed as “best practices”). Trade-related measures considered were catch or trade documentation and tracing/tracking/certification schemes, either as voluntary instruments set up and controlled mainly by the industry or as government-imposed schemes. Participants also discussed the elimination of subsidies which contribute to excessive fishing capacity (as used in paragraphs 25 and 26 of the FAO IPOA for the management of fishing capacity) and economic incentives as well as effects of the regulation or prohibition of international commercial trade (i.e. under CITES conditions for trade in Appendix I or Appendix II species).

6. SUPPORTING MEASURES

6.1 Scientific data collection and assessment

The availability of scientific advice on the status of a species and its stocks as well as its environment and associated species is an essential prerequisite for fishery managers when devising adequate measures for the fisheries under their responsibility. Fishery scientists and assessment analysts evaluate the status of a stock and make policy recommendations to managers on how the spawning biomass of the stock can be maintained or recovered. Stock assessment uses mathematical and statistical models to integrate the fishery dependent and independent information (including from research vessel surveys), often using computer simulation to attempt to re-create the most important features and trends of the stock. Assessments are expensive, time consuming and require a high number of staff and other resources.

From a management point of view, a “stock” is a group of animals that is considered as a unit for population assessment and fishery management, and that can be distinguished from other similar units in time and space based on movement and migratory patterns, geographic distribution of different live stages and other features. The main management reference point used to manage fisheries is

known as maximum sustainable yield (MSY), which is the maximum level of catch that an exploited fish population can sustain continuously. When the stock biomass falls below the level that produces MSY, the stock is considered overfished. Fishery managers have several tools (both effort and catch regulations, e.g., size limits, time-area closures, commercial catch quotas, recreational bag limits) to restore or rebuild the stock to the MSY or higher level. Likewise, when the level of fishing mortality (mortality of the stock due to fishing only) exceeds the level that represents MSY, overfishing is said to be occurring. It should be noted that such overfishing does not necessarily mean that the species concerned is severely depleted or that it meets the CITES listing criteria – the determination whether a species warrants listing by CITES is complex[18] and was not addressed by this workshop.

6.1.1 Scientific data requirements

Apart from the training and experience of the scientists involved, the quality of the scientific assessment depends on the data available. Data required to conduct a full stock assessment include information on the level and trends of catch, life history characteristics (or parameters) of the species, and trends in abundance. In addition to information collected during fishing operations or from landings, fishery independent data (i.e. scientific surveys and sampling) are used to tune assessment models and to provide valuable information on the marine environment and other factors. The most basic data for scientific assessment are "simple" landing data, i.e. species-specific catch (number of fish and/or weight) and effort (e.g. days fished or number of hooks used). However, it was noted that even these are not always obtainable for scientists, in particular in countries with limited resources. The collection of additional information on individual fish size, sex and age, on the fishing gear, and on more accurate quantification of effort is difficult, time-intensive and costly. Nonetheless, every effort must be made to establish a framework for additional data collection and provide trained personnel for the identification of species caught and the recording of fishing operations and catches as well as for the collection of post-landing data to monitor the trade of aquatic products. This can be achieved through adequately trained observers on board, through landing and processing plant inspections, and/or through the analysis of sales records and sampling of markets. All of these approaches require comprehensive capacity building. The basic information required by scientists includes:

- Temporal and spatial distribution of fish stocks: Generally such data are derived from observer programmes, reporting requirements (e.g. prescribed information to be included in a vessel's logbook), or other monitoring programmes. These programmes can be difficult to implement and require specific knowledge for those carrying them out, e.g. identifying the fish and characterizing the fishing operations (i.e. geographic coordinates, depth and length of tow, discard estimates, etc.).

- Catch information by species including numbers, weights, size, sex and disposition (e.g. whether the fish was alive/dead when hauled on board or released/discarded). This information is essential for a robust evaluation of stock status and a realistic estimate of fishing mortality and should therefore be made available to assessment scientists. Target species usually receive more attention by the industry than bycatch species and therefore the risk of obtaining incomplete data is higher for species that are not targeted; this is one of the reasons why scientifically trained observers on board are so crucial for a sound fish stock assessment.

[18]The CITES criteria for the amendment of Appendices I and II, adopted by the Conference of the Parties, are detailed in CITES Resolution Conf. 9.24 (Rev. CoP15) and can be found at www.cites.org/eng/res/all/09/e09-24r15.pdf

- Basic biological information including data on age, growth, migration (horizontal and vertical), segregation, diet and reproduction (e.g. periodicity, gestation period, fecundity). In data-poor situations, other sources of information have been applied, e.g. the empiric and traditional knowledge of resource users as well as biological information on related species. However, any estimates derived from the latter approach must be treated as preliminary. Applying life history data from a well-known species to a less studied species should only be undertaken with extreme caution because shark life history patterns can differ greatly by species. Even species of the same genus can exhibit very distinct characteristics, with some growing rapidly and maturing early while others are slow growing and long lived.

- Estimates of catch rates from fisheries or surveys are needed for determining the relative abundance of sharks. Data for scientific surveys are ideal but are often not available because of costs. Survey data that should include information on the marine ecosystem such as water temperature, depth, current patterns and bathymetry. In cases where scientific surveys are not present, standardization of data from fisheries to correct for factors unrelated to abundance are often applied. However such estimates may have a high degree of uncertainty and must be regarded as preliminary.

- Trade information (including information obtained from catch documentation systems implemented by some RFMOs) by species including processed weight and country of origin and/or general catch location (often by FAO area). If available, this information can be used to cross-reference fishery data and should therefore be made available to assessment scientists.

6.1.2 Stock assessment models

A subgroup of the workshop elaborated a summary of stock assessment models. Non-equilibrium surplus production models, also known as biomass dynamic models, have traditionally been used to assess the stock status of shark species because of their relatively low data requirements, their ease of implementation, and their provision of management benchmarks such as MSY and virgin biomass. The more sophisticated models include delay difference models and age-structured models. However, the lack of data for many of these species requires the need to more fully investigate the use of other innovative assessment methodologies. Models have been developed that do not require information on catch and have been successfully used on several shark species. In addition, Bayesian analyses can be used to address the uncertainty in the inputs to assessment models. Ecological risk assessment, also known as “Productivity and Susceptibility Snalysis”, is a tool that is gaining popularity to evaluate the vulnerability of a species to becoming overfished based on its biological productivity and susceptibility to the fishery or fisheries exploiting it. Its more practical use is to help management bodies identify the species in the ecosystem that are more vulnerable to overfishing so that they can monitor and assess their management measures to protect the viability of these stocks. It can also be used to prioritize research efforts by focusing, for example, on species with high susceptibility but with poor biological information, or alternatively, by identifying and excluding species with low vulnerability from data-intensive assessments.

Assessment of species or stocks with a subregional or local geographic range will require the cooperation of a few neighbouring range States. However, for species or stocks with global or regional distribution, a meaningful scientific assessment requires wider international cooperation, usually under the auspices of a regional fishery body (RFB) or some other similar initiatives of the range States and those who have long-distance fleets exploiting the resource in international waters. Such an international cooperation requires that scientists from different countries and even regions come together regularly to share and review their stock assessment data, and involves a substantial and ongoing financial commitment. It may take several scientists to conduct an assessment for one species, and if alternate models are utilized, more personnel will be required. Stock assessments can take anywhere from a week to several months to complete depending on data availability, data processing and the number of scientists involved.

6.2 Compliance measures

There are various instruments for achieving compliance of the resource users with regulatory measures. Strategies should be developed to gain the support of users for the regulations needed to implement an effective MCS regime. Without compliance by the fishing industry, fisheries management measures cannot be effective and therefore the education and appropriate involvement of the users in management decisions, as well as the establishment of an adequate MCS scheme, are unavoidable and necessary prerequisites for the sound management of sharks. Furthermore, monitoring regimes are not only essential for control and surveillance and for combating IUU fishing, but they can also be an important source of fishery baseline data. Thus, by supporting science-based fishery management measures (described under Section 6.1) and ensuring their effectiveness, MCS regimes provide a foundation for improving the biological status of stocks and the environment, and also enhance the stability of the industry, provide jobs and support food security.

Compliance regimes are not only required for harvest-related measures but also to ensure the efficiency of trade-related measures such as product documentation and certification as well as the regulation or prohibition of international trade (see below). As is the case with harvest-related measures, responsible administrations and/or RFMOs have to allocate substantive costs and resources for the purpose of ensuring compliance with trade-related measures, including sufficient numbers of trained customs officers, provision of species identification tools as well as building public awareness and education. As customs officers are not fishery experts and traded products vary from whole fish to highly processed products, it is important to ensure that customs officers have the knowledge, skills and support needed to identify in a timely manner, through documentary or physical inspections and consultations, the shark species from which various types of shark products are derived in order to avoid adverse effects on the legitimate international trade of shark products.

Many of the MCS tools require significant financial and other resources, and the cost factor can be an impediment to their implementation. Occasionally, the industry is burdened with some of the costs, especially during the initial phases of an MCS scheme.[19] The specific MCS measures implemented from the array of potential measures available will vary by fishery type (e.g. EEZ vs high seas). MCS tools involving sophisticated and cost-intensive technology are usually more appropriate in a high volume fishery, but there are exceptions to this rule and advanced MCS technology can also be implemented in small-scale fisheries provided it is cost effective. Most MCS measures are applicable to all types of fisheries but some are specific to shark fisheries, e.g. the frequent use of a fin to carcass weight ratio to ensure that finning has not occurred or the registration of shark landings and exports at a species level as exercised in Argentina.

Some workshop participants expressed deep concern that the effectiveness of an MCS scheme in some countries could be hampered by bribery and favouritism. Where the use of bribes is pronounced, it may not be possible to effectively implement certain resource conservation measures. Therefore, the honesty and fairness of government officials is a factor that contributes in a decisive manner towards the success or failure of harvest- or trade-related regulations.

Capacity building and technology transfer are necessary to implement effective MCS programmes, in particular for developing states. These requirements are recognized and stipulated by important international agreements such as UNCLOS, UNFSA and the FAO Code of Conduct for Responsible Fisheries. In the absence of an RFMO authorized to carry out these tasks, the implementation of an MCS regime is the sole responsibility of individual flag and, as appropriate, port states. Once international MCS regimes are in place, the obligations of Parties to such international agreements must be properly enforced to ensure the effective operation of the regime and the prosecution of

[19] In a number of countries, such as Australia that endorses a policy of “users pay”, the costs for MCS schemes are fully recovered from the industry.

violators. MCS regimes can be perceived as having a negative impact on the industry, especially if the costs for their implementation are partially allocated to the industry. On the other hand, there is a real interest by lawful resource users in an effective MCS scheme to discourage non-compliance and IUU fishing. The support of resource users is important for the effectiveness of an MCS scheme, and thus managers are well advised to initiate educational campaigns on the need and desirability of the MCS measures implemented and to involve the industry in the development of fisheries management and MCS schemes.

6.2.1 Logbooks

Where employed, logbooks are a useful monitoring tool and can provide valuable data on shark catches, including discards and effort for both target and bycatch fisheries of the species in question. Logbook entries can also be used for control purposes by crosschecking them with vessel monitoring system (VMS) data, observers/inspectors reports and with research vessel survey results. For many fisheries, especially the industrial type, logbooks are an essential requirement regardless of whether they are conducted in waters under national jurisdiction (EEZ) or in the high seas. In general, the implementation of obligatory logbook-keeping is not only effective, but also economical in comparison with other MCS measures, such as observer programmes. However, it can be difficult to introduce a requirement for logbook-keeping in small-scale artisanal fisheries, in particular in the presence of obstacles such as unregulated access to the fisheries, illiteracy of resource users, large number of landing points, lack of control officers, etc.

6.2.2 Fishing permits

Fishing permits are a very important instrument in any fishery management regime. In a TAC and quota allocation scheme, fishing permits are essential and particularly useful in supporting legal fishing as they provide clarity on how much, and what, a vessel is allowed to fish and they enable inspectors to easily identify illegal catches. The issuance of permits for a fee allows for the recovery of at least part of the administrative costs involved and can be applied with similar results to industrial and artisanal fisheries.

6.2.3 Vessel monitoring system

A vessel monitoring system (VMS) is particularly efficient for surveying the operations of many fisheries targeting sharks. Satellite monitoring of the fleet(s) will give a synoptic, real-time view of the distribution of the fishing effort and the compliance with certain conservation measures (e.g. time/area closure). While the initial implementation costs of a VMS can be high[20], the operational costs of the system can be relatively low. One limitation of the use of VMS is vessel size as it may not be appropriate to require a VMS to operate on smaller vessels, particularly those associated with artisanal fisheries. Data gained from a VMS can also be used for statistical and scientific assessment purposes as already done in some parts of the world, e.g. by the NAFO and for catch allocation into different jurisdictions by Argentina.

6.2.4 Inspection-at-sea/port control

Inspections-at-sea contain the element of surprise and can therefore be very successful in determining non-compliance by vessels. However, to become effective, a minimum coverage of inspections-at-sea by area and number of fishing vessels is necessary. The biggest disadvantage of an inspection-at-sea system consists of the high costs of vessels and trained personnel. In addition, the meaningful coordination of at-sea inspections can be complicated in the context of high seas inspection.

[20] However, these costs are becoming increasingly lower.

Port inspections, on the other hand, can be carried out on all fishing vessels[21] about to land their catches in a port provided sufficient qualified personnel is available. While the personnel and training requirements of a port inspection system are similar to that of an inspection-at-sea scheme, the purchasing and running costs for inspection vessels will not be incurred, making port inspections less expensive. However, the element of surprise does not exist, and it can therefore be easier for fishers to destroy evidence of non-compliance before the inspection. A port inspection scheme is most functional in permanent ports. For artisanal fisheries with varying landing points and times, such schemes might be less effective.

It is important to also monitor the transhipment of catches at sea as this activity can be used to cover up IUU fishing if not adequately controlled[22].

6.2.5 Observer programmes

The dual function of data collection and control/enforcement inherent to many MCS tools is even more pronounced in the case of observer programmes. Observers on board can be scientifically trained to collect information on catch composition by species, discards and biological details. This information can be invaluable for stock assessment purposes. The control and/or enforcement role of an observer is tenuous because it may put the observer in a position of one who enforces the law rather than that of a scientist, and can be more difficult, especially if the fishing trip extends over months. It is sometimes argued that a scientific observer programme can be more costly than one set up primarily for compliance purposes based on the assumption that a scientific scheme requires that a higher amount of vessels be equipped with scientifically trained and highly paid observers than would be necessary for compliance purposes. However, this is not always true: the most effective compliance schemes operate with high observer (on-board inspectors) coverage[23] and may have directives in place to reduce corruption, e.g. high salaries and short duty periods on a vessel.[24] Therefore, a successful observer programme for compliance purposes can be even more expensive than one for scientific purposes.

The high costs associated with observer programmes mean that they may not be applied for all fisheries. In particular for small-scale and artisanal fisheries the feasibility of observer programmes can be low: not only are the costs very high for low-profit enterprises, but the additional person on board can prove problematic on small boats. Alternatively, the fishing operation may be recorded by video cameras installed at strategic sites of the vessel that monitor the use of selective gears, catch composition and discards. This has been introduced by Argentina as a pilot system, which was officially launched in January 2011.

[21] Many RFMOs include obligatory port inspections on vessels having fished in their area of responsibility by all fishery landing ports of their member States.
[22] A number of RFMOs, e.g. CCSBT, adopted measures requiring 100 percent observer coverage of all products transshipped at sea.
[23] Ideally the observer coverage should be 100 percent, i.e. on all vessels at all times.
[24] Ultimately, however, it depends on the moral integrity of the individual observer whether the observed data are accurately recorded or not. This has to be considered in the selection process of observers.

7. CONSERVATION AND SUSTAINABLE USE MEASURES

7.1 Harvest-related measures

The overall objective of any management regime is to ensure the long-term sustainability of the fishery, which, according to the FAO Fisheries Glossary, can be defined as "fishing activities that do not cause or lead to undesirable changes in the biological and economic productivity, biological diversity, or ecosystem structure and functioning from one human generation to the next".

As mentioned above, most harvest-related measures depend on scientific advice and the associated data collection and assessment, which preferably should be performed in cooperation with relevant fishing and marketing industries. Trade-related measures are also dependent on such information. The implementation of a precautionary approach, as well as adaptive management strategies, is important for the management of all fisheries including sharks, a group that contains many species with life history traits that make them particularly vulnerable to overfishing or of those that are scientifically largely unknown. This is especially true for the less productive species, and special provisions should be taken to ensure their conservation. Furthermore, as for all species, shark species with low demand and caught as bycatch will benefit from more holistic management approaches such as an ecosystem approach. It should be recognized that vulnerable species of low or no commercial value (including sharks) can still be impacted by fishing activities and may require special measures to mitigate against their accidental capture.

The success of harvest-related and trade-related measures can be greatly enhanced if the support of the industry exists in addition to the implementation of effective compliance measures. Therefore, "beginning from the very basic point" can be viewed as a key approach for the conservation and management of shark species. This basic point is: to increase awareness of fishers and other resource users of the stock status of the species in question and of the importance of conservation and management measures for its sustainable utilization including collection of catch information and biological sampling, if possible, on these species.

The interest of fishery managers in shark fisheries has historically been relatively low and this lack of attention is reflected in the current state of conservation measures for sharks.

7.1.1 Access to the fishery

Access to the fishery can be obtained through open access or granted by means of a permit, or licenses issued by the corresponding administration.

7.1.2 Fishing moratorium

The temporary complete prohibition of directed fisheries for a species is the most drastic measure that can be taken by fishery managers to prevent a fish stock from collapsing or to encourage the rebuilding of a collapsed stock. Resource users could resist such a measure, in particular if they can still find some spots with sufficient abundance of the species in question to justify a fishing trip or if they have no alternative source of income, e.g. other resources during the rebuilding phase. Usually, fishers will be aware of the poor status of the stocks and hopefully be at least somewhat supportive of the measure. Additional bycatch regulations will be necessary for associated fisheries that may incidentally catch the species under moratorium. However the (illegal) discarding of such species is known to represent a problem for fisheries regimes without adequate monitoring. Trade-related measures may play a useful supportive role in any such fishing moratoria until stocks recover, although they can be subverted by illegal harvest and trade of the species in questions.

7.1.3 Effort control

Effort control implies regulation of the number and/or efficiency (size, length, horsepower, gross registered tonnage, freezing capacity, the number of hooks for longline fisheries, etc.) of fishing vessels and/or the number of fishing days permitted to each unit during the fishing season. A standardized number of fishing units and gears and operational time is usually established for the different strata of the authorized fleets. The probability of attaining the overall management objective by applying the corresponding fishing mortality (FM) must be estimated. Licences and VMS effort-control schemes are relatively easy and cost-efficient to enforce.

Restriction of the fishing period: a fixed number of fishing days may be allocated for individual vessels, but such schemes require careful monitoring of individual fishing vessels (e.g. using a satellite-based VMS). Lower compliance costs are involved for the establishment of a fishing season that allows every fishing vessel with a license to fish during this time. However, if such a fishing season becomes too short, a sharp increase in fishing efficiency ("derby" or "Olympic fishery") could result to maximize catch rates and profits. This may have a negative effect on livelihoods and market stability because of the resulting supply/demand imbalance (i.e. the entire annual catch is landed only during a very short time), and they also may impact safety on board. Such a situation can only be mitigated by control measures such as a strictly limited entry to the fishery.

7.1.4 Catch control

Catch control measures such as the establishment of a TAC require information on the biology and fishing mortality of the species concerned and its bycatch. Normally, a TAC will be distributed among resource users through a licensing or quota system. Where this is not done, a "derby" or "Olympic fishery" may be the result (see above).

Under a quota system, the individual shares are usually sold to resource users or distributed according to established rules. In high seas areas regulated by RFMOs, national quotas are typically allocated to every Party to the RFMO based, among other criteria, on the historical catch record of the species in question (this may involve a lengthy process of difficult and sensitive political negotiations). It was noted that monitoring the implementation of these agreements and ensuring compliance has proved difficult in some cases, especially where the resource is of considerable economic value. TACs for species in multi target fisheries are more difficult to implement because of their implications for catches of the associated species (i.e. possible closure of the target fisheries when the TAC of a second target species or an incidentally caught species is reached). There is a considerable risk that a catch quota system leads to high grading[25]of the catches to maximize profits. Also, resource users might not accept certain TACs, which in their opinion, might be unreasonably low; therefore, education and involvement of the industry in the decision-making as well as the implementation of a functional and effective compliance scheme are of prime importance for catch control measures and will help to keep IUU fishing at a low level.

It was noted that effective catch control schemes (with or without an individual quota system) entail high administrative and compliance costs. The practice of high grading, which has negative effects on resource conservation, is particularly pronounced under an individual quota system and needs to be controlled in a proper implementation of catch control schemes.

[25] FAO defines high grading as "the discarding of a portion of a vessel's legal catch that could have been sold, so that a higher or larger grade of fish can be subsequently caught that brings higher prices. This may occur in any fishery, but the incentive to do so is particularly great with individual quotas (catch limitations)."

7.1.5 Technical conservation measures

Technical conservation measures regulate how and where fishers may fish, and include: minimum landing sizes of individual fish, minimum mesh sizes for nets, limits on bycatch and discards, requirements to use more selective fishing gear (to reduce unwanted bycatch) and measures to prevent damage to the marine environment. During the workshop, the effects of some technical measures were discussed separately:

- Temporal/spatial closures: area closures can be established on a temporary/seasonal or a more permanent basis. Usually such closures come into effect to protect spawning or nursery grounds during certain periods or seasons. Also, such closures can be in place for certain gear types only, e.g. bottom trawls, longlines or purse seines. The effects of area closures may be different for different species, e.g. for migratory versus sedentary species, but they are generally thought of as having a very beneficial effect not just for the species requiring conservation measures but also for the protection of important marine habitats such as seagrass beds and tidal flats. Such effects may be limited for areas that are only temporarily closed compared with a year-round closure. It was noted that more information on the period of mating and parturition of many exploited shark species is required for the effective establishment of seasonal area closures for sharks. Also, the determination of which areas to close preferably should involve the resource users concerned but at least must take into consideration the situation and possible alternatives for fishers who will be shut out from the area.
- Ban on shark and ray finning: shark-specific ban of finning is a technical conservation measure that prohibits the discard of shark carcasses at sea while keeping only the fins on board. It is a common regulation adopted by a number of States and RFMOs for the conservation of sharks in their areas of responsibility. Participants remarked that a ban on shark finning has conservation effects in fisheries that are only interested in shark fins. Such bans support the rational utilization of living marine resources as they help diminish shark discards and reduce the overall amount of sharks caught; however, efforts should be made to avoid reduced opportunities to collect necessary scientific and statistical data by the introduction of a shark finning ban. While profits in shark fisheries operating under a finning ban regulation will most likely be cut, the measure could encourage the use of previously discarded shark meat and thus help create new jobs in the shark processing industry as well as enhancing food security. A ban of shark finning will not change the sustainability of those shark fisheries targeting all parts of the shark.

7.1.6 Best practices: safety and health regulations

During the workshop, the term “best practices” was defined as including a number of regulations for (a) optimization of resource utilization by reducing mortality and waste; (b) sanitation measures (e.g. maintaining freezing chains, hygienic standards and preventing contaminated products from entering trade); and (c) health and safety of fishery workers on vessels and in ports. Mostly, these regulations will be imposed and enforced by governments, but costs for the necessary equipment and personnel, etc., are usually absorbed by the industry. Adequate investments for public awareness and education should be considered, as public endorsement will greatly improve the cooperation of the industry in the implementation of such measures.

7.2 Trade-related measures

International demand for sharks and their products often is an important driver for shark fisheries. Mostly, the usefulness of trade-related measures is restricted to those species or to that portion of the catch subjected to a complex trading process that can involve several intermediaries and processing industries in more than one country. In coastal areas, local demand for food fish is often satisfied by artisanal fisheries, which can substantially contribute to the food security of coastal communities. Such local artisanal fisheries may target available low-value species that would not be a viable target

for more industrial fishing vessels with high operational costs, and most trade-related measures listed here may have only minimal effects. Still, participants recognized that many artisanal food fishers also collect and dry high-value shark fins selling them occasionally to international merchants; they thus play a role in the shark-fin economy.

Trade regulations for fish generally increase the transparency of the exploitation and marketing process and may thus support compliance of the fisheries with harvest-related measures. Many trade-related measures also assist consumers in making educated choices when purchasing a product and can thus contribute to more sustainable fisheries.

Workshop participants agreed that a routine collection of customs trade data is valuable under virtually all circumstances. Regarding the imposition of tariff barriers[26] in support of shark conservation the workshop was divided: some participants found that tariff barriers could be useful as long as compatibility with World Trade Organization (WTO) rules was ensured, while others would not recommend the use of such barriers for this purpose.

A number of trade-related measures, most prominently ecolabelling[27], have been introduced as voluntary measures, led and controlled by the industry with or without government support. Obviously such voluntary schemes usually have full support from participating resource users and face less compliance problems than government-imposed (statutory) measures. However, the effect on stock status and the marine environment of a voluntary regime depends on the degree of participation by the industry and, if participation is low, might not be noticeable at all.

Trade measures may be useful in supporting a rational and sustainable use of marine living resources, but careful consideration in the design of trade-related measures is as important as for harvest-related measures to avoid jeopardizing livelihoods and jobs. Trade-related measures may be an incentive to developing a fisheries management regime in areas where it does not exist or to improving an existing one, which is particularly important for species with low productivity or resilience. However, in the absence of appropriate harvest-related measures, some trade-related measures could instead result in discarding the species subject to trade-related measures or in changing target species.

Once a locally distributed species has declined below the threshold for a commercially viable target fishery and is not caught in significant numbers as bycatch, its trade will dwindle independently of the existence of trade-related measures.[28] However, in the case of a widely distributed regional or global stock, an overall significant decline might not be immediately manifested in all parts of its geographic distribution and its commercial exploitation could continue in areas where it is still sufficiently abundant. Such a situation urgently requires bilateral or multilateral cooperation for the establishment of adequate conservation measures for both high seas and EEZ fisheries for that stock, and the concurrent introduction of trade-control measures (such as product documentation and certification or the regulation of international trade) could be an additional instrument to encourage the development of bilateral or multilateral harvest-related measures or complement those international measures already in place.

7.2.1 Product documentation and certification programmes

Trade documents are based on records that prove legal acquisition and are issued only with respect to products that enter international trade. Catch certifications are issued at the major harvesting, processing and trading places and apply to nationally and internationally traded products for which

[26] A tariff is a tax levied on imports or exports.
[27] A number of examples can be found in: Deere, C.L., 1999. *Eco-labelling and sustainable fisheries*, IUCN, Washington, D.C. and FAO, Rome. See also: FAO. 2005. *Guidelines for the ecolabelling of fish and fishery products from marine capture fisheries*. Rome. FAO. 90 p.
[28] Nonetheless, it must be kept in mind that if the species in question is still caught as bycatch in a multispecies fishery, a reduced but profitable trade could continue long after its target fishery has seized to be viable.

such a scheme has been devised. Both types of documents contain information relating to the fish in question, although catch certifications contain more comprehensive data, including trade and transfer information in some cases. Both catch certification and trade documentation schemes can assist with verifying catch data and minimizing opportunities for IUU products to enter the market. Such verification/certification can be issued under a voluntary industry-led scheme or by a government imposed programme.

Catch certification and related trade documentation can be particularly effective for globally traded species targeted by fisheries both on the high-seas and within an EEZ. A certification programme can also help to improve basic fishery information and to cross-check related information from other sources (i.e. to verify catch data with trade data). Catch certification and trade documentation schemes can be used for targeted as well as for bycatch fisheries, e.g. the dolphin mortality limit agreement in IATTC. There is a concern that, in the presence of multiple and different catch certification and trade documentation schemes, government administrations (customs) and/or RFMOs responsible for the implementation of a scheme could become overburdened. This risk can be minimized through harmonization of existing catch certification and trade documentation schemes.

Ecolabelling[29] is a catch certification and trade documentation scheme that provides information about the provenance and environmental sustainability of the product. It entitles a fishery product to bear a distinctive logo or statement that certifies that the fish has been harvested in compliance with conservation and sustainability standards to allow consumers to make an informed choice. There are many ecolabelling schemes in place, and there is a risk that the lack of harmonization adds to the administrative burden and to customer confusion that can undermine the effectiveness of these schemes. Thus, a harmonization of labelling standards is important to enhance efficiency and reduce confusion among the industry and consumers.

Tracking and tracing schemes are a form of catch or trade documentation that helps determine the legal origin of and "chain of custody" for current and past locations (and other information) of a product in trade. Such schemes enhance transparency and thus product quality found in the market with beneficial effects on nutritional health. In areas with sufficient awareness and education, products traded under such schemes can increase customer demand and may achieve higher prices. Under low-demand circumstances, however, such programmes may not be cost-effective.

7.2.2 Conditions for or limits on trade

International trade regulations can assist in reducing fishery catches of a substantially overexploited species where the driver for such unsustainable exploitation consists of high international demand for and trade of the fish (products) concerned. This can be achieved through requiring trade documentation (e.g. export permits), placing prerequisite conditions on the issuance of such documents (e.g. legal acquisition and environmental sustainability), limiting the amount traded (e.g. export quotas) and controlling the number of countries involved in the trading (e.g. only member countries of a particular regime) as well as reducing the volume of and access to IUU products (e.g. through enhanced compliance monitoring and enforcement efforts). Import and export regulations can be imposed on a national, regional or global basis by countries and by intergovernmental organizations.

Much of the discussion under this heading[30] focused on the implementation and effects of international trade measures without specifically analysing the application of CITES. Nonetheless, some points were illustrated through examples of CITES practice, as it is the only intergovernmental organization with the sole mandate to adopt international trade measures where needed for the

[29] See also: FAO. 2005. Guidelines for the ecolabelling of fish and fishery products from marine capture fisheries. Rome. FAO. 2005. 90 pp.

[30] Similar to other workshop discussions, many of the discussions on trade regulations took place during sub group meetings as explained under Chapter 3.

conservation and sustainable use of listed species and to monitor the implementation of those measures. For this reason, at the end of the workshop, a majority of participants decided that it would make sense to have a brief discussion on the specific operations of CITES in the context of conservation and sustainable use of elasmobranchs. In particular workshop participants considered the implications of listing a species on CITES Appendix I[31] (prohibition of commercial international trade, excepting aquaculture) and CITES Appendix II[32] (regulation of commercial international trade).[33]

These measures require that all import, export, re-export and introduction from the sea (i.e. from waters not under the jurisdiction of a State) of species covered by the Convention have to be authorized through a permit or certification system. Each Party to the Convention must designate one or more management authorities in charge of administering the certification licensing system and one or more scientific authorities to provide advice about the effects of any proposed trade on the status of the species. A management authority or scientific authority can be, and often is, a national authority with fisheries competence.

Workshop participants observed that – analogous to the operations of RFMOs – the effective implementation of CITES Appendix I and II listings by States requires substantial national administrative investment, e.g. for staffing, research, maintaining a CITES office and an effective presence at the triennial CoP meetings. CITES does not stipulate rigid guidelines for the non-detrimental findings (NDFs) required of national scientific authorities, and national authorities themselves have responsibility for determining whether the trade in a given species is "non-detrimental" (see footnote 17, page 8).

Some participants felt that the issuing of NDFs for widely distributed marine species can be particularly difficult in comparison with other species and represents a burden on developing countries. The CITES Secretariat pointed out that – although capacity-building is certainly needed – most States can fulfill the CITES requirements as witnessed by the total number of about 10 million authorized trade transactions recorded in the CITES global trade databases since 1975.

As mentioned above, the prohibition of international commercial trade (e.g. Appendix I listing) occurs when the CoPs to CITES determines that a species is threatened with extinction and is or may be affected by trade. Usually, serious socio-economic impacts should already be evident before the international trade of a species is prohibited. However, concerns were voiced that negative socio-economic consequences, in particular for developing countries (e.g. on livelihoods/jobs) as well as the creation of illegal markets and of fisheries supplying such illegal markets, could arise or continue in those cases where "healthy" stocks are listed in Appendix II as look-alikes (see footnote 32) and/or when recovered stocks are not delisted or downlisted soon after their recovery.

[31] Species listed in Appendix I are threatened with extinction and are or may be affected by trade. Trade in specimens of these species must be subject to particularly strict regulation in order not to endanger further their survival and must only be authorized in exceptional circumstances. The management authority of the exporting State is expected to check that an import permit has been secured and the management authority of the State of import must be satisfied that the import will not be for primarily commercial purposes.

[32] Species listed in Appendix II are those that are not necessarily now threatened with extinction but may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with their survival. In addition, Appendix II can also include other species, whose specimens, in the form that they are traded, resemble specimens of another species in Appendix I or II to such an extent that enforcement officers who encountered them would be unlikely to be able to distinguish between them (so-called look-alike species). International trade in specimens of Appendix II species may be authorized by the granting of an export permit or re-export certificate. No import permit is necessary for these species under CITES. A finding that trade will not be detrimental to the survival of the species and confirmation that the specimen was legally obtained are required before an export permits can be issued.

[33] CITES does not generally address domestic trade in listed species unless it has implications for international trade.

Workshop participants remarked that the listing of a species in the CITES Appendices is usually considered at a global level, although it should take into account the regionally diverse stock status of a widely distributed species.[34] This might be easier for RFMOs who from the onset can devise a management regime tailored to specific regional and local situations drawing on an array of possible measures for different stocks and socio-economic situations. However, as the CITES Secretariat pointed out, the actual implementation of CITES provisions by States should be similarly diverse taking into account local bioecological and socio-economic attributes of the fish species concerned as well as the capacity of a certifying State. Finally, it was noted that detailed information on the market and the distribution of a product are also necessary to understand the effect of trade regulations as there could be areas and social groups in parts of a country that have a higher demand for, or even dependence on, certain products than other areas or groups.

The need for capacity-building and improved species identification for data collection for the successful operation of international trade regulations was acknowledged by all workshop participants. A correct on-the-spot identification of shark species can be particularly difficult, if not impossible, if the enforcement officers are faced with processed body parts (e.g. fins and meat with and without skin, raw, salted, dried, boiled and dried, ready-to-cook products) whose origin might sometimes be difficult to determine as the distribution system of these products can be complicated. As long as it remains problematic for customs officers to identify species, the practice of listing "look-alike" species will continue in support of the effective implementation of CITES measures.

It was pointed out that the necessary assessment data for NDFs would need to be generated from fishery records (and scientific surveys). In this context, concern was voiced that if a fishery actually stops as a result of a CITES Appendix I listing (or a fishing moratorium), valuable and necessary fishery data will no longer be available for assessment purposes[35], making it difficult to determine whether the species still meets the criteria for its listing or requires the moratorium.[36]

If a species threatened with extinction is mainly exploited for local consumption, and international demand and trade are not important factors in its exploitation, the species is unlikely to be listed in CITES, and CITES trade regulations would have only little effect on the harvest rate of the species concerned. Workshop participants discussed the scenario where a part of a globally/regionally distributed shark, e.g. fins, are a valuable commodity traded internationally, but in a number of regions substantial income is gained from the meat that is supplied to local markets. In such case and in regions where the fishery for the meat alone remains commercially viable, a prohibition of international trade (CITES Appendix I) may only affect the sale of fins but not the sale of the meat. In the absence of a local demand for fins, the main effect of the regulation would then consist of a reduction of profits for local fishers and intermediaries exporting the fins, but without positive effects for the local stocks as the meat fishery may continue (with the fins being discarded or sold to illegal markets).[37] In these cases, harvest-related measures are the only choice to effectively conserve the stocks.

[34] This was particularly the case in the 2010 proposal to list several shark species on CITES Appendix II where the inclusion of stocks in healthy condition was justified by the proposals on account of the "look-alike" clause, i.e. because the different stocks would be impossible to distinguish by compliance officers.

[35] It noted that an Appendix I listing would not necessarily stop the collection of fishery data. For example, fishers could be required to record all catches including discards in their logbooks and observers would also note if a CITES listed species was caught. Some participants questioned the practicability of this approach and the reliability of the data collected in such a way.

[36] It was suggested by a few participants that a listing under CITES Appendix II could have similar impacts on the availability of fishery data if the difficulties of fulfilling the NDF requirements for marine species resulted in fishers no longer catching the species concerned.

[37] It was commented by a few participants that an Appendix II listing could have similar effects resulting from difficulties of issuing NDFs for marine species by certain countries.

In particular, with regard to commercially-exploited marine species, workshop participants noted that the intervals of two to three years for the CITES CoP decision-making process may not always be in synchrony with the usual annual review of measures by fishery management schemes.[38] Because trade regulations have a direct impact on the fisheries concerned and will alter the effect of many harvest-related measures, the less frequent review of CITES listings can add inflexibility to a fisheries management system, particularly for species whose international commercial trade is regulated (Appendix II) or prohibited (Appendix I) by CITES. Therefore, the idea of reviewing each listing at regular intervals linked to the stock assessment cycles of the species in question as suggested by the CITES Secretary-General in his introductory speech found much approval.

Participants noted that as a result of the need for a two-thirds majority vote of parties present and voting at a CITES CoP, the listing and in particular the delisting or downlisting of a species usually is very difficult. This means that not only will it often be hard to include an eligible species in the Appendices but that, in the opposite case, even if a species status has improved such that it appears to no longer fulfil the CITES listing criteria, delisting or downlisting of this species may still be very challenging.[39] This aspect of a CITES listing was of great concern to many participants.

All participants agreed that the effective implementation of trade regulation regimes will depend on the capability of exporting coastal States to properly implement appropriate fishery conservation/management measures as well as on the medium- to long-term socio-economic gain that can be achieved through a more sustainable use of the fishery resources. In the case of low-value bycatch species, the incentive for establishing such a trade regime may be rather low. A few participants expressed their general doubt about of the usefulness of a CITES listing[40] for the conservation of commercially-exploited aquatic species.[41]

In keeping with the opening remarks of the CITES Secretary-General, it was suggested that CITES listings and trade regulations in general, if properly implemented, may be complementary to other measures, e.g. fishery management. They may help improve compliance with fishery measures and thus improve their effectiveness and support the recovery of stocks without necessarily having strong adverse socio-economic implications. According to a number of workshop participants, the establishment of an effective fisheries management regime that includes a scientific assessment and data collection scheme should be regarded as a highly desirable prerequisite for the successful implementation of trade regulations.[42]

7.2.3 Elimination of subsidies and economic incentives

Although government financial transfers such as subsidies and economic incentives are not trade measures in the strict sense, they were discussed by workshop participants as factors that may have great impact on fishing capacity and indirectly affect markets and trade. After considerable discussion about the correct wording for this issue, participants decided to use language from the FAO IPOA for the Management of Fishing Capacity. This document includes reference to “subsidies and economic incentives” (as subtitle to paragraphs 25 and 26), which contribute, directly and indirectly, to the build

[38] It was noted that, to date, those countries and RFBs that do have regular scientific assessments of commercially important shark species tend to perform them at longer intervals of two to three years.
[39] It was noted that it has proven to be difficult or even impossible to delist or downlist some CITES species. Several participants felt that this has been impeeding the proper working of CITES.
[40] Both Appendix I and II.
[41] These participants felt that the CITES decision-making process was strongly influenced by environmental non-governmental organizations (NGOs) and that this could result in conflict with the objective of sustainable use. Others noted that RFMOs are also often subjected to pressure from the industry, which can result in conflict with conservation objectives.
[42] In this context, some participants noted that the prospect of a commercially-exploited aquatic species being proposed for listing on one of the CITES Appendices may have an encouraging effect on coastal States to develop a more effective fisheries management regime.

up of excessive fishing capacity thereby undermining the sustainability of marine living resources. It was understood that the scope of the workshop did not allow for a detailed discussion of this item.

However, the workshop recognized that, in general, by eliminating such subsidies and economic incentives, the costs of fishing have to be fully internalized by the affected industry, which will have negative impacts on the profits, jobs and possibly the prices of the fishery sector concerned. All non-subsidized industries, however, will benefit from the disappearance of this type of competition. Because such subsidies and economic incentives tend to encourage fishing (and overfishing), the benefits of eliminating such incentives were viewed as an overall positive benefit for the resource and as contributing towards the long-term stability and sustainability of the industry (provided that there is no competition from illegal industries or from foreign subsidized or low-cost industries).

Administrations would incur no costs for the revoking of such subsidies and economic incentives; on the contrary, the costs of administering the incentives would disappear. It was noted that not all subsidies are detrimental to sustainable fisheries; for example, the introduction of bycatch mitigating devices for sea turtles and sea birds has been supported by economic incentives. The existence and creation of such positive incentives to enhance the implementation of certain conservation measures was not viewed as harmful but it will cause administrative costs.

8. CONCLUSIONS

- Workshop participants stressed that for a species (or stock) with a broad geographic distribution (global/regional), the international cooperation of States is very important to ensure that necessary management measures are applied over a sufficiently large area of the species' or stock's[43] distribution; otherwise, the measures taken by one or a few States might not have the desired effect on the status of the species or stock. For national/local shark stocks, effective national fishery management is required to ensure the sustainability of the resource.

- Workshop participants found that (apart from jurisdictional matters) the main difference for high seas versus EEZ scenarios was that the high seas fisheries do not include artisanal fisheries and normally do not supply small local markets, which can play a key role in ensuring food security in poor coastal communities.

- Workshop participants concluded that every regulatory measure will be met with a mixed response by civil society when different groups have different interests. The media play an important role in influencing public opinion and awareness building. Participants stressed the importance of an independent education process, possibly led by governments or intergovernmental organizations (even if the costs are significant), to increase awareness and acceptance of the necessity to introduce management measures by those most affected, and to feed the media with objective information to raise public awareness.

- Workshop participants underlined the importance of scientific assessment and data collection for sound shark management regimes at national and international levels. The requirement for species identification tools and appropriate training of data collectors and inspectors was highlighted.

[43]The normal fishery management unit is a stock; however, the area inhabited by such a stock often comprises only a fraction of the overall geographic distribution of a species. For the purpose of assessing the conservation status of a whole species, a broader geographical view than that of a single stock is preferable.

- In view of the fact that most of the data on catch and trade of sharks are reported in broad taxonomically aggregated categories, workshop participants recommended strengthening international efforts for capacity building in the harvesting and trading sector, and developing species identification tools (field guides, workshops, training courses, etc.) with the collaboration of governmental, private sector and non-governmental organizations.

- Workshop participants recognized that, as a result of the relatively low interest of fishery managers in sharks and the difficulties of accurately identifying sharks, there is a general lack of species-specific data for catch, fishing effort and trade of sharks. This means that one of the desirable prerequisites for a successful management regime, i.e. scientific assessment, currently will not be generating the quality of advice that managers require. Therefore, while every effort to improve the scientific assessment of sharks should be made (see above), the application of adaptive management and precautionary management approaches as well as the ecosystem approach to fisheries should be considered for the conservation and sustainable use of elasmobranchs.

- Information from fishery-independent sources (i.e. scientific surveys) is very important for scientific stock assessment and subsequent management advice. However, workshop participants acknowledged that these types of activities are very costly and may be beyond the economic realities of developing countries without international assistance and cooperation.

- Workshop participants noted the economic risk for target fisheries that depend on vulnerable species (especially in coastal fisheries), and considered non-consumptive uses of sharks such as environmentally friendly ecotourism as a rational alternative for some coastal communities where shark stocks have been overfished and tourism is feasible.

- Workshop participants strongly encouraged the application of fisheries management measures to exploited and/or vulnerable sharks. It was felt that the listing of sharks on one of the CITES Appendices alone cannot effectively ensure their conservation without a proper fishery management scheme. The use of CITES to regulate international trade in sharks should therefore be considered as a complementary measure rather than an alternative to traditional fisheries management, if properly implemented. However, it was recognized that under the right circumstances international trade measures – provided they are properly implemented – can play a valuable supportive role in helping to ensure sustainable fisheries and provide incentives for the creation or enhancement of a fisheries management scheme for the species concerned.

9. OUTPUT: SUMMARY OF LIKELY EFFECTS OF CONSERVATION AND SUSTAINABLE USE MEASURES

Table 3 contains condensed summary findings, which should be read in conjunction with the narrative parts of this report in order to avoid any misinterpretations. The likely effects of various measures described in the table are based on the assumption of a relatively simple situation as reflected in the scenarios discussed above. In reality, species will meet various particular conditions that also have to be taken into account and that could change the outcome predicted by the table.

Workshop participants agreed that the anticipated benefits of a particular conservation measure (be it harvest- or trade-related) could only come about if this measure was appropriately implemented. It was noted that quite often this may not be the case and that apart from a poor quality of scientific assessments and an underfunded MCS scheme, corruption and gratuities may contribute to a poor implementation of shark conservation measures. In addition, it was understood that any biological benefits of a conservation measure (in particular, the most severe ones such as a prohibition of harvest

or trade) will only become apparent if the biological status of the species for which the conservation measures were devised was affected by fisheries to a degree where it was severely declining or in poor status. In this context, it was observed that a number of artisanal fisheries depend on incidental shark catches including the ability to trade them, and that sustainable shark fishing and shark fin trade can have a positive impact on poverty alleviation for millions of people around the world.

Table 3. Likely effects on different sectors if the conservation measure is adequately implemented (see appropriate subchapters for details and explanations)

Measures	Stock status and environment	Industry/livelihoods/food security	Markets and trade	Administration and public opinon
Fishing moratorium (= fishing ban)	Would benefit from supporting trade-related measures if these are sufficiently flexible. **BENEFITS:** Positive effects on sustainability and biodiversity. **RISKS:** IUU in the absence of efficient MCS may compromise stock recovery; lack of fishery data for assessment purposes.	**BENEFITS:** In the long term, stock recovery and chance of subsequent sustainable fishery and improved food security. **RISKS**: Immediate impact on jobs if alternative target species not available; short-term food supply may be affected; might meet resistance; non-compliance issues if not properly enforced.	**BENEFITS:** In the long term, improved stability of supplies owing to more sustainable resource use. **RISKS**: Immediate impact on markets, trade and product manufacturers, especially if a species is high in demand. Eventually, demand will switch to other species; this might be less feasible for small local markets.	Costs for supporting scientific and compliance schemes are high and have to be carefully considered; public education highly desirable; effective enforcement can be particularly difficult and costly in mixed fisheries.
Effort regulations	**BENEFITS:** Positive effects on sustainability and biodiversity. **RISKS:** IUU in the absence of efficient MCS may compromise stock recovery.	**BENEFITS:** In the long-term, stability and increased food security. **RISKS**: Non-compliance issues and resistance; short-term food supply may be affected; reduction of fishing opportunities can diminish jobs, in particular for low-value target species on which local fisheries might depend; this could affect food security.	**BENEFITS:** In the long-term, improved stability of supplies owing to more sustainable resource use. **RISKS**: Temporarily, markets and trade could be affected if the measure results in a pronounced catch reduction; in case of very short fishing seasons an asynchronous supply/demand situation may result.	Costs for supporting scientific and compliance schemes are high and have to be carefully considered; otherwise, high risk of IUU fishing.
Catch regulations	**BENEFITS:** Positive effects on sustainability and biodiversity. **RISKS:** IUU in the absence of efficient MCS may compromise stock recovery.	**BENEFITS:** In the long-term, increased stability through improved sustainability of the resource. **RISKS**: High compliance costs and reduced catches may affect the viability of a fishery and can lead to change of target species; short-term food supply may be affected; high-grading issues; might meet resistance; non-compliance issues if not properly enforced.	**BENEFITS:** In the long-term, increased stability through improved sustainability. **RISKS**: High compliance costs, if borne by the industry, can affect profits, especially for low-demand species; demand may shift to other species (small local markets might be most affected).	Costs for supporting scientific and compliance schemes are high and have to be carefully considered; otherwise, high risk of IUU fishing.
Technical conservation measures (TCMs)	**BENEFITS:** Positive effects on sustainability, biodiversity and habitats (area closures). **RISKS:** IUU in the absence of efficient MCS may compromise stock recovery.	**BENEFIT**S: In the long-term, increased stability through improved sustainability of the resource. **RISKS**: Additional costs, e.g. VMS for temporal/spatial closures, and reduced catches may affect the viability of a fishery for low-value species (e.g. local food fisheries) resulting in change of target species; closures may impact fisheries with other target species; high grading and non-compliance issues; might meet resistance.	**BENEFITS:** In the long-term, increased stability through improved sustainability of the resource. Increased production costs can impact profit and price could rise if supported by demand. **RISKS**: Fishers might not always be able to recover higher production costs, especially for low-demand species (small local markets might be most affected).	Less costs and resources for the implementation of the necessary supporting MCS and enforcement scheme as well as scientific assessments than other harvest-related measures.
Best practices including sanitary certification	**BENEFITS:** Waste reduction; can supply data (e.g. content of heavy metals in tissues). **RISKS:** None.	**BENEFITS:** Beneficial effects on job safety, food quality and waste reduction. **RISKS**: Moderate compliance costs; might meet some resistance, in particular in low-value fisheries.	**BENEFITS:** Increases saleability of the products and may give access to new markets where demand exists. **RISKS**: May lower profits – if fishers cannot recover the increased production costs they will stop supplying the markets or raise prices where demand will support this.	Some costs for research, MCS and enforcement (in the case of sanitary certification, these costs can be substantive). Additional costs for public education and awareness building are recommended to increase the demand.

Table 3, continued: Likely effects on different sectors if the conservation measure is adequately implemented (see appropriate sub-chapters for details and explanations)

Measures	Stock status and environment	Industry/livelihoods/food security	Markets and trade	Administration and public opinion
Statutory product documentation and certification schemes	**BENEFITS:** Improved sustainability and biodiversity through increased effectiveness of fishery regulations. **RISKS:** If compliance costs are too high, IUU fishing could compromise fish stocks	**BENEFITS:** Reduces IUU and thus benefits legal fishers; in the long-term improved stability and food security quality. **RISKS**: Might meet resistance. If compliance costs are too high, legal fishing activities might not be economically viable.	**BENEFITS:** Increased consumer confidence in products improves demand in some areas; shift to international markets; lower supply from IUU products; long-term increased stability of supply. **RISKS**: Fishers may not be able to recover compliance costs and stop supplying local markets; illegal trading if supported by demand.	Substantial costs and resources are required for implementation, control and enforcement as well as for public education and awareness building. This is especially true for certification schemes, such as ecolabelling.
Regulation of international commercial trade, e.g. CITES Appendix II	**BENEFITS:** Positive effects on sustainability and biodiversity through increased effectiveness of fishery regulations; can encourage fisheries management. **RISKS:** Without fisheries management, effectiveness compromised.	Affects fisheries supplying international markets; those supplying local markets are not or less affected. **BENEFITS**: If complemented by effective fishery management, chance of long-term stock recovery and opportunity for sustainable fishery. **RISKS:** May impact export fisheries in States without capacity to apply required procedures to meet NDF requirements; may lead to a change in target species; might meet resistance.	**BENEFITS:** Can create advantages for range State markets. **RISKS**: NDF requirement can lead to decreased trade and/or profits and create additional bureaucratic burden for traders; may encourage illegal markets (less than Appendix I); shift to alternative species.	Costs and resources for enforcement, training, NDF, permits or certificates are high; NDF is based on fisheries assessment (implies costs). Developing countries might find it difficult to implement without support for capacity-building. Need for fish identificiation tools and training for customs officers.
Prohibition of international commercial trade, e.g. CITES Appendix I	Most efficient as supplement to fishing moratorium. **BENEFITS:** Reduced catches have positive long-term effects on sustainability and biodiversity. **RISKS**: Overfishing for local markets may continue; data availability for scientific purposes diminished.	Affects fisheries supplying international markets; those supplying local market are not or less impacted. **BENEFITS**: If complemented by effective fishery management, chance of long-term stock recovery and opportunity for sustainable fishery. **RISKS:** Significant negative impact if done in isolation (and not as a complement to fishery management measures) through reduction of fishing possibilities and loss of jobs in affected fisheries (mainly at high seas and in developing countries); may lead to a change in target species; insufficient flexibility of CITES listings could prevent resumption of sustainable resource use after stock recovery; might meet resistance and affected fisheries could continue in supply of illegal markets.	**BENEFITS:** Can create advantages for range State markets if national demand exists. **RISKS:** Legal international commercial trade of the species disappears and illegal markets may appear; shift to alternative species.	Costs of implementation and running costs – including monitoring and control (at all entry points) are high. Customs officers have to be trained to identify these species and detect their illegal trade (i.e. export, import, re-export and introduction from the sea). Need alternate data-gathering system for high-sea portion of resources.
Voluntary industry-led product documentation, and certification schemes	**BENEFITS:** Positive effects on sustainability and biodiversity. **RISKS**: No effects with low participation rate.	**BENEFITS:** Long-term benefits for participating fisheries; no resistance (voluntary); compliance high; long-term improved stability. **RISKS**: Low participation will jeopardize effects; possible decrease of domestic fish supply in developing countries could be a threat to food security; implementation costs are carried by industry	**BENEFITS:** Facilitates access to new markets or allows retaining access in geographic areas where demand exists; possible shift from local to international markets. **RISKS:** Consumer demand has to be created through public-awareness programmes; confusion in the case of concurrent schemes; low industry participation can undermine scheme.	No administrative costs by States unless the scheme is supported by governments. Effectiveness will greatly benefit from public education and awareness building through government campaigns.
Elimination of harmful subsidies and economic incentives	**BENEFITS:** Positive effects on sustainability and biodiversity. **RISKS:** Little or no effects if subsidies were not alone responsible for overfishing.	**BENEFITS:** Immediate benefit for non-subsidized fisheries; long-term benefits for all from improved efficiency and more sustainable fisheries (provided there is no price competition from foreign industry). **RISKS:** Internalization of costs leads to a loss in comparative advantage resulting in a reduction in fleet capacity and loss of profits (particularly negative for sustainability of artisanal/ small-scale fisheries and resource-dependent coastal communities).	**BENEFITS:** Improved national and international trade opportunities for products from formerly non-subsidized fisheries **RISKS**: Possible price increase; overall reduction in fishing effort could create shortages and reduce product diversity; will cut profits for previously subsidized industry.	This measure unburdens administrations because it reduces costs and resources.

APPENDIX A

Agenda

Monday, 19 June

9:00	Arrival at meeting venue
9:15−9:20	Welcome message on behalf of the mayor by Ms Elena Antonelli and Augusto Milana, representatives of the Town Council
9:20−9:40	Welcome message by John Scanlon, Secretary-General CITES Secretariat
9:40−10:00	Welcome message by Kevern Cochrane, Director Fisheries and Aquaculture Resources Use and Conservation Division, FAO
10:00−10:30	Election of Chair and adoption of agenda

Summary presentations on different aspects of shark utilization and management

10:30−10:50	Global status of sharks, their ecological role and some important biological characteristics (John Carlson)
10:50−11:10	International law of relevance to the management and conservation of sharks (Marceil Yeater)
11:10−11:30	Major catching and trading countries of shark products and the tracking of shark products in trade (Glenn Sant)
12:00−12:20	The shark-trading industry in Asia (Charlie Lim)
12:20−12:40	CITES activities related to sharks: status of implementation and effects on stock abundance and trade (David Morgan)
12:40−13:00	Overview of the FAO IPOA-Sharks: Status of its implementation to date (Dave Ebert)
14:50−15:10	Overview of shark fisheries, management and trade in Latin America (Ramiro Sanchez)
15:10−15:30	The European Union Plan of Action for Sharks (Antonio Fernandez-Aguirre)
15:40-16:00	Brief overview of shark fishery and trade in West, Central and Northern Africa (Paul Bannerman)
16:00−16:20	Sharks exploitation in the Benguela Current LME (Moses Maurihungirire)
16:20−16:40	Shark fishery and conservation in China (Xiaojie Dai)
16:40−17:00	Overview of shark fisheries, management and trade in South and Eastern Asia (Yasuko Semba)
17:00−17:20	The conservation and management of sharks by RFMOs and other relevant bodies (Cheri McCarty)
17:20−17:40	Introduction to the scenario approach of the workshop (Johanne Fischer)
17:45−20:00	Guided tour of the old centre of Genazzano and welcome drinks at the Hotel Cremona

Tuesday to Thursday, 20–22 June

09:00−16:00	Working Group meetings in parallel
16:00−18:00	Plenary session

Friday. 23 June

09:00−17:00	Finalization of the core parts of the report.

APPENDIX B

List of participants

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Concerns about the status of sharks and their often unregulated exploitation have led to a number of international initiatives to improve shark conservation, among them the FAO International Plan of Action for the Conservation and Management of Sharks (FAO IPOA Sharks), as well as the regulation of international trade through CITES of several elasmobranchs currently listed on one of the CITES Appendices. Progress in the implementation of the IPOA has been slow and the status of a number of shark species remains a concern, which makes it plausible that sharks will continue to be proposed for inclusion in one of the CITES Appendices.

The status of many sharks is unknown or poor, but there are different views on the best course of action to improve the conservation of sharks. Some countries hold the view that regulation of international trade is necessary to ensure their use is sustainable, while other countries have expressed doubts that regulation of international trade – through CITES – is a suitable instrument for the management, conservation and sustainable use of commercially-exploited marine species including sharks.

With these considerations in mind, this workshop, jointly convened by FAO and CITES, was held in Genazzano (Rome) from 19 to 23 July 2010, and attended by experts from different geographic areas and sectors, including scientific assessment, fisheries management, fishing industry, fish trade, monitoring and control, and government administration. The workshop report describes various types of fishery and trade regulations, and discusses their effectiveness with regard to implementation and stock recovery as well as their impact on fisheries, livelihood, food security, markets and trade, and government administrations. A key output of the workshop consists of a tabular summary of the discussed effects of different measures on various sectors. This table and the descriptions in the narrative part of the report are designed to assist resource managers in various regions and countries and under different fisheries development and shark management situations in their decision-making regarding their own most appropriate management regulations for the conservation and sustainable use of sharks that concern them.

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